Japan Transport Safety Board
Annual Report
2021

July, 2021

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.

Contributing for fostering a culture of transportation safety

It has been two years since I was appointed to the chairperson of the Japan Transport Safety Board (JTSB). Last year, due to the restrictions imposed by impact of the COVID-19, we were faced with a situation that we were not able to carry out our investigation activities in the same way as before. Initially, there were some obstacles, such as difficulties in conducting direct interviews with the relevant people, but thanks to the steady efforts and ingenuity of the accident investigators and the secretariat that supports them, we have been able to continue our investigation activities close to normal. The number of accidents and serious incidents in the transportation field has not decreased much under the COVID-19 pandemic. Japanese transportation safety must not be damaged in such a situation. 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.

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.

Society's expectations for the JTSB, which was established in October 2008 as an organization to investigate accidents across three modes (Aircraft, Railway and Marine) are keeping high, and I believe that we need to step up our efforts further in 2021. Although the background and features of accidents or incidents or incidents differ for each of the three modes, the purpose of cause investigation and developing safety actions to prevent recurrence of the accidents or incidents are common. On the other hand, there are many common issues on human factors, structural and destructive analysis, digitalized operation management and monitoring systems, and automated and unmanned systems and so on. It is important to value the unique safety culture that has been cultivated in the three modes, and to mutually enhance each other acknowledging each advantage. I would like

to contribute to improve Japanese Transportation Safety by facilitation of learning other mode by each mode well.

In addition to the early release of accident investigation reports, interim reports and factual information, we analyze the accident investigation reports we have been accumulated to date and publish the "JTSB Digest" in order to help raise awareness of accident prevention. The eight regional offices publish regional analyses collections, mainly on fishing vessels and pleasure boats. This year, we will continue to widely disseminate the safety measures taken based on careful examination and analysis of past survey results and useful suggestions for responding to social situations, etc., and promote their use in workshops and seminars at businesses, government agencies, educational and research institutions, etc.

When a cargo ship grounded in the Republic of Mauritius in July last year, we dispatched a five-member investigation team to investigate this accident. Although this was the first case in terms of investigating an accident involving a non-Japan-flagged ship that occurred off the coast of another country, I believe that it is significant that we were able to achieve international cooperation based on the Convention. On the other hand, I believe that we need to continue to contribute to the development of rules related to safe transportation at the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO), international cooperation and exchange of opinions, including the International Transportation Safety Association (ITSA) Chairperson's Meeting and provide technical training for railway accident investigations to support for improving railway safety of Asian countries, even though it is difficult to do so in a situation where international traffic is restricted.

The JTSB will make every effort to contribute to fostering a culture of transportation safety in Japan by contributing to the prevention of accidents by steadily accumulating factual information, conduct more accurate analysis in the accident investigation, compiling a report at an early stage and providing information necessary for safety as needed. Your understanding, support and cooperation would be highly appreciated.

July 2021

TAKEDA Nobuo
Chairperson
Japan Transport Safety Boar

Japan Transport Safety Board
Annual Report 2021
Contents

JTSB Mission / JTSB Principles
Contributing for fostering a culture of transportation safety

Major activities in the past year 1
Feature: Information dissemination for improving transport safety 5

Chapter 1 Summary of major investigation activities in 2020 13
1 Major accidents and serious incidents occurred in 2020 for which investigations commenced 13
2 Major accidents and serious incidents for which investigation reports were published in 2020 15
3 Accidents and serious incidents for which progress reports were published in 2020 17

Chapter 2 Summary of recommendations and opinions issued in 2020 18
1 Recommendations 19
2 Opinions 32
3 Safety Recommendations 32

Chapter 3 Aircraft accident and serious incident investigations 34
1 Aircraft accidents and serious incidents to be investigated 34
2 Procedure of aircraft accident/serious incident investigation 37
3 Statistics of investigations of aircraft accidents and serious incidents 38
4 Statistics of investigated aircraft accidents and serious incidents in 2020 38
5 Summaries of aircraft accidents and serious incidents which occurred in 2020 39
6 Publication of investigation reports 43
7 Actions taken in response to recommendations in 2020 (aircraft accidents and serious incidents) 51
8 Provision of factual information in 2020 (aircraft accidents and serious incidents) 51
9 Summaries of major aircraft accident and serious incident investigation reports (case studies) 57

Chapter 4 Railway accident and serious incident investigations 62
1 Railway accidents and serious incidents to be investigated 62
2 Procedure of railway accident/serious incident investigation 68
3 Statistics of investigations of railway accidents and serious incidents 69
4 Statistics of investigated railway accidents and serious incidents in 2020 69
5 Summaries of railway accidents and serious incidents which occurred in 2020 70
6 Publication of investigation reports 72
7 Actions taken in response to recommendations in 2020 (railway accidents and serious incidents) 84

8 Provision of factual information in 2020 (railway accidents and serious incidents) 95
9 Summaries of major railway accident and serious incident investigation reports 98

Chapter 5 Marine accident and incident investigations 103
1 Marine accidents and incidents to be investigated 103
2 Procedure of marine accident/incident investigation 105
3 Jurisdiction of the Offices over marine accidents and incident 106
4 Role of the Offices and Committees according to category of accident and incident 107
5 Statistics of investigations of marine accidents and incidents 107
6 Statistics of investigated marine accidents and incidents in 2020 108
7 Summaries of serious marine accidents and incidents which occurred in 2020 111
8 Publication of investigation reports 112
9 Actions taken in response to recommendations and opinions in 2020 124
10 Provision of factual information in 2020 (marine accidents and incidents) 134
11 Summaries of major marine accident and incident investigation reports (case studies) 148

Chapter 6 Efforts toward accident prevention 154
1 Information dissemination for accident prevention 154
2 Issuance of the JTSB Digest 154
3 Issuance of the Analysis Digest Local Office Edition 156
4 Issuance of the JTSB Annual Report 159
5 Preparation of safety leaflet 159
6 J–MARISIS – Now even easier to use 159
7 Engine Trouble Search System ~ Easy Search with Click~ 160
8 Outreach lectures (dispatch of lecturers to seminars, etc.) 161
9 Activities of the Accident Victim Information Liaison Office 163

Chapter 7 International efforts for accident prevention 166
1 Objectives and significance of international cooperation 166
2 Overseas-accident investigations and international conferences under the COVID-19 pandemic (activities in 2020) 166
3 Efforts of international organizations and JTSB's contributions 167
4 Cooperation and information exchange with foreign accident investigation authorities and investigators 169
5 Technical cooperation 171
6 Participation in overseas training 172

Column
A training course participated by accident investigators at an overseas institution (Aircraft Accident Investigator) 55
Investigations of derailment accidents involving trains using rubber wheels Railway Accident Investigator (Railway Accident Investigator) 96
Serious accidents that occurred in other country's territorial water (Marine Accident Investigator) 146
Approaches toward investigations and accident prevention (Sendai Office, Secretariat) 153

Preparation of publicly available reports and analysis digests (Hiroshima Office, Secretariat) 158
Relocations of the office building of the JTSB (General Affairs Division) 165
“Foundation Project” – New efforts for securing human resources (General Affairs Division) .. 173

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.

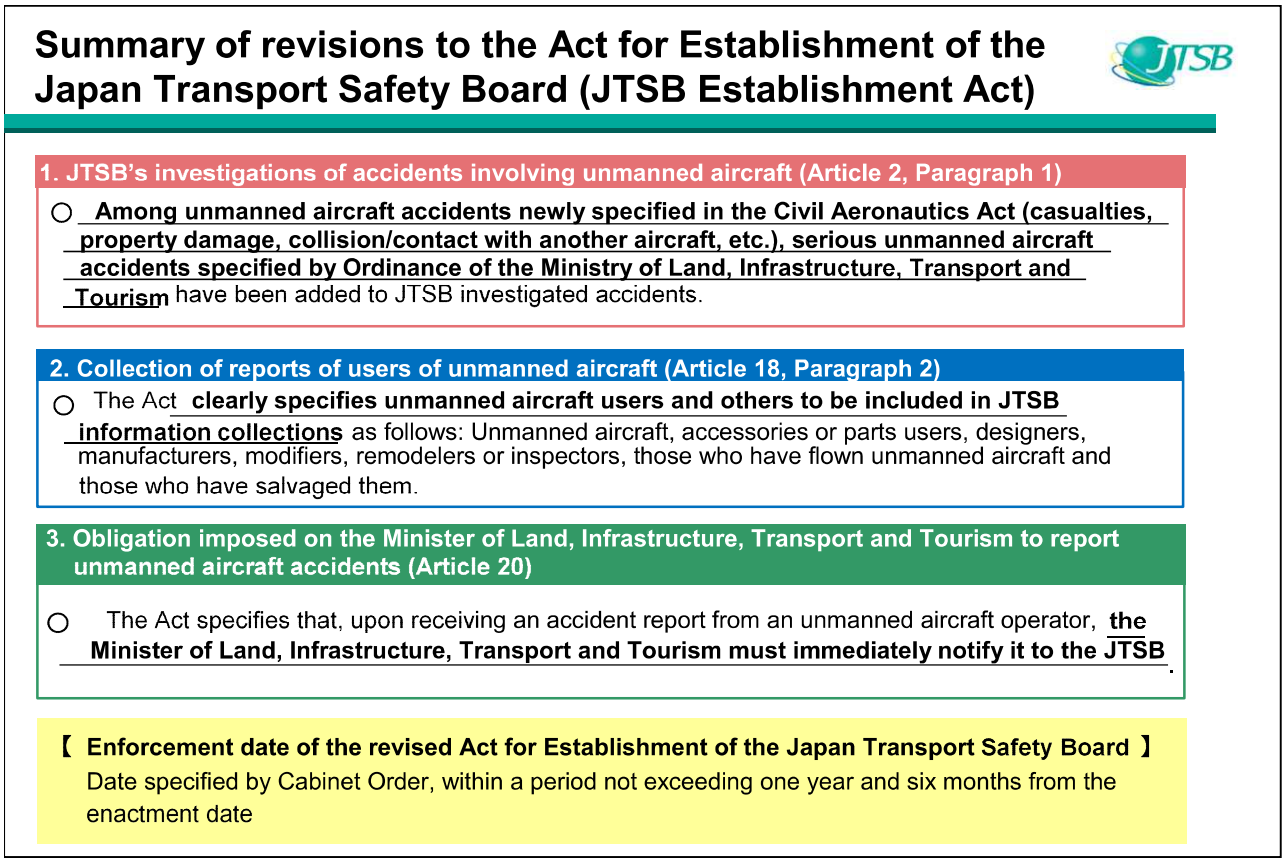
1. 【Partial revision of the Act for Establishment of the Japan Transport Safety Board: Investigations of unmanned aircraft accidents and serious incidents】

In the 204th Ordinary Session of the Diet, the "Law for the Partial Revision of the Civil Aeronautics Act" was enacted to include revisions to the Act for Establishment of the Japan Transport Safety Board (JTSB).

Unmanned aircraft such as drones are part of technologies associated with the "aerial industrial revolution" from which arises new possibilities, including aerial photography, dispersal of chemicals used in agriculture, surveying, infrastructure inspections and the like that are already widely in use. Their usefulness for purposes such as delivering goods to remote islands, mountainous areas, depopulated areas, etc. is also being developed.

In order to expand use of unmanned aircraft (i.e., enabling human conveniences of deliveries into urban areas) and bringing about industrial, economic and societal innovations, the realization of "BVLOS flight over populated areas (level-4 flight)," which has not been permitted so far from a safety standpoint, is indispensable. To realize this, the "Law for the Partial Revision of the Civil Aeronautics Act" requires that the establishment of a new system for licensing unmanned aircraft and their maneuvering (allowing them to begin operation in FY2022) be enacted as one of its main pillars.

As level-4 flights are put into practical use, the widespread utilization of unmanned aircraft, including routes over "third-party airspaces" is expected. Therefore, the Act for Establishment of the Japan Transport Safety Board has been revised to prevent occurrences and recurrences of accidents and serious incidents and reduce their damage by carrying out proper investigations of the accidents and serious incidents (see the following figure for revised contents). Furthermore, accidents and others caused by unmanned aircraft will be newly added as investigation targets by the JTSB.



2 Accident investigations amid the COVID-19 pandemic

The JTSB has been holding meetings (hereinafter referred to as "committee meetings"; also see Appendices-2 of the "Appendices") regarding accident investigation reports on aircraft, railways and ships about eight times monthly to investigate the causes of each accident and serious incident and the causes of damage incidental to such accidents. However, in response to the declaration of a state of emergency due to the COVID-19 pandemic in April 7, 2020, committee meetings were canceled for about six weeks. We also had to cancel the April and May regular press briefings by the JTSB Chairperson.

While the committee meetings were canceled, aircraft accidents, such as cabin attendant injuries due to turbulence, railway accidents, such as one fatality at a level crossing unequipped with crossing bars, and marine accidents, such as a collision between a foreign-flag container vessel and a domestic cargo vessel, accidents and others involved in each mode of aircraft, railway, and marine occurred, even under the state of emergency. In any accident investigation, an immediate investigation of the accident site is necessary, and information must be collected as soon as possible from concerned parties before memories and impressions fade. Thus, the accident investigators were dispatched to conduct the necessary on–site investigations, noting the declaration of the state of emergency.

Since the declaration of the state of emergency, the JTSB has been endeavoring to prevent COVID-19 infections among their staff through telework, staggered working hours, twice-per-day temperature checks for each staff member, and having those with cold-like symptom to stay at home.

Investigators dispatched to accidents are required to carry faceguards, masks, alcohol-based sanitizers and vinyl gloves. When accident investigators are dispatched from Tokyo to local areas, they need to take special care not to arouse anxiety in local people who were involved in accidents and to check PCR test results of all involved who recently entered or returned to Japan (see “Column” in page 120). In this way, site investigations were conducted with the utmost precautionary measures against COVID-19.

When accident investigators conducted hearings from parties related to causation in accidents or incident, they ensured proper room ventilation, social distancing and mandatory masks, which sometimes impeded clear speech and sound projection. Yet they were able to continue with their site investigations and information gathering tasks thanks to the understanding and cooperation of concerned parties.

Measures against the spread of COVID-19

With such site investigation challenges at hand, teleworking made it possible for accident investigators to continue the analyses of accidents with which they were charged, as well as continue the preparations and examinations of the draft accident investigation reports to be submitted at committee meetings, so the number of reports slotted for the meetings (after their resumption) gradually increased. The investigators pointed out that one merit of teleworking is that they allow for more focused attention at home than at the workplace. However, they also noted the disadvantage of less information sharing among those in charge shared cases and additional time required needed to gather data. Currently, teleworking-based team meetings utilizing a web-based systems have been increasing.

Due to the lifting of the state of emergency in May, committee meetings were resumed, but local committee members have been deliberating via a teleconference. Also, the opening and closing hours of meetings have been based on staggered commuting schedules so that committee members can participated in effective deliberations with limited time.

Although it was impossible to publish accident investigation reports in June, more reports than usual were published in July and August as a result of these efforts. Since the JTSB mission is to improve transport safety and protect the lives and livings of people through early dissemination of measures as accident investigation reports to prevent the recurrence of like accidents, they are proceeding steadily with accident investigations while minimizing the impact of the COVID-19

pandemic.

Regrettably, these measures against COVID-19 must be continued. Due to accident investigators' need to thoroughly assess accident sites and perform analyses with the use of technical equipment, and the committee members and chairpersons need to complete in-depth deliberations on each case, they are often required to commute to their workplaces. However, the JTSB is determined to comprehensively identify the causes and damage of every accident, actively disseminate transport safety-related information (including recommendations, opinions and concrete data) and take necessary safety measures (while ensuring counter-infection precautions and data security) by adopting appropriate work methods such as teleworking.

Feature: Information dissemination for improving transport safety

The Japan Transport Safety Board (JTSB) has been reporting on aircraft, railway and marine accidents and serious incidents via monthly press briefings by the chairperson and through publication of accident investigation reports. During 2020, JTSB published 18 reports on aircraft accidents and serious incidents, 16 on railway accidents and serious incidents, and 895 on marine accidents and incidents.

In the process of investigating accidents, collected information that the JTSB has considered is deemed factually useful for accident prevention and damage mitigation, they provide these data to relevant administrative bodies and make it available to the public, as well as factual information deemed appropriate in terms of transport safety enhancement to related parties.

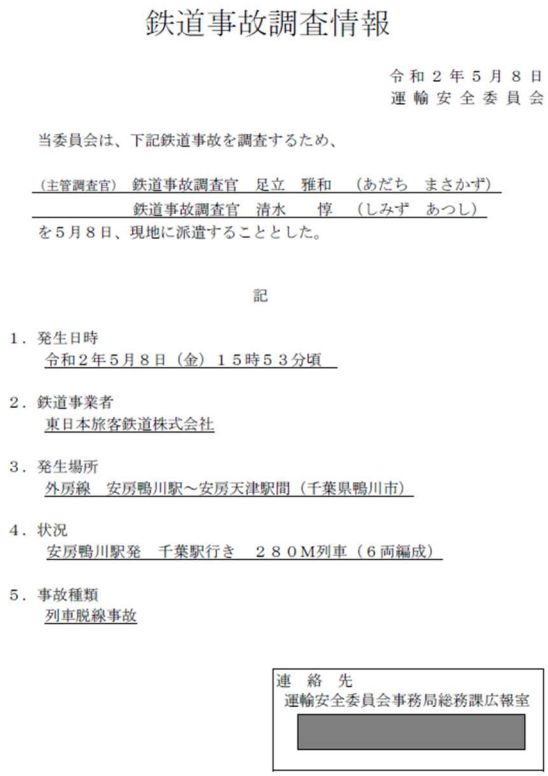
Chairperson's press briefing

Information releases by the JTSB are often picked up by the press. JTSB updates are presented in a courteous, accessible manner so that it reaches as many people as possible. However, there are cases of accidents of with greater public interest which occur due to multiple complicating factors or those that cannot be explained without using highly technical terms. In reporting these types of accident investigation reports, the JTSB makes a point to comprehensibly explain both the causes of these accidents came to pass and safety measures necessary to prevent them.

This Feature explains the JTSB's information dissemination in 2020.

1. Announcement of investigation-related information

After the occurrence of an accident, the JTSB promptly appoints accident investigators, and to the extent possible announcing dispatch schedules for accident site as the investigation information. In response to these announcements, media may report that "An accident investigation by JTSB has started." News media sometimes broadcast video footage and/or post photographs of the investigators heading for accident sites.



鉄道事故調査情報

令和２年５月８日
運輸安全委員会

当委員会は、下記鉄道事故を調査するため、

（主管調査官）鉄道事故調査官　足立　雅和　（あだち　まさかず）
鉄道事故調査官　清水　　惇　（しみず　あつし）
を５月８日、現地に派遣することとした。

記

１．発生日時
令和２年５月８日（金）１５時５３分頃

２．鉄道事業者
東日本旅客鉄道株式会社

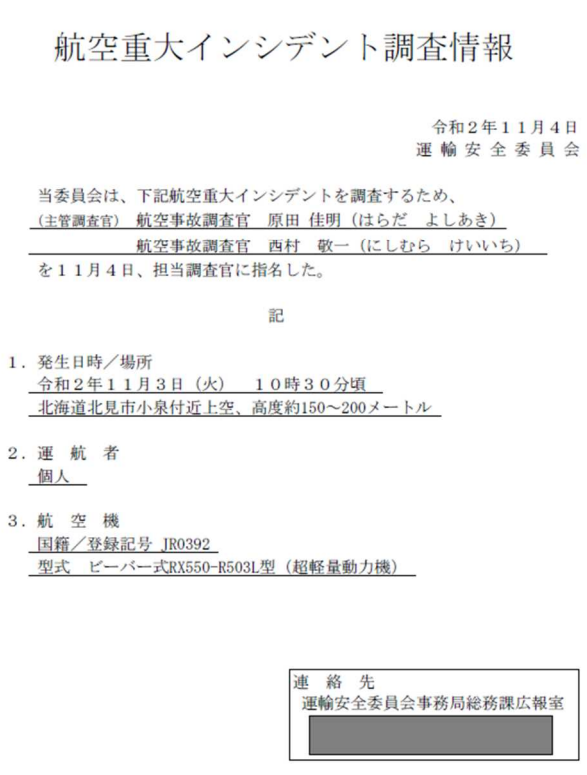
３．発生場所
外房線　安房鴨川駅～安房天津駅間（千葉県鴨川市）

４．状況
安房鴨川駅発　千葉駅行き　２８０M列車（６両編成）

５．事故種類
列車脱線事故

連　絡　先
運輸安全委員会事務局総務課広報室
[redacted]

Information on accident investigations



航空重大インシデント調査情報

令和２年１１月４日
運輸安全委員会

当委員会は、下記航空重大インシデントを調査するため、
（主管調査官）航空事故調査官　原田 佳明（はらだ　よしあき）
航空事故調査官　西村　敬一（にしむら　けいいち）
を１１月４日、担当調査官に指名した。

記

１．発生日時／場所
令和２年１１月３日（火）　１０時３０分頃
北海道北見市小泉付近上空、高度約150～200メートル

２．運　航　者
個人

３．航　空　機
国籍／登録記号 JR0392
型式　ビーバー式RX550-R503L型（超軽量動力機）

連　絡　先
運輸安全委員会事務局総務課広報室
[redacted]

Information on serious incident investigations

By making our information available to the public, we hope to broaden public understanding of our activities.

2. Information dissemination at investigation sites

In the cases of accidents of with greater public interest, accident investigators are often interviewed by the media at the sites. In these on-site interviews, the investigator in charge of the site is there to offer real-time information about scene and the situation. At this stage, the investigator cannot speak to the cause of the accident or any conclusions based on data collected. However, even when it is difficult for the general public to understand the situation, i.e., because the site of the investigation is located deep in the mountains or designated off-limits, JTSB believes in the necessity of explain the situation, facts and our activities to the public with the greatest degree of transparency possible.

Responding to questions from media at an investigation site

With regard to the investigation of fire on a large passenger ship that occurred in June 2020, the incident attracted a high a great degree of public attention and therefore many video images of the fire were broadcast, to which the accident investigator explained the situation to the media. In this case, the media were able to report the data as confirmed in ways such as, “It is highly likely that the fire was caused by welding work being carried out in a vent pipe. No noticeable gaps or holes were found in the iron plate that isolated the vent pipe from the storage compartment.”

3. Information dissemination during an accident investigation

When it is appropriate to provide information to concerned parties at an early stage in terms of transport safety enhancement, we make it a point to promptly disseminate information that we have obtained, even if the investigation is ongoing.

(1) Regarding the accident investigation of a helicopter that became difficult to control during flight, crash-landed and rolled onto its side in February 2020, the JTSB’s chairperson in a press briefing held in the same month, put forth the possibility that the helicopter’s main rotor blade had impacted the tail rotor drive shaft. The chairperson explained that helicopter accidents of this kind had also occurred in the past and that they occur due to a combination of the aircraft attitude and a dramatic shift in the angle of the main rotor’s rotational plane. These factors can cause the main rotor blade to impact the tail rotor drive shaft

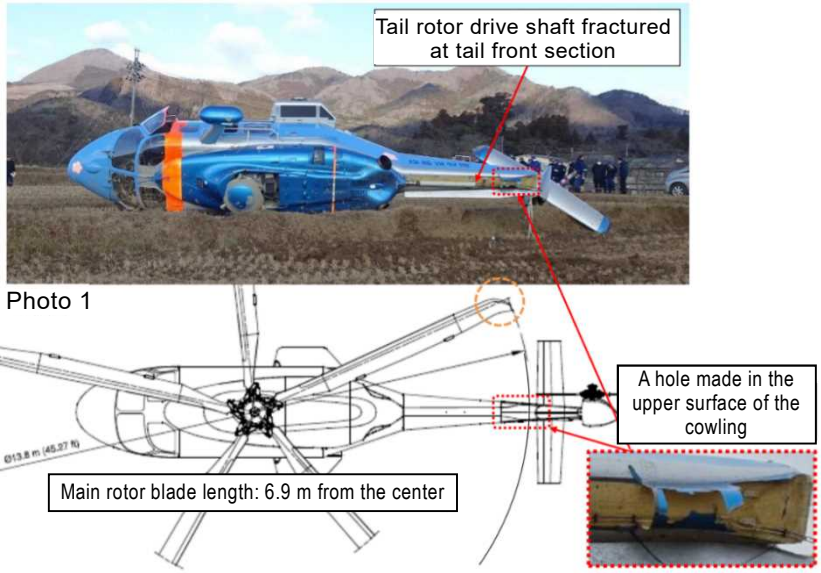


Photo 1

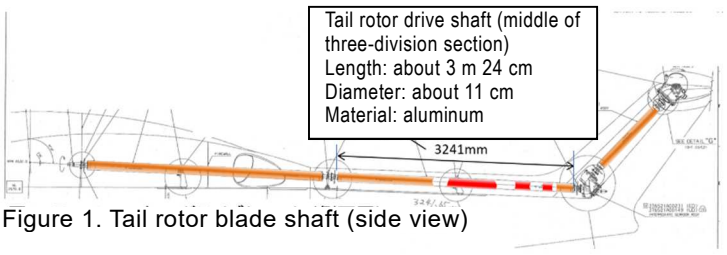
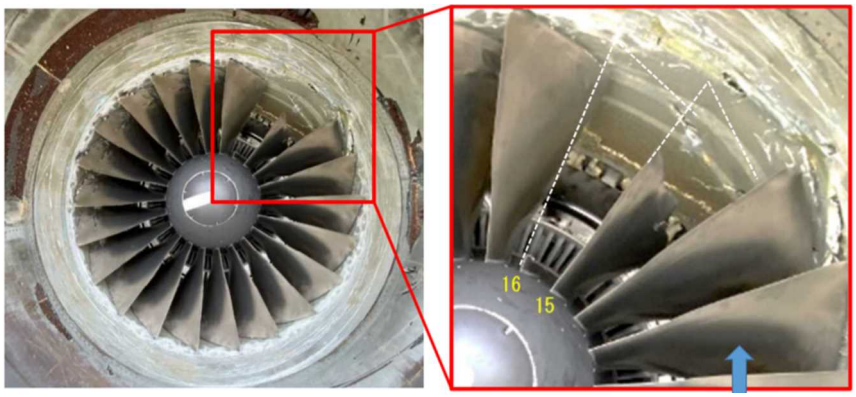


Figure 1. Tail rotor blade shaft (side view)

Here is one example of a headline that was printed as a result of the announcement: “Main Rotor Impact with Fuselage May Have Caused Accident,” indicating a possibility that the main rotor blade touched the rear section of the fuselage during flight.

We believe that our speedy dissemination information regarding this accident may have helped pilots of the same type of helicopters to narrow down points to remember in daily flights.

(2) Regarding the investigation of a serious incident that occurred at an altitude of about 5,000 m, about 100 km north of Naha Airport due to a defective engine on a Boeing 777-200 in December 2020, the JTSB reported damages to the left engine's fan blades and to the aircraft while a beach mark and a radial marking (characteristic of fatigue fracture) were found on the fractured surfaces of the fan blades damaged nearly to their bases (see page 51, Chapter 3).



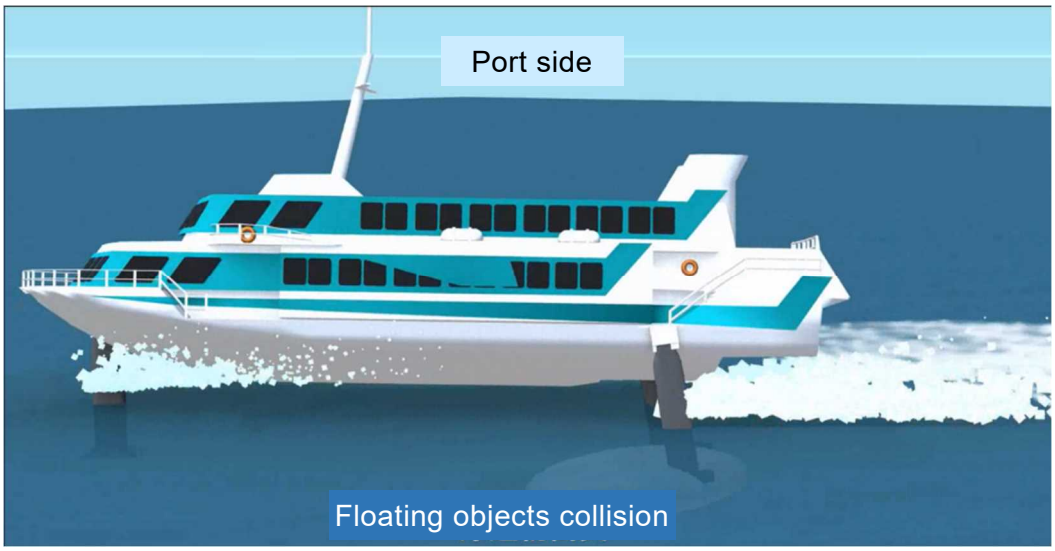
In response to the JTSB's announcement, the press explained the incident in detail with headlines such as "Engine Damage – Fatigue Fracture Suspected" and "JAL Plane Showing Fatigue Fracture Symptoms on Fractured Surfaces."

After this serious incident, the Ministry of Land, Infrastructure, Transport and Tourism's Civil Aviation Bureau immediately ordered domestic airline companies to perform enhanced inspections on operating aircraft using the same type of engines, to which they all complied. On the basis of information provided by the JTSB and to ensure aviation safety, it was decided that aged fan blades would be subject to limited non-destructive tests (NDTs) by drastically moving forward their current NDT schedule.

4. Publication of investigation reports

Each time an investigation is completed, the JTSB publishes investigation reports explaining both accident causes and measures against recurrence. To ensure broad public understanding of its these reports, the JTSB endeavors to make them clear and understandable, for example, by visualizing moving graphic representations of accident timelines or using models at press briefings.

(1) In the March 2020 investigation report on passengers injured onboard a jetfoil passenger ship that collided with objects floating on the sea surface (see page 115, Chapter 5), the JTSB prepared a computer-generated moving graphic representation reproducing the ship's motion to explain the events leading to the floating objects striking the rear hydrofoil.

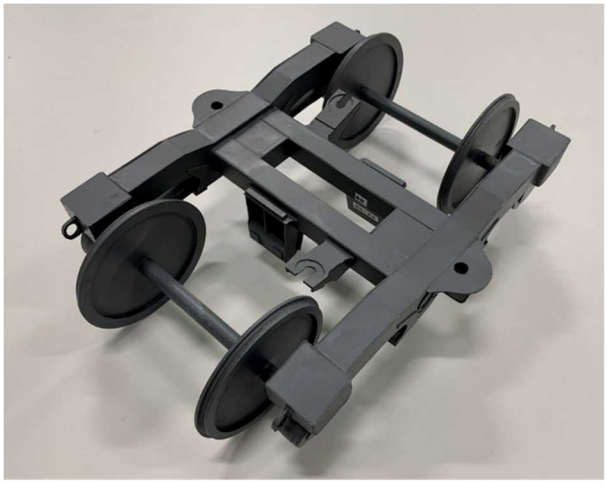


Computer graphic reproduction of ship behavior at the time of accident
(URL:https://www.mlit.go.jp/jtsb/video/ship/2019tk0008-movie.wmv)

This computer graphic image was intended to make those who read the investigation report easily image the accident; the report stated as follows: "It is probable that, after the rear hydrofoil collided with the floating objects, the fuse pins fractured, causing the rear hydrofoil to swivel backward at the pivot points where it was attached to the ship's hull. Probably the lifting power of the rear hydrofoil decreased and was lost, which lowered the stern. At the same time, the rear hydrofoil probably pulled the ship's hull into the sea due to the water resistance. As a result, It is probable that the bottom of the ship at the stern impacted the sea surface, generating significant upward and backward acceleration which generated a strong impact on passengers."

As a result of these efforts, this accident was covered in a comprehensible manner by the media using headlines such as "Collision with Stern Hydrofoil Magnifies Damage" and "Significant Damage due to Impact of Hitting Sea Surface."

(2) In the serious incident investigation report on a dangerous situation on a railway vehicle (a crack in a bogie) (see page 83, Chapter 4) issued in November 2020, the location where the crack formed was described as "the welded spot connecting the cross beam of a bogie frame with the backside reinforcement rib of a main-motor seat plate." Because the crack was difficult to identify even using a plan view, railway accident investigators prepared a bogie model, which the chairperson used in a press



Model of bogie

briefing to explain the incident.

Thanks to the chairperson's clear explanation, the incident was reported by the media with the precise description of "penetration of the iron plate's welded spot connecting the bogie and the motor." Some media reported using their own image charts.

(3) Regarding the investigation report on the crashing of a firefighting & disaster prevention helicopter into a mountain slope (see page 44, Chapter 3) issued in February 2020, one of the causes considered for the accident was that the captain suffered from spatial disorientation and was unable to perform an appropriate maneuvering to maintain the attitude of the aircraft Thus, the JTSB prepared explanatory materials explaining spatial disorientation in general and also in terms of aviation medicine.

※ Spatial disorientation does not mean a physiological abnormal condition of spatial orientation but a confused condition of spatial orientation of those who own normal sensory functions. Concretely, as in the case of losing a correct cognition of motion of aircraft against the earth similar to an illusion caused by acceleration speed, spatial disorientation includes illusions by visual sense, by somatic sense and by equilibrium sense.
"Aviation Medicine and Safety" (co-written by Kenichi Azuma and Masaoki Tsuchiya published by Houbun Shorin in 1997 pp. 41 – 55)

○Spatial disorientation by linear acceleration speed is illusion caused by increasing speed of acceleration or deceleration during the flight. During a level flight, especially when the outside scenery is invisible, a pilot sometimes misjudges the gravity direction, feels like the aircraft is ascending and tries to lower the nose of the aircraft, which results in the descent of the aircraft and further acceleration. If a pilot continues the maneuvering as he/she is deluded, it occasionally results in abnormal ATT of nose down.

○When the banking angle of an aircraft is slight, the pilot may sometimes fail to recognize the bank due to a lean illusion and continue to fly while angling the balance plane of the aircraft in the opposite direction.

In this way, the JTSB provided supplementary explanations to describe this accident whose causes were deemed difficult to image for the general public. Media were able to report using comprehensible language such as "losing a sense of equilibrium because of poor visibility due to clouds," and "bad weather prevents correct situational judgment."

5. JTSB Digest

The JTSB has been analyzing similar types of accidents and incidents and issuing "JTSB Digests" comprehensibly explaining their countermeasures (see page 154, Chapter 6).

In response to a small passenger ship accident resulting in injuries regarding which the JTSB had issued an investigation report in November 2020, it analyzed anew, in December 2020, 18 similar accidents resulting in passengers' spinal fractures. The JTSB Digest presented countermeasures (including a method of steering a ship that is encountering tidal waves), measures for ensuring safety in passenger compartments and the necessity of collecting information on weather and oceanographic phenomena.

[Illustration on the right: JTSB Digest No. 35]

"For the safe navigation of small passenger ships – Bang! Backache! For the prevention of a spine fracture accident on a small passenger ship."

The JTSB sincerely addressed inquiries and requests from news media for more detailed information. As a result, the media covered recommendations from the JTSB Digest, stating that "small passenger ship passengers should, to the extent possible, use posterior seats with fewer shaking motions."

Article by the Asahi Shimbun (Feb. 12, 2021)

6. Situation of news reporting

In this way, the JTSB endeavors to disseminate information through monthly press briefings by the chairperson while the news media understand JTSB activities and provide this information to the general public. For example, 49 investigation reports were issued by the JTSB in 2020, about which 194airticles were issued by major six media companies in Tokyo alone. Moreover, the investigation reports by the JTSB have also been widely covered by local news media located in the areas where accidents or incidents have occurred.

Technical terms are often used in our investigation reports, and in the cases of accidents or incidents

with complicated factors, it is difficult to grasp their whole pictures, but we believe that disseminating such information widely and comprehensibly to the society is our mission.

We will also continue our efforts in the future to report to the public JTSB activities, accident/incident causes and measures for safety in a courteous and comprehensible manner.

Table: Numbers of investigation reports covered by respective media in 2020

	Reports	Newspaper	TV	Internet articles
Number	49	59	21	114

* Researched by the Secretariat of the JTSB
* The numbers under the "newspaper" and "TV" are the numbers of reports by major six companies in Tokyo.

7. Accident prevention

To disseminate information on accidents and incidents as described above, the JTSB's website is presenting them by category, and the JTSB is distributing "JTSB E-Mail Magazines" to those who request them so that as many people as possible will have access to our information. The "Marine Accident Hazard Map" and the "Engine Trouble Search System" can be found on the JTSB website, making it possible to search marine accident/incident investigation reports from maps, engine sections and parts. These are intended to assist navigators to easily obtain information on marine accidents in sea areas where they navigate as well as engine safety information.

In order to clearly explain information we disseminate, we provide outreach lectures by accident investigators. For those who suffered in accidents and their families, we endeavor to explain accident investigation information to them in an easy-to-understand manner (see Chapter 6 for details).

Through these various activities, the JTSB hopes to raise the public's awareness with regard to transport safety and contribute to the prevention of accidents and the mitigation of accident damage.

Chapter 1 Summary of major investigation activities in 2020

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.

[Regarding recommendations and opinions, see “Chapter 2. Summary of recommendations and opinions issued in 2020” (page 18).]

1 Major accidents and serious incidents occurred in 2020 for which investigations commenced

The accidents and serious incidents also occurred in 2020. The primary investigations which the JTSB commenced are listed below:

(1) Aviation mode

- **A serious incident in which an ATR 42-500 (large aeroplane) owned by Japan Air Commuter Co., Ltd. deviated from a runway at Amami Airport after landing (Occurred on January 8)**
- **A forced landing accident, which damaged the fuselage of the Fukushima Prefecture Police Aviation Corps Agusta AW139 (rotorcraft) in Koriyama City, Fukushima Prefecture (Occurred on February 1)**
- **A ground impact accident involving a privately-owned EX-03C PUFFIN-LT447 (ultralight plane) manufactured by the Sanyo Tekko Co., Ltd. during a jump flight at a small landing field in Shiroishi-cho, Kishima District, Saga Prefecture (Occurred on June 9)**
- **A tail strike accident, which damaged the body of a Bombardier DHC-8-402 (large aeroplane) owned by Oriental Air Bridge Co., Ltd. at Fukue Airport (Occurred on October 23)**
- **A serious incident caused by an engine damage equivalent, involving a Boeing 777-200 (large aeroplane) owned by Japan Airlines Co., Ltd. about 100 km north from Naha Airport and at an altitude of 5,000 m (Occurred on December 4)**

In 2020, 13 aircraft accidents were subject to investigation, with investigations into the causes of 28 accidents conducted, including 15 ongoing accident investigations from the previous year. Further, 9 aircraft serious incidents were subject to investigation, with investigations into the causes of 30 serious incidents conducted, including 21 ongoing serious incident investigations from the previous year.

(2) Railway mode

- **A train derailment between West Japan Railway Company's Tojo Station and Bingo-Yawata Station on the Geibi Line, Shobara City, Hiroshima Prefecture (Occurred on March 9)**
- **A train derailment in the Aoto Station yard of Keisei Electric Railway Co., Ltd., Katsushika, Tokyo (Occurred on June 12)**
- **A train derailment between Toyamachiho Railroad Co., Ltd.'s Higashi-Shinjo Station and Shinjo Tanaka Station, Toyama City, Toyama Prefecture (Occurred on July 26)**
- **Main track overrun (serious incident) between Willer Trains Inc's Tango-Yura Station and Kunda Station, Miyazu City, Kyoto Prefecture (Occurred on October 4)**
- **A level crossing accident at Hachioji level crossing No. 2 (class 4) located between Japan Freight Railway Company's Shimata Station and Hikari Station on the Sanyo Line, Hikari City, Yamaguchi Prefecture (Occurred on October 18)**

In 2020, 13 railway accidents were subject to investigation, with investigations into the causes of 27 accidents conducted, including 14 ongoing accident investigations from the previous year. Further, 2 railway serious incidents were subject to investigation, with investigations into the causes of 4 serious incidents conducted, including 2 ongoing serious incident investigations from the previous year.

(3) Marine mode

- **A collision between cargo ship Guo Xing 1 and fishing vessel Daihachi Tomimaru at about 6.5 nautical miles off the eastern coast of Nakayamasaki, Rokkasho-mura, Aomori Prefecture (Occurred on February 29)**
- **A grounding accident of cargo ship Wakashio at the south eastern offshore of Mauritius (Occurred on July 25)***
- **An accident caused by a pleasure boat (name unidentified) resulting in a death and injuries of swimmers off the coast of Nakatahama of Lake Inawashiro, Fukushima Prefecture (Occurred on September 6)**
- **Sinking of passenger ship Shrimp of Art at the northern offshore of Yoshima, Sakaide City, Kagawa Prefecture (Occurred on November 19)**
- **A collision between cargo ship Hayato and recreational fishing vessel Fudomaru No5 in the vicinity of Kashima Port, Ibaraki Prefecture (Occurred on November 28)**

In 2020, 732 marine accidents were subject to investigation, with investigations into the causes of 1,319 accidents conducted, including 590 ongoing accident investigations from the previous year (excluding 3 incidents deemed to not be an accident as a result of investigations). Further, 173 marine incidents were subject to investigation, with investigations into the causes of 322 (excluding 2 incidents deemed to not be an incident as a result of investigations) incidents conducted, including 151 ongoing

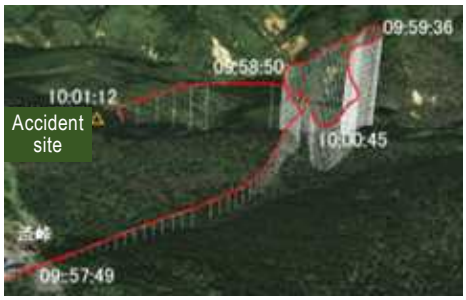
incident investigations from the previous year.

* See the Column at page 146 for details.

2 Major accidents and serious incidents for which investigation reports were published in 2020

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



- **An uncontrolled crash of an aircraft owned by Toho Air Service Co., Ltd. due to loss of control during flight above Ueno-mura, Tano District, Gunma Prefecture (Occurred on November 8, 2017)**
- **A serious incident resulting in emergency maneuvers of an aircraft owned by Thai Airways International to avoid ground impact during an approach to Tokyo International Airport (Occurred on April 11, 2018)**
- **A serious incident due to an engine damage equivalent (i.e., penetration of an engine case by a broken debris) of an aircraft owned by Japan Airlines Co., Ltd. at about 6 km southwest from Kumamoto Airport (Occurred on May 24, 2018)**
- **A ditching, which damaged the body of an aircraft owned by Excel Air Service Inc. at sea 41 km northwest from Naha Airport (Occurred on June 7, 2018)**
- **A crash of a Gunma Prefectural Air Rescue helicopter due to pilot spatial disorientation during a flight above Yokoteyama, Nakanojo-machi, Azuma District, Gunma Prefecture (Occurred on August 10, 2018)**

(For more details, see “Chapter 3. 9 Summary of major aircraft accident and serious incident investigation reports (case studies)” at pages 57-61.

Completed investigation reports into 10 aircraft accidents and 8 serious aircraft incidents have been published.

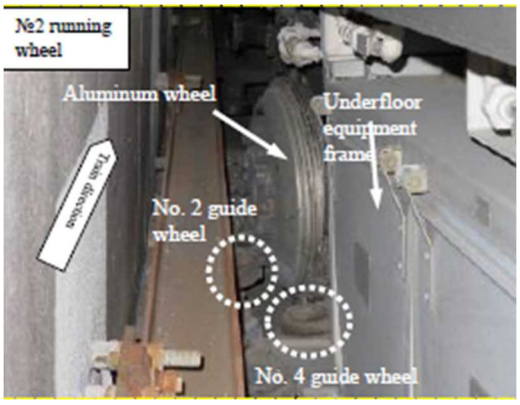
Among the published investigation reports, the JTSB made recommendations to the Minister of Land, Infrastructure, Transport and Tourism regarding the “accident of Eurocopter AS350B3 owned by Excel Air Service Inc.” and the “accident of Bell 412EP helicopter owned by the Gunma Prefectural Air Rescue” on February 27.

Moreover on April 23, the JTSB made recommendations to Toho Air Service Co., Ltd. regarding the accident of its “Aerospatiale AS332L helicopter.”

(For more details, see “Chapter 2. Summary of recommendations and opinions issued in 2020” at page 28.)

(2) Railway mode

- **A train derailment of a Saitama New Urban Transit Company train between Kamonomiya Station and Tetsudo-Hakubutsukan Station on the Ina Line, Saitama City, Saitama Prefecture (Occurred on January 16, 2019)**
- **A level crossing accident in the yard of Zushi Station on the Yokosuka Line, Zushi City, Kanagawa Prefecture (Occurred on March 21, 2019)**
- **Incorrect management of safety block (serious incident) between Asakura Station and Yashiro-dori Station on the Ino Line operated by Tosaden Traffic Co., Ltd., Kochi City, Kochi Prefecture (Occurred on March 25, 2019)**



- **A train derailment of an East Japan Railway Company train between Shibukawa Station and Shikishima Station on the Joetsu Line, Shibukawa City, Gunma Prefecture (Occurred on June 28, 2019)**
- **A serious incident involving dangerous trouble in vehicle at the Suminoe Inspection Ward owned by Nankai Electric Railway Co., Ltd., Osaka City, Osaka (Occurred on August 24, 2019)**

(For more details, see "Chapter 4. 9 Summaries of major railway accident and serious incident investigation reports (case studies)" at pages 98-102.

Completed investigation reports into 16 railway accidents and two serious railway incidents have been published.

(3) Marine mode

- **Collision of passenger ship Nippon Maru with a mooring facility (Occurred on December 30, 2018)**
- **Collision of passenger ship Ginga with objects floating in the sea (Occurred on March 9, 2019)**
- **A collision between cargo ship JK III and marine sweeper Notojima (Occurred on June 26, 2019)**
- **Capsizing of fishing ship Keiei Maru No.65 (Occurred on September 17, 2019)**
- **A passenger injury accident on passenger ship Nankyu No. 10 (Occurred on December 2, 2019)**

(For more details, see "Chapter 5, 11 Summaries of major marine accident investigation reports (case studies)"at pages 148-152.)

Completed investigation reports into 708 marine accidents and 187 incidents have been published.

Among the published investigation reports, the JTSB made recommendations to the Minister of Land, Infrastructure, Transport and Tourism regarding the "collision of passenger ship Ginga with objects floating in the sea" on March 26 and regarding the "passenger injury accident on passenger ship Nankyu No. 10" on November 26.

(For more details, see "Chapter 2. Summary of recommendations and opinions issued in 2020" at

pages 19-24.)

3 Accidents and serious incidents for which progress reports were published in 2020

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) Railway mode

・A railway accident resulting in casualties at Shin-Sugita Station on the Kanazawa Seaside Line (Occurred on June 1, 2019)

This investigation is anticipated to take time to analyze facts further investigate before a final report is completed.* Therefore, to prevent the occurrence of a similar accident, the JTSB submitted a progress report to the Minister of Land, Infrastructure, Transport and Tourism on February 27 a summary of the accident, progress of investigation, analyses of the line disconnection and reverse run, and measures for preventing line disconnection and reverse run of the trains using the railroad on February 27. The report was made publicly available.

This progress report has been published on the Japan Transport Safety Board website.
(https://www.mlit.go.jp/jtsb/railway/rep-acci/keika20200227.pdf) (Japanese only)

* Later on in February 18, 2021, an investigation report was published.
(https://www.mlit.go.jp/jtsb/railway/rep-acci/RA2021-1-1.pdf) (Japanese only)

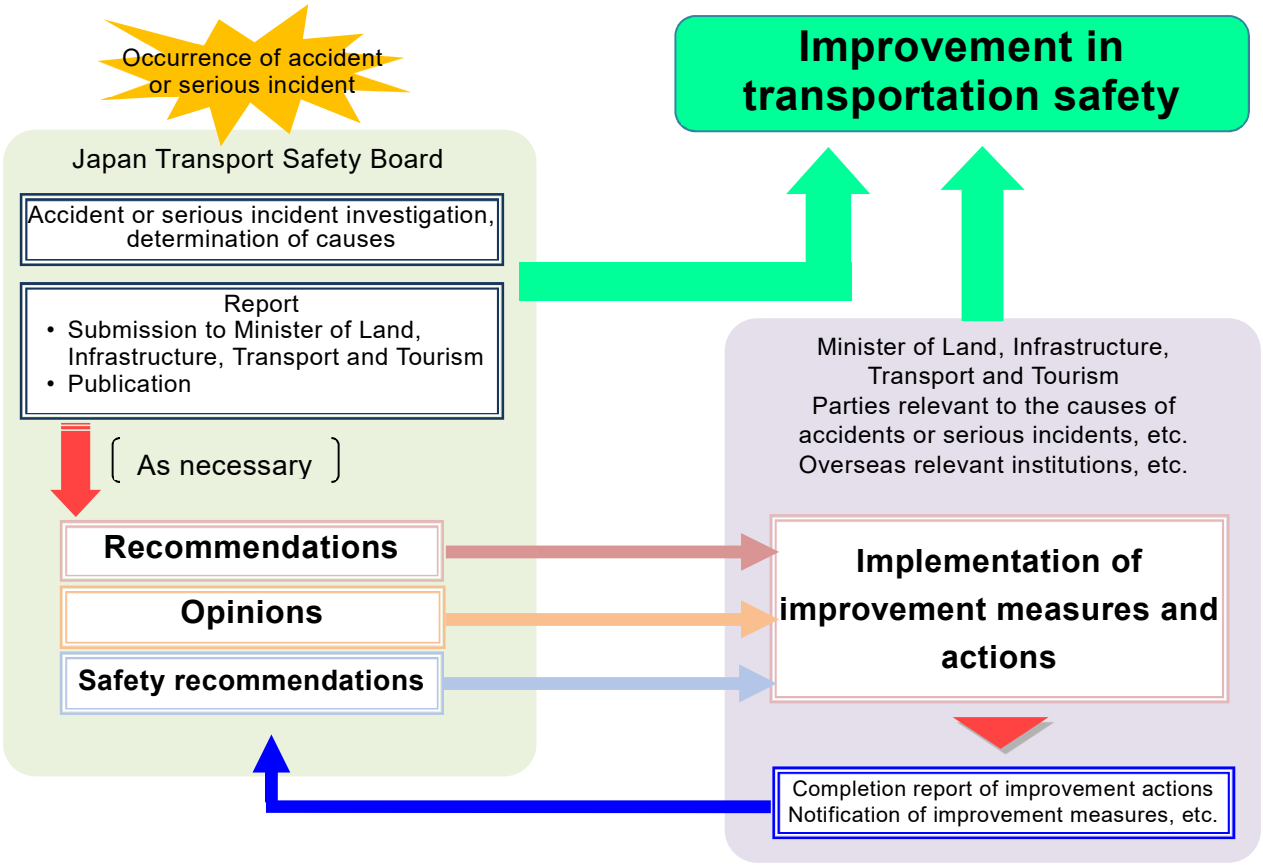
Chapter 2 Summary of recommendations and opinions issued in 2020

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 2020 are summarized as follows.

1 Recommendations

(1) Collision of passenger ship GINGA with objects floating in the water

(Recommendations on March 26, 2020)

Summary of the Accident

Passenger ship GINGA, with its captain, chief engineer and two crew members as well as 121 passengers, was navigating westward on hydrofoils at about 41.7 knots off the eastern shore of Himesaki, Sado City, Niigata Prefecture on the way to Ryotsu Port also in Sado City, when the ship collided with floating objects at around 12:16, March 9, 2019. This resulted in the injuries of 108 passengers and one crew member.

This accident caused a breach in GINGA's starboard quarter.

Probable Causes

It is probable that, after GINGA passed through the deceleration zone located off the eastern coast of Himesaki, it accelerated and headed westward in a foilborne state, when the captain noticed floating objects in the direction of the port bow (front left side) of the ship and attempted to avoid a collision but was not successful. As a result, some objects probably hit the rear hydrofoil wing, resulting in many lumbar fractures among passengers.

It is probable that reason the captain could not avoid the collision is that, when he first identified them off the port bow, they had already approached beyond an avoidable distance.

The probable reason that he could not identify them until they were already so near was that the objects were submerged.

Regarding the probable cause of many passengers' lumbar fractures: After the rear hydrofoil was hit, the fuse pins sheered off, causing the rear hydrofoil to swivel backward with the points still attached to the ship body acting as pivot points. This lowered the stern and at the same time, the rear hydrofoil pulled the ship body into the sea due to the resulting resistance. As a result, it is probable that the bottom of the stern struck the sea surface, generating significant upward and backward acceleration resulting in a strong impact on the passengers.

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

This accident occurred after GINGA passed through the deceleration zone located off the eastern coast of Himesaki and was accelerating westward in a foilborne state. The captain noticed floating objects in the direction of the port bow (front left side) of the ship but failed to avoid a collision probably because they had already approached beyond GINGA's avoidable distance. As a result, It is probable that the floating objects struck the rear hydrofoil wing, resulting in many lumbar fractures among passengers.

It is probable that the passengers suffered lumber fractures due to the impact from the bottom of the stern striking the sea surface.

The Ministry of Land, Infrastructure, Transport and Tourism's Maritime Bureau has already instructed jetfoil operators to take measures for collision avoidance. In addition to this, the necessity of further instructing to take effective measures in case of collision has been stressed to mitigate injury to passengers.

On the basis of the investigation results and to enhance transport safety, the JTSB recommends the following to the Minister of Land, Infrastructure, Transport and Tourism, pursuant to the provision of the Act for Establishment of the Japan Transport Safety Board, Article 26, Paragraph 1:

The minister should instruct jetfoil operators to take the following measures:

(1) The following measures must be taken to mitigate damage to passengers including lumbar fractures to the extent possible in case of collision with a marine animals, driftwood or other objects during the foilborne navigation of a jetfoil.

i) Shipowners should take into account the situation of passenger injuries including lumbar fractures resulting from this accident and take countermeasures such as ensuring that passenger

seats and seat cushions can adequately absorb a strong impact.

ii) If marine animals, driftwood, or other objects have been detected in the vicinity of navigation route, or during periods when marine animals sightings are expected (e.g., seasonal migrations), ship operators should instruct elderly passengers to take their seats where the impact would be relatively mild such as the rear seats in a passenger compartment. This is due to the correlation between age and the bone density of the lumbar spine.

(2) Shipowners must take measures such as placements of a shock-absorbing material in all seats to avoid injuries due to rapid decelerations in case of collisions with a marine animals, driftwood, etc. during foilborne navigation.

(3) Ship operators shall develop written protocols and engage in regular crew training for cases in which many passengers have been injured so that rescues maybe conducted quickly and smoothly after accidents.

Measures based on the recommendations

The JTSB made recommendations to the Minister of Land, Infrastructure, Transport and Tourism on March 26, 2020, and received notification regarding the following measures having been taken based on the recommendations of December 16, 2020:

○ Measures taken by the Minister of Land, Infrastructure, Transport and Tourism based on the recommendations

On March 26, 2020, the ministry sent an administrative guidance document to each jetfoil operator, requiring them to immediately take measures regarding the JTSB's recommendations to the minister.

1) To prevent collisions with marine animals, driftwood, etc. jetfoil operators must continuously ensure safety by utilizing the Japan Coast Guard's reports of sighting marine animals, driftwood, etc., a whale hazard map, information on whale sightings shared among operators, monitoring and underwater speakers (UWSs).

2) If a marine animal, driftwood, or other object has been sighted in the vicinity of navigation route, or during periods when such sightings are expected to increase (e.g., seasonal migrations), jetfoil operators and captains shall navigate their vessels at reduced speed to the extent possible to avoid collisions and mitigate impacts even in cases of collision. Jetfoil operators and captain shall review their deceleration zones when necessary while taking into account the current situation of similar accidents and reports marine life sightings, driftwood, etc.

3) When having judged that further navigation is difficult because of the risk of rear foil collisions with marine animals, driftwood or other object and the risk of a large impact on passengers, the ship operator shall immediately shift the navigation mode to full astern (reverse full speed), submerge the hydrofoils deeper and ease off on the throttle.

4) Even in cases of a collisions with marine animals, driftwood or other object during foilborne navigation, the following measures shall be taken to prevent injuries such as lumbar spine fracture to the extent possible:

i) Shipowners should take into account the possibility of passengers injuries including the lumbar fractures in this example and take countermeasures such as ensuring that passenger seats and seat cushions can adequately absorb impact.

ii) If a marine animal, driftwood, or other object has been sighted in the vicinity of a navigation route, or during periods when marine animals sightings are likely to increase, ship operators should instruct elderly passengers to take seats where collision impact would be relatively small such as the front seats of passenger compartments. This is due to the correlation between age and the bone density of the lumbar spine.

5) Shipowners must take measures such as placements of a shock-absorbing material in all seats to avoid injuries due to rapid backward decelerations in case of collisions with marine animals, driftwood, etc. during foilborne navigation. In order for passengers to keep an appropriate seating posture and to prevent them from colliding with the backs of the seats in front of them, the use of three-point seatbelts is recommended.

6) Ship operators and crew members shall keep passengers informed about the importance of fastening seatbelts and ensure their appropriate use.

7) Ship operators shall develop written protocols and engage in regular crew training for cases in which many passengers have been injured so that rescues maybe conducted quickly and smoothly after accidents.

* The contents of the notice are posted on the JTSB website.
https://www.mlit.go.jp/jtsb/shiphoukoku/ship-kankoku20re_20200326.pdf (Japanese only)

(2) Passenger ship Nankyu No. 10

(Recommendations on November 26, 2020)

Summary of the Accident

On December 2, with the captain, ordinary seamen and 55 passengers on board, passenger ship Nankyu No. 10 departed Nejime Port, Minamiosumi-cho, Kagoshima Prefecture and was taking a north-northwest course. At around 16:24, the ship encountered severe upward and downward pressures from incoming tidal waves. As the bow lifted, seated passengers were lifted upward and then slammed down onto their seats, resulting in 14 passenger injuries.

Probable Causes

It is probable that this accident occurred because passenger ship Nankyu No. 10 departed Nejime

Port in spite of weather and hydrographic conditions having reached the standards for departure and navigation cancellation conditions (specified by the safety management manual of Nankyu-Dock Co., Ltd.) and continued navigating outside the port at about 12 knots while taking a north-northwest course, which was further north from the standard navigation route. The bow of the ship was probably hit and lifted by oncoming tidal waves, which lifted the seated passengers upward and then slammed their buttocks down onto their seats, resulting in injuries.

It is probable that the ship continued navigating at 12 knots in the north-northwest direction, which was further north than the standard route, were twofold: Firstly, the captain probably believed that, despite the up-and-down motions, the ship could safely avoid the oncoming waves by making a series of left turns and navigating at a slower pace than that specified by the navigation standard table, secondly, although taking the north-northwest course would subject the ship to the oncoming wind and waves, it would prevent the ship from drifting toward the aquaculture facilities located to the west from the breakwater and lighthouse of Nejime Port.

It is probable that the captain considered the course to be safe probably because he did not consider the possibility of passengers being tossed violently upward from their seats and subsequently falling back down with such force that lumbar fractures would ensue.

It is likely that the reasons why the ship departed Nejime Port despite the bad weather and hydrographic conditions having reached the standards for departure cancellation conditions specified by the safety management manual of Nankyu-Dock Co., Ltd. were that the captain mistakenly believed that he could cancel departure only when the wind speed and wave height exceeded the standards for departure cancellation condition and also the operation management director left navigation the final decision on him. These factors are likely the cause of the accident.

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

It is probable that this accident occurred because Nankyu No. 10 departed Nejime Port despite weather and hydrographic conditions that had reached the standards for departure and navigation cancellation conditions specified by the safety management manual of Nankyu-Dock Co., Ltd and continued operations taking a north-northwest course (further north from the standard route), at about 12 knots outside the port. The ship was struck and lifted by oncoming tidal waves, which in turn caused passengers to be lifted above their seats and be slammed down, resulting in injuries.

It is probable that the ship continued navigating at 12 knots in the north-northwest direction, which was further north than the standard route, because the captain believed that, despite the up-and-down motions, the ship could safely avoid the oncoming waves by making a series of left turns and navigating at a slower pace than that specified by the navigation standard table and although he knew that taking the north-northwest course would subject the ship to the oncoming wind and waves, he thought that the course would prevent the ship from drifting toward the aquaculture facilities located to the west from the breakwater and lighthouse of Nejime Port.

It is probable that the captain considered the course to be safe probably because he did not consider

the possibility of passengers being tossed violently upward from their seats and subsequently falling back down with such force that lumbar fractures would ensue.

Among accidents published in the accident investigation reports of the JTSB from 2008 to October 2020, 15 involved small passenger ships (excluding hydrofoil boats) that navigated solo and their passengers suffered spinal injuries similar to those described above. In 11of these accidents, the vessels were traveling at less than 22 knots.

It is probable that operators of small high-speed ships (excluding those of less than 20 tons in total tonnage and which attain speeds of 22 knots or more in service speed navigating only in horizontal areas) have been instructed by the Minister of Land, Infrastructure, Transport and Tourism to develop written protocols for navigation under wild weather and thoroughly implement accident prevention measures. However, instructions obligating measures for preventing similar accidents are also deemed necessary for passenger transportation business operators (referred to as "transportation business operators") operating small passenger ships other than small high-speed ships.

Therefore, on the basis of the investigation results of the above accident and to ensure passenger transport safety, the JTSB recommends the following pursuant to the provision of Article 26, Paragraph 1 of the Act for Establishment of the Japan Transport Safety Board:

Recommendations

It is recommended that the Minister of Land, Infrastructure, Transport and Tourism should instruct transportation business operators to take the following measures:

1. Transportation business operators shall provide the following instructions to captains and relevant crew members:
   i) When a ship oscillates due to wave impact, the operator shall decelerate to a speed that is adequate to prevent the passenger injuries.
   ii) When significant up-and-down motions of a ship are anticipated with a strong wind and high-seas warning issued, the captain and relevant crew members shall guide passengers to take the suitable seats (e.g. rear seats in cases in which a ship's center of gravity is located in its rear section) beforehand so that risks of being ejected from the seats and suffering violent impacts are minimal.
2. Transportation business operators shall recheck the possibility of topographical, tidal, tidal waves or heavy swell effects for standard routes, departure and arrival ports and share such information with captains and relevant crew members.
3. Transportation business operators shall regularly instruct captains and crew members to ensure compliance with the standards judgement as to whether departure and standard navigation are possible as specified by safety management manual.

(3) Accident of Excel Air Service Inc. Eurocopter AS350B3 (Rotorcraft)

(Recommendations on February 27, 2020)

Summary of the Accident

On Thursday, June 7, 2018, a Eurocopter AS350B3, registered JA350D, operated by Excel Air Service Inc., ditched near 41 km northwest of Naha airport while flying for Aguni airport after take-off from Naha airport, and sank in the sea. The pilot was seriously injured.

Probable Causes

In this accident, it is probable that NR of the main rotor was reduced during the flight and flight altitude became unable to maintain, which led to ditching at the excessive speed and descent rate and caused damage to the airframe, followed by sinking.

It is likely that the reduced NR of the main rotor was caused by some kind of malfunction occurring with engine system; however, it could not be determined in which section of the engine malfunction occurred and what caused it.

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

In this accident, it is highly probable that the helicopter, when ditching for emergency, ditched at an excessive descent rate and sank in the sea having damage to the Emergency Float and the airframe. The pilot, who did not put on a life jacket, was waiting for rescuers to come grabbing the Emergency Float in the sea, and he was found and rescued by a rescue helicopter about 13 minutes after the ditching.

It is necessary to sufficiently reduce speed and descent rate of aircraft in order to let the Emergency Float function in an effectual manner and to perform a stable ditching. It is predictable that, under the situation where such conditions is not met as in the case of this accident, a stable ditching is difficult to perform and crew members do not have enough time to exit after putting on life jackets.

In view of what is stated above, pursuant to the provision of Article 26 (1) of Act for Establishment of the Japan Transport Safety Board, the Japan Transport Safety Board recommends Minister of Land, Infrastructure, Transport and Tourism to take measures described below in order to prevent aircraft accident and to mitigate damage in the event of occurrence of aircraft accident.

Civil Aviation Bureau of Ministry of Land, Infrastructure, Transport and Tourism is to consider to request aircraft operators that all crew members on board wear life jackets when helicopters fly over a water area beyond the autorotation distance from the land.

Measures based on the recommendations

The Japan Transport Safety Board stated its opinion to the Minister of Land, Infrastructure, Transport and Tourism on February 27, 2020, and was notified on September 1, 2020 of the measures taken based

on the recommendations as follows.

○ Measures taken by the Minister of Land, Infrastructure, Transport and Tourism based on the recommendations

Pursuant to the provisions of Article 62 of the Civil Aeronautics Act (Act No. 231 of 1952) and Article 150 of the Ordinance for Enforcement of the Civil Aeronautics Act (Order of the Ministry of Transport No. 56 of 1952), the Ministry of Land, Infrastructure, Transport and Tourism is mandating that helicopters flying over water be equipped with emergency floatation devices and life jackets for all crew members. However, the ministry has newly taken the following measures based on the recommendations:

1 The ministry has issued a notification titled "Safety Measures for Helicopters Flying over the Sea" (KOKU-KU-KOU No. 3111 on February 17, 2020) to helicopter operators and concerned bodies to instruct them to ensure the following:

i) Implementation of inspections, maintenance and captain's pre-departure checks to ensure that all instruments and equipment including engine reliably function.

ii) Rechecks of emergency floatation device conditions, life jacket placements and emergency water landing procedures and their compliance

iii) Use of life jackets by all crew members as early as possible when flying above water in excess of autorotation distance from the shore

2 The Detailed Rules of the Operation Manual Examination Procedure (enacted on January 28, 2000, Kuko No. 78) was revised on July 31, 2020 and the following are required of air transport business operators using helicopters:

i) In case of a single-engine helicopters flying above water beyond a point where emergency on-shore landing by means of autorotation is possible, all members on board shall wear life jackets or their equivalent, excluding a medical condition in which this is difficult (i.e., due of emergency transport of a patient for example).

ii) In cases of a multi-engine helicopters flying above water at a distance equivalent to 10 minutes at normal cruise speed from land suited to an emergency landing, measures for ensuring the safety of all members on board shall be determined through risk analysis and assessment according to the operational situation to judge whether all should wear life jackets.

iii) In case of offshore operation of a helicopter (an operation using a sea-based facility or a ship heliport), all members on board shall wear life jackets or their equivalent, excluding a medical condition in which this is difficult (i.e., due of emergency transport of a patient for example).

* The contents of the notice are posted on the JTSB website
https://www.mlit.go.jp/jtsb/airkankoku/kankoku13re_020901.pdf (Japanese only)

(4) Accident of Gunma Prefectural Disaster Prevention Aviation Unit Bell 412EP (Rotorcraft)
(Recommendations on February 27, 2020)

Summary of the Accident

On Friday, August 10, 2018 around 10:01 JST (JST: UTC+9 hours; unless otherwise noted, all times are indicated in JST in this report on a 24-hour clock), a Bell 412EP, registered JA200G, operated by Gunma Prefectural Disaster Prevention Aviation Unit, took off from

Gunma heliport in Shimoauchi-machi, Maebashi City, Gunma Prefecture to explore and identify dangerous spots in preparation for rescue activities on the trails on the ridge lines of Gunma Prefectural border and crashed into the mountain slope in the vicinity of about 2 km northeast of Mt. Yokote in Nakanojo Town, Agatsuma County, Gunma Prefecture.

There were nine persons in total were on board, consisting of a captain, a mechanic A in charge, a chief air rescuer, an air rescuer and five firefighters, and all of them were killed.

The helicopter was destroyed, however, there was no outbreak of fire.

Probable Causes

In this accident, it is probable that, while flying over mountainous areas for exploration of mountain climbing trail, the helicopter entered the cloudy airspace and was unable to continuously recognize the ground surface due to lowered visibility, and the captain who was exposed to spatial disorientation could not perform an appropriate maneuvering to maintain the attitude of the Helicopter that subsequently crashed into the slope of the mountain.

It is probable that losing continuous visual recognition of the ground surface in the lowered visibility were caused by delayed decision to return and continuing flight in the situation that it was getting difficult to maintain VMC.

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

In this accident, it is probable that, while flying in mountainous areas for exploration of mountain climbing trail, the Helicopter entered the cloudy airspace and was unable to continuously visually recognize the ground surface due to lowered visibility that exposed the captain to spatial disorientation and disabled him to perform an appropriate maneuvering to maintain the attitude of the aircraft, which crashed into the slope of the mountain.

It is probable that the lowered visibility and losing continuous visual recognition of the ground surface were caused by delayed decision to return and continuing flight in the situation that it was getting difficult to maintain VMC.

Pilots operating aircraft for fire and disaster prevention and police rescue activities have many opportunities due to the nature of their missions to fly mountainous areas where meteorological conditions are easy to change and it is difficult to predict localized meteorological conditions. It is

important that, even in the case of abruptly worsened weather, pilots take appropriate actions to promptly leave air space in worsened weather conditions without being exposed to spatial disorientation. For that purpose, it is probable that pilots are required to regularly get acquainted with concrete preventive measures and coping ones by deepening understanding of danger in relation to spatial disorientation, to immediately switch to basic instrument flight, if required, and to properly use autopilot system, if equipped.

From what is described above, the Japan Transport Safety Board, pursuant to Article 26 (1) of the Act for Establishment of the Japan Transport Safety Board, recommends Minister of Land, Infrastructure, Transport and Tourism to take following measures in order to prevent an aircraft accident and to mitigate damage if an aircraft accident has occurred:

Civil Aviation Bureau of Ministry of Land, Infrastructure, Transport and Tourism should alert pilots operating aircraft engaged in rescue activities to danger of spatial disorientation and disseminate preventive measures not to be exposed to spatial disorientation, and coping measures to leave the situations if exposed to it by any chance.

(5) Accident of Toho Air Service Co., Ltd. Aerospatiale AS332L (Rotorcraft)

(Recommendations on April 23, 2020)

Summary of the Accident

While an Aerospatiale AS332L, registered JA9672, operated by Toho Air Service Co., Ltd., was flying from Arakura temporary helipad in Hayakawa Town, Minami-koma County, Yamanashi Prefecture, to Tochigi heliport for ferry flight, the tail rotor was separated from the airframe over Ueno-mura, Tano County, Gunma Prefecture, and the aircraft became uncontrollable and crashed around 14:29 JST on November 8, 2017.

Four crew members, consisting of a captain, a mechanic in charge and two mechanics were on board, and all of them were killed.

The aircraft was destroyed and there occurred the outbreak of fire.

Probable Causes

In this accident, it is highly probable that, when the Helicopter attempted an emergency landing due to abnormal vibrations occurring in the airframe in flight, the tail rotor was separated leading to loss of control and subsequent crash.

It is highly probable that the separation of the tail rotor from the airframe was caused by imbalanced rotation of the tail rotor due to the fracture of the spindle bolt of the flapping hinge of the White Blade, which generated excessive vibrations and damaged the section attached to the tail rotor.

It is highly probable that the fractured spindle bolt was caused by damaged and stuck bearings of the flapping hinge. Besides, it is highly probable that this resulted from the fact that the damaged

condition of the bearings was not grasped in inspections and maintenance work performed on the Helicopter and the appropriate measures were not taken.

Safety recommendations to the parties relevant to the causes of accidents or serious incidents

In this accident, the information on the malfunction of the flapping hinge of the white blade was not reported and appropriate maintenance was not performed in the disassembly maintenance work for the flapping hinge of the White Blade. Besides, the information issued by Airbus Helicopters with regard to the usage of the grease was not disseminated, and maintenance work in the event of parking at high temperature and high humidity was not thoroughly performed. It is probable that either case was related to the factors of the accident.

In the view of this accident investigation, in order to contribute to the prevention of recurrence of similar cases of accident, the Japan Transport Safety Board submits recommendations pursuant to the provision of the Article 27, paragraph (1) of the Act for Establishment of the Japan Transport Safety Board to Toho Air Service Co., Ltd. as follows:

1) In the event that malfunction including damage, which is not described in manual or the like of the designer and manufacturer, is found during maintenance inspection work, report to the designer and the manufacturer for their technical review, and take necessary measures for the malfunction in accordance with their instructions.

2) From technical point of the view, promptly review the malfunction information, notified in relation to caution in maintenance work that was notified by the designer and the manufacturer, and disseminate such information to mechanics on-site.

Measures based on the recommendations

The JTSB issued recommendations to Toho Air Service Co., Ltd. on April 23, 2020, and on September 1, 2020, received a report from them regarding the following measures taken in response to the recommendations:

○ Measures taken by Toho Air Service Co., Ltd. in response to the recommendations:

1 Progress of required measures

1-1 Regarding the recommendation: “In the event that malfunction including damage, which is not described in manual or the like of the designer and manufacturer, is found during maintenance inspection work, report to the designer and the manufacturer for their technical review, and take necessary measures for the malfunction in accordance with their instructions.”

(1) Newly established “Aircraft Maintenance Support Team” and “Maintenance Control Office”

To improve the maintenance organization for addressing malfunctions and ensure the integrity

of aircraft, the "Aircraft Maintenance Support Team" was newly established and the maintenance manual reviewed.

(Approval for the maintenance manual: January 30, 2020)

In the past, malfunctions of aircraft (including damage not described in the designer and manufacturer manuals) were handled by a division to which malfunctions are reported, such as the Management Division, but the "Aircraft Maintenance Support Team" was newly established as a maintenance division organization. Thus, a team system for centrally managing malfunctions has been established.

Moreover, the appendix of the maintenance manual was reviewed, the "Maintenance Control Office" for handling malfunctions found in maintenance work in general and an organization for comprehensively managing the "Aircraft Maintenance Support Team" were established. (Approval of the appendix of the maintenance manual: January 30, 2020)

(2) Revision of the work manual "Handling of Malfunctions Against Which Measures Based on Manufacturer's Technical Data Are Difficult or Impossible"

A management system in which the Maintenance Management Division systematically handles malfunctions including damage not described in the designer and manufacturer manuals was stipulated in the appendix of the maintenance manual, and organizational handling methods for removing ambiguities in maintenance work were clarified.

(Approval of the appendix of the maintenance manual: January 30, 2020)

In cases in which a malfunction such as damage not described in the designer and manufacturer manuals that is difficult to handle occurs, the "Aircraft Maintenance Support Team" requests support from the Technical Affairs Division. The Technical Affairs Division reviews methods to repair the malfunction. If the division cannot find a repair method even armed with technical data, it reports the malfunction to the designer and manufacturer, requests their advice on a repair method and then reports the results to the Quality Assurance Office Head. When necessary, the Quality Assurance Office Head holds the Maintenance Management Division's "maintenance technology review meeting." Malfunction countermeasures reviewed by the Technical Affairs Division are transposed as work instructions via the "Aircraft Maintenance Support Team" to the site mechanics, who carry out the installation of these countermeasures.

Work manual (in-house manual; the same shall apply hereinafter) "Handling of Malfunctions Against Which Measures Based on Manufacturer's Technical Data Are Difficult or Impossible (work evaluation records/entry manual)" was reviewed and revised (August 12, 2020).

(3) Ad-hoc training for all the members of the Maintenance Division

i) From November 30, 2018 to March 25, 2019, ad-hoc training was provided to all the members of the Maintenance Division to instruct them regarding the newly established "Aircraft Maintenance Support Team" and the work manual "Handling of Malfunctions Against Which

Measures Based on Manufacturer's Technical Data Are Difficult or Impossible."

ii) From December 10, 2018 to March 30, 2019, the company reviewed both its effectiveness and the level of comprehension of it on all the members of the Maintenance Division.

iii) From February 20 to May 29, 2020, the company provided ad-hoc training regarding the appendix of the maintenance manual revised according to an order to improve business operations and reviewed both its effectiveness and the level of comprehension of it on all the members of the Maintenance Division.

1-2 Regarding the recommendation: "From technical point of the view, promptly review the malfunction information, notified in relation to caution in maintenance work that was notified by the designer and the manufacturer, and disseminate such information to mechanics on-site."

(1) From April 1 to May 1, 2020, the company implemented research and reviews of the "prompt technical review of maintenance-related information (such as points to note) pointed out by designer and manufacturer and alerting the site mechanics to such information" and took the following corrective measures.

i) Current situation of technical review and information sharing

As a result of current situational research from April 1 to 7, 2020, it was found that information such as maintenance alerts from designer and manufacturer consisted of ASB, SB, LETTER, NOTICE, etc., and it was confirmed that important aircraft malfunction notifications (ASB and SB) were technically reviewed promptly and shared appropriately among the site mechanics as maintenance information.

Regarding the technical review and sharing of "other maintenance information or maintenance alerts (LETTER and NOTICE)," it was found that their handling of alerts based on the maintenance manual was unclear.

ii) Improvements in technical reviews and information sharing

From April 8 to 30, 2020, as a result of reviewing methods of improving technical reviews and information sharing of "other maintenance information or maintenance alerts (LETTER and NOTICE)," the existing work manual "In-House Technical Information Handling Manual (Toho maintenance information sharing standard)" was revised (May 1, 2020) to establish a system for promptly and systematically carrying out technical reviews and sharing the maintenance information among site mechanics.

(2) From June 16 to 29, 2020, e-learning regarding the revisions of the "In-House Technical Information Handling Manual (Toho maintenance information sharing standard)"was implemented for all members of the Maintenance Division and their level of comprehension of the revised manual was checked.

* The contents of the notice are posted on the JTSB website
https://www.mlit.go.jp/jtsb/airkankoku/kankoku15re_020901.pdf (Japanese only)

2 Opinions

No opinion was issued in 2020.

3 Safety Recommendations

(1) Collision Accident between Cargo Ship SM3 and Oil Tanker KOUTOKU MARU

(Safety Recommendations on January 30, 2020)

Summary of the Accident

While cargo ship SM3, with a master and 9 crew members on board, was proceeding north-northeast bound for Pohang Port, Republic of Korea, in Wakamatsu Passage of Kanmon Port, and while oil tanker KOUTOKU MARU, with a master, boatswain and 6 crew members on board, was proceeding southeast bound for Setonaikai in No. 2 Kanmon Passage of Kanmon Port, both vessels collided at around 14:55 on September 29, 2018, after having just entered Kanmon Passage.

SM3 suffered denting of her shell plate on her port fore side and port aft side, and KOUTOKU MARU lost her starboard anchor and suffered denting of her bulbous bow, etc.; however, there were no casualties or injuries on either vessel.

Probable Causes

It is probable that the accident occurred because, while SM3 was traveling eastward from Wakamatsu Passage to Kanmon Passage and KOUTOKU MARU was traveling southeastward from No. 2 Kanmon Passage to Kanmon Passage in a situation whereby the courses of both vessels would cross in Kanmon Passage, the master of SM3 intended to turn to the left and pass the bow of KOUTOKU MARU and boatswain of KOUTOKU MARU was maintaining the same course and ship speed, as a result of which both vessels collided.

It is probable that the master of SM3 intended SM3 to turn to the left and pass the bow of KOUTOKU MARU because of the possibility that he wanted to move ahead of a cargo ship proceeding northwest in Kanmon Passage and because he had the experience that other vessels kept out of the way of SM3 when he called their names by VHF wireless telephone, and that, at the time of the accident, the master of SM3 similarly thought that KOUTOKU MARU would turn to the right and avoid SM3 by passing off her stern.

It is probable that boatswain of KOUTOKU MARU was maintaining the same course and ship speed because, according to the navigation rules of Kanmon Port in the Ordinance for Enforcement of the Act on Port Regulations, SM3 was in a position whereby she had to keep out of the way of KOUTOKU MARU, and thus he was expecting SM3 to eventually avoid KOUTOKU MARU and diverted his attention to responding to a total three calls by VHF wireless telephone.

Safety recommendations to the parties relevant to the causes of accidents or serious incidents

It is probable that this accident occurred because, while the cargo ship SM3 was traveling eastward from Wakamatsu Passage to Kanmon Passage and the oil tanker KOUTOKU MARU was traveling southeastward from No. 2 Kanmon Passage to Kanmon Passage in a situation whereby the courses of both vessels would cross in Kanmon Passage, the master of SM3 intended to turn to the left and pass the bow of KOUTOKU MARU while the boatswain of KOUTOKU MARU maintained the same course and ship speed, as a result of which both vessels collided.

It is probable that the master of SM3 turned to the left toward the path of KOUTOKU MARU because he intended SM3 to go ahead of a vessel proceeding northwest in Kanmon Passage at the time of the accident and because it was his experience that other vessels kept out the way of SM3 when he called their names by VHF wireless telephone and thus, at the time of the accident, probably he again thought KOUTOKU MARU would turn to the right and avoid SM3 when he called KOUTOKU MARU's name by VHF wireless telephone.

In view of the result of this accident investigation, the Japan Transport Safety Board recommends that SEMYUNG SHIPPING CO., LTD. (Republic of Korea), which is the owner and the management company of SM3, take the following countermeasures for the purpose of preventing the occurrence of a similar accident and reducing damage:

SEMYUNG SHIPPING CO., LTD. (Republic of Korea) shall provide thorough instruction to masters of its vessels to unfailingly execute the following measures and shall also implement training in accordance with said measures:

(1) Masters and duty watch persons should utilize information provided by the Vessel Traffic Service Center, etc., effectively. In particular, they should give immediate attention to dangerous situations based on the content of warnings from the Center, etc., and respond appropriately.

(2) Masters and duty watch persons should navigate in accordance with rules that are established for the navigational area. In particular, when communicating with approaching vessels becomes necessary, they should not only call the vessel's name but also implement VHF wireless telephone communication proactively and mutually confirm the maneuvering intentions.

Chapter 3 Aircraft accident and serious incident investigations

1 Aircraft accidents and serious incidents to be investigated

<Aircraft accidents to be investigated>

◎Article 2, paragraph (1) 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 Article 76 paragraph (1), each items of the Civil Aeronautics Act.

◎Article 76, paragraph (1), 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 (Ordinance for Enforcement of the Civil Aeronautics Act).

◎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 Article 76, paragraph (1), item (v) 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).

< Serious aircraft incidents to be investigated>

◎Article 2, paragraph (2), item (ii), of the Act for Establishment of the Japan Transport Safety Board (Definition of aircraft serious incident)

Serious aircraft incidents to be investigated refers to situations that may escalate into aircraft accidents as specified by the Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism (Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board).

◎ Article 1 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board

(Situations specified in Article 2, paragraph (2), item (ii) of the Act for Establishment of the Japan Transport Safety Board)

* The contents of Article 166-4 of the Ordinance for Enforcement of the Civil Aeronautics Act, cited in Article 1 are also provided here.

1 The following situations (Situations (8), (11) and (12) relate only to an in-flight aircraft.)

(1) Case recognized by the captain that it may have resulted in contact between the in-flight aircraft and another object

(2) Takeoff from a closed runway, from a runway being used by other aircraft, from a runway different from the designated one or from a taxiway, or aborted takeoff

(3) Landing or the landing attempt on a closed runway, on a runway being used by other aircraft, on a runway different from the one designated, or on a location where aircraft are not normally supposed to land such as a taxiway or road

(4) Contact of engine cowling, wingtip or component other than landing gear with ground surface during landing

(5) Overrun, undershoot and deviation from a runway (limited to when an aircraft is disabled to perform taxiing)

(6) Case where emergency evacuation was conducted with the use for emergency evacuation slide

(7) Case where aircraft crew executed an emergency operation during navigation in order to avoid crash into water or contact on the ground

(8) Damage of engine (limited to such a case where fragments penetrated the casing of subject engine

(9) 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

(10) 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

(11) Multiple malfunctions in one or more systems equipped on aircraft impeding the safe flight of aircraft

(12) Occurrence of fire or smoke inside an aircraft and occurrence of fire within an engine fire-prevention area

(13) Abnormal decompression inside an aircraft

(14) Shortage of fuel requiring urgent measures

(15) 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

(16) Case where aircraft crew became unable to perform services normally due to injury or disease

(17) 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

(18) Case where parts dropped from aircraft collided with one or more persons

(19) Case equivalent to any of (2) to (18) above.

2 The following situations are considered extraordinary:

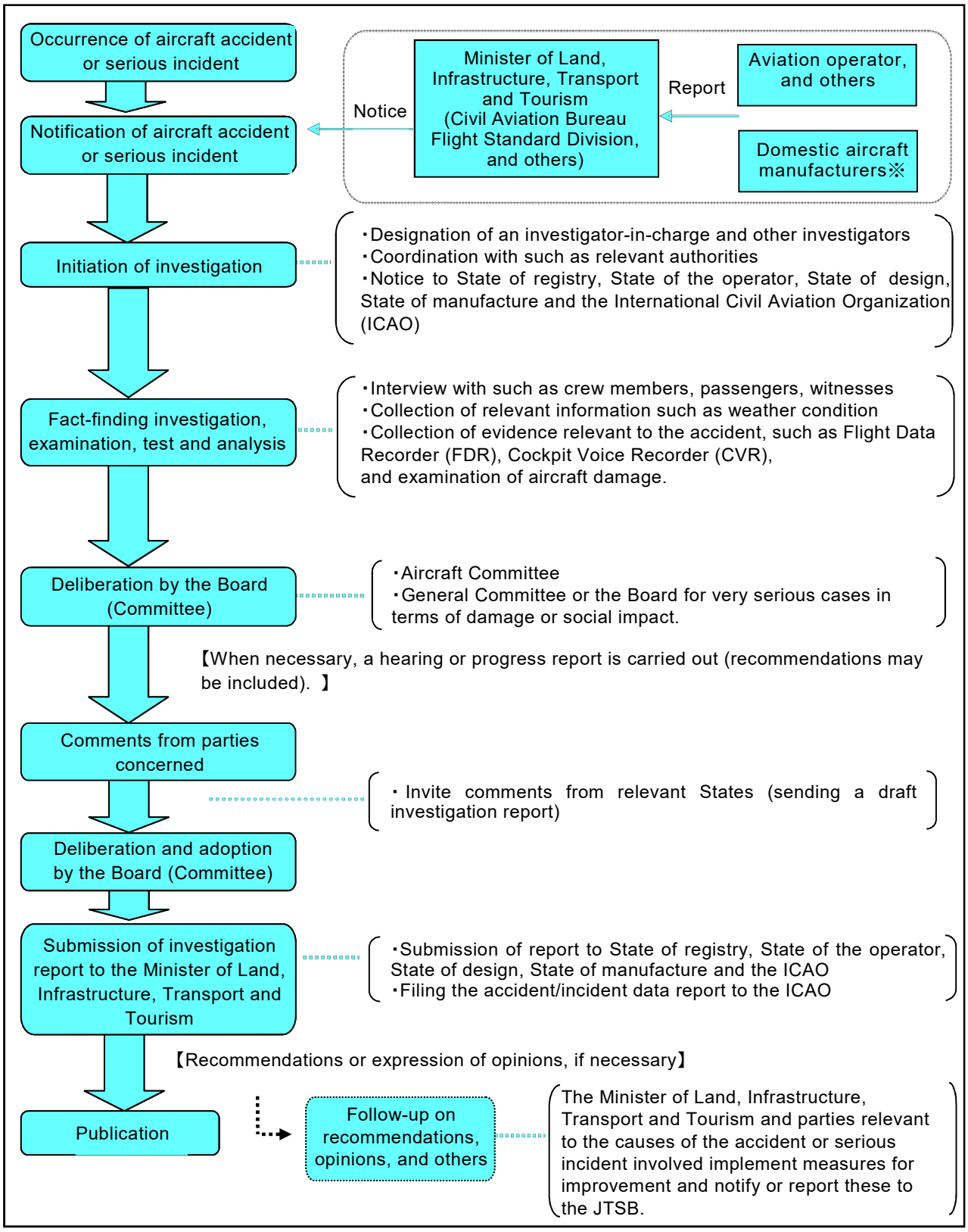
(1) Situations described in (8), (11) and (12) of 1 above occurring with aircraft not in flight

(2) Damage to an aircraft not in flight (except the sole damage of engine, engine cowling, engine accessory, propeller, wingtip, antenna, tire, brake or fairing) (excluding cases where the repair of the aircraft does not correspond to major repair work)

(3) Case where the propeller, rotary wing, landing gear, rudder, elevator, aileron, or flap is damaged, hindering the start of its flight

(4) Case equivalent to those described in (1) to (3)

2 Procedure of aircraft accident/serious incident investigation



* Opinions may be expressed in a flow chart (as above) or whenever and however necessary to prevent accidents or incidents or mitigate damage thereof.

3 Statistics of investigations of aircraft accidents and serious incidents

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

In 2020, 15 accident investigations were carried over from 2019, and 13 accident investigations were newly launched. Besides, 10 investigation reports were published, and thereby 18 accident investigations were carried over to 2021.

Moreover, 21 serious incident investigations were carried over from 2019, and nine serious incident investigations were newly launched in 2020. Furthermore, eight investigation reports were published in 2020, and thereby 22 serious incident investigations were carried over to 2021.

Among the 18 investigation reports published in 2020, three were issued with recommendations and none was issued with opinions.

Investigations of aircraft accidents and serious incidents in 2020

(Cases)

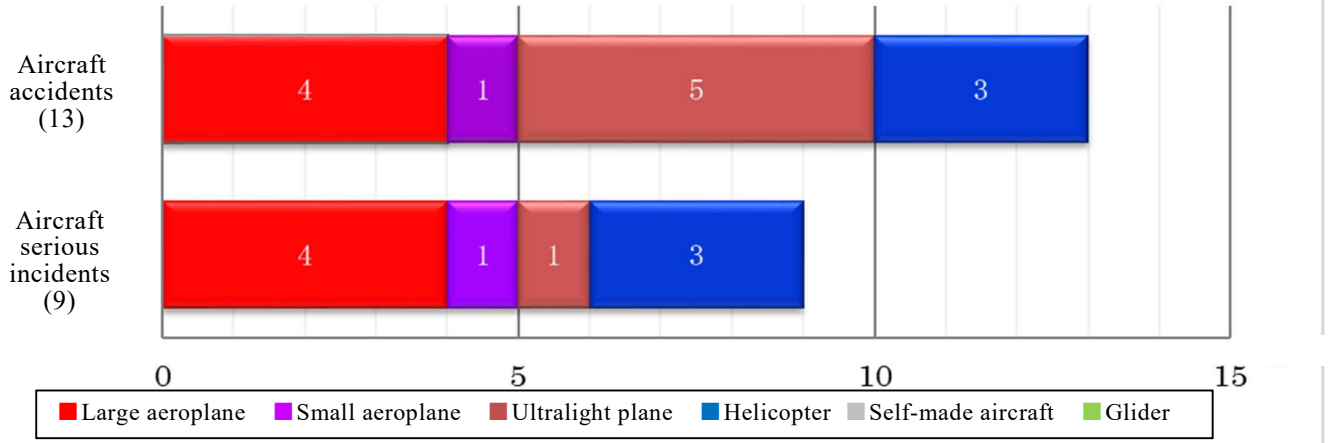
Category	Carried over from 2019	Launched in 2020	Total	Published investigation reports	(Recommendations)	(Safety recommendations)	(Opinions)	Carried over to 2021	(Interim report)
Aircraft accident	15	13	28	10	(3)	(0)	(0)	18	(0)
Aircraft serious incident	21	9	30	8	(0)	(0)	(0)	22	(0)

4 Statistics of investigated aircraft accidents and serious incidents in 2020

The aircraft accidents and serious incidents that were newly investigated in 2020 consisted of 13 aircraft accidents, which increased by one from 12 for the previous year, and nine aircraft serious incidents, which decreased by eight from 17 for the previous year.

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

Number of investigated aircraft accidents and serious incidents by aircraft category in 2020



* 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.
* Ultralight planes include self - made aircraft in the form of ultralight planes.

The number of deaths, missing and injured were 18 in 13 cases, including two deaths and 16 injuries.

The number of casualties (aircraft accident)

(Persons)

2020							
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	2	2
Small aeroplane	0	0	0	0	1	1	2
Helicopter	1	0	0	0	2	5	8
Ultralight plane	1	0	0	0	3	2	6
Self-made aircraft	0	0	0	0	0	0	0
Glider	0	0	0	0	0	0	0
Total	2	0	0	0	6	10	18
	2		0		16		

*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 2020

The aircraft accidents and serious incidents which occurred in 2020 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
	January 3, 2020 In the vicinity of Gusukube Nagama, Miyakojima City, Okinawa Prefecture	Privately owned	JR0251 Maxair drifter XP-R503L (Ultralight plane)
	Summary	The plane collided with a tree during flight at the above-described location and crashed to the ground. One passenger was seriously injured.	

2	Date and location	Operator	Aircraft registration number and aircraft type
	January 12, 2020 About 30 km Northwest of Fukuoka Airport	Jin Air Co., Ltd.	HL8243 Boeing 737-800 (Large aeroplane)

	Summary	The aircraft took off from Kitakyushu Airport. During its ascent, it experienced turbulence near the above-described location, which seriously injured a flight attendant.	
3	Date and location	Operator	Aircraft registration number and aircraft type
	February 1, 2020 A rice field in Mihota-machi, Koriyama City, Fukushima Prefecture	Fukushima Prefecture Police Aviation Corps	JA139F Agusta AW139 (Rotorcraft)
	Summary	During a flight to transport a kidney for transplant from the helipad of Aizu Wakamatsu Chuo Hospital, Aizu Wakamatsu City, Fukushima Prefecture to Fukushima Airport, a main rotor blade came in contact with the tail drive shaft above Mihota-machi, Koriyama City, Fukushima Prefecture. As a result, the aircraft became uncontrollable, crash-landed and overturned. It was heavily damaged, but no fire occurred. Seven persons on board were injured.	
	Reference	Feature 3 (page 7)	
4	Date and location	Operator	Aircraft registration number and aircraft type
	April 12, 2020 About 30 km south-southwest of Matsuyama Airport and an altitude of about 8,200 m	ANA Wings Co., Ltd.	JA64AN Boeing 737-800 (Large aeroplane)
	Summary	The aircraft departed Fukuoka Airport and experienced turbulence near the above-described location, which injured a flight attendant. The flight attendant was seriously injured.	
5	Date and location	Operator	Aircraft registration number and aircraft type
	April 30, 2020 A temporary airfield in Isezaki City, Gunma Prefecture	Privately owned	JE0205 Air Command R532 (Gyroplane)
	Summary	During a jump flight at a temporary airfield in Isezaki City, Gunma Prefecture, after it ascended by about 10 meters, it lost altitude suddenly upon while turning left, resulting in a hard landing on the front landing gear. The pilot was seriously injured.	
6	Date and location	Operator	Aircraft registration number and aircraft type
	May 6, 2020 Aso City, Kumamoto Prefecture	Privately owned	JR0213 Quicksilver MX II J-R503L (Two-seat ultralight plane)
	Summary	During a flight above Yamada, Aso City, Kumamoto Prefecture, the engine output dropped and could not be recovered, resulting in a crash-landing, damage to the aircraft and injuries of both persons on board.	
7	Date and location	Operator	Aircraft registration number and aircraft type
	June 9, 2020 Temporary airfield in Shiroishi-cho, Kishima District, Saga Prefecture	Privately owned	JR0862 Sanyo Tekko Co., Ltd. EX-03C PUFFIN-LT447 (Ultralight plane)
	Summary	During a jump flight at a temporary airfield in Shiroishi-cho, Kishima District, Saga Prefecture, the aircraft entered a partial stall and fell onto the ground. The pilot died.	
8	Date and location	Operator	Aircraft registration number and aircraft type
	June 29, 2020 Temporary airfield in Fukuzaki-cho, Kanzaki District, Hyogo Prefecture	Central Japan Airlines Co., Ltd.	JA9383 Fuji-Bell 204B-2 (Rotorcraft)

	Summary	After departing a Nara prefectural heliport, the rotorcraft made a hard landing on a temporary airfield in Fukuzaki-cho, Kanzaki District, Hyogo Prefecture.

9	Date and location	Operator	Aircraft registration number and aircraft type
	July 19, 2020 In the vicinity of Minamifurano-cho, Sorachi District, Hokkaido	Privately owned	JA3825 Cessna 172N Ram (Small aeroplane)
	Summary	After departing Sapporo Airfield, the aircraft crashed into the mountain described above, injuring two persons on board.	

10	Date and location	Operator	Aircraft registration number and aircraft type
	August 1, 2020 Temporary airfield in Aisai City, Aichi Prefecture	Privately owned	JR7151 New Wing MAX-447 MAW (Ultralight plane)
	Summary	At a temporary airfield in Aisai City, Aichi Prefecture, the aircraft was performing a jump flight, when it entered a partial stall and crashed. The pilot was seriously injured.	

11	Date and location	Operator	Aircraft registration number and aircraft type
	August 29, 2020 About 15 km east-southeast of Tokyo International Airport and an altitude of about 3,300 m	Skymark Airlines Inc.	JA73NM Boeing 737-800 (Large aeroplane)
	Summary	During its ascent after departing Tokyo International Airport, the aircraft collided with a bird at the above-described location, causing damage to its outer plate and other parts.	

12	Date and location	Operator	Aircraft registration number and aircraft type
	October 23, 2020 A runway of Fukue Airport	Oriental Air Bridge Co., Ltd.	JA845A Bombardier DHC-8-402 (Large aeroplane)
	Summary	After departing Fukuoka Airport and during its landing at Fukue Airport, the posterior portion of the fuselage struck the runway, damaging the aircraft.	

13	Date and location	Operator	Aircraft registration number and aircraft type
	December 30, 2020 In the vicinity of Ojiro, Shimada City, Shizuoka Prefecture	Privately owned	JA77AR Robinson R66 (Rotorcraft)
	Summary	After departing Tsu City Isewan Heliport, the rotorcraft crashed at the above-described location, resulting in the death of the captain.	

(Aircraft serious incidents)

1	Date and location	Operator	Aircraft registration number and aircraft type
	January 8, 2020 In the vicinity of a runway of Amami Airport	Japan Air Commuter Co., Ltd.	JA07JC ART 42-500 (Large aeroplane)
	Summary	After departing Kikai Airport and landing at Amami Airport, the aircraft deviated leftward and stopped in a green belt west from the runway.	

2	Date and location	Operator	Aircraft registration number

			and aircraft type
	February 16, 2020 Ishikari City in Hokkaido	Sapporo City Fire Department Air Corps	JA17AR Agusta AW139 (Rotorcraft)
	Summary	The Rotorcraft took off from Ishikari Temporary Airfield and while approaching from the west side of the Airfield for rescue training, dropped weights attached to the hoist over the national forest.	
3	Date and location	Operator	Aircraft registration number and aircraft type
	February 20, 2020 About 55 km southwest of Okinoerabu Airport and an altitude of about 12,200 m	Silver Air	N829RA Bombardier BD-700-1A10 (Large aeroplane)
	Summary	During a flight at FL 440 from Tokyo International Airport to Tan Son Nhat International Airport (Vietnam), a gauge indicated an abnormal pressure drop inside the cabin, so the pilot declared an emergency and carried out an emergency descent to an altitude of about 10,000 ft.	
4	Date and location	Operator	Aircraft registration number and aircraft type
	April 17, 2020 A runway of Obihiro Airport	Civil Aviation College	JA017C Cirrus SR22 (Small aeroplane)
	Summary	Due to a landing gear that was damaged on touchdown at Obihiro Airport, the aircraft was suddenly unable to continue taxiing.	
5	Date and location	Operator	Aircraft registration number and aircraft type
	May 22, 2020 About 120 km southwest of Tokyo International Airport and an altitude of about 13,700 m	Privately owned	N146BG Gulfstream Aerospace G-IV (Large aeroplane)
	Summary	The chartered airplane departed Phnom Penh International Airport and started its descent toward Tokyo International Airport, then the left and right airspeed indicators malfunctioned. However, the airplane was preferentially guided in by the control tower and was able to land.	
6	Date and location	Operator	Aircraft registration number and aircraft type
	August 28, 2020 In the vicinity of a temporary airfield in Kamikashiide, Nagaoka City, Niigata Prefecture and an altitude of about 25 m	Tohoku Air Service Co., Ltd.	JA332T Eurocopter AS332L1 (Rotorcraft)
	Summary	The rotorcraft departed a temporary airfield in Nagaoka City, Niigata Prefecture carrying a hanging a rope basket containing cargo (weight: about 790 kg with the weights of old steel tower components and the rope basket combined), when the materials dropped onto a grass field (used for unloading) in the vicinity of the temporary helipad.	
7	Date and location	Operator	Aircraft registration number and aircraft type
	November 3, 2020 An altitude of about 150 to 200 m above Koizumi, Kitami City, Hokkaido	Privately owned	JA0392 Beaver RX550-R503L (Ultralight plane)
	Summary	The plane departed a temporary airfield in Kitami City, Hokkaido, but because the engine stopped at the location described above, it landed on a farmland in the city.	
8	Date and location	Operator	Aircraft registration number and aircraft type

	December 4, 2020 About 100 km north of Naha Airport and an altitude of about 5,000 m	Japan Airlines Co., Ltd.	JA8978 Boeing 777-200 (Large aeroplane)
	Summary	The aircraft departed Naha Airport, and during its ascent, an abnormal sound generated from No. 1 (port side) engine, so the pilot stopped the engine, declared an emergency, turned around and landed on runway B of the same airport. After the aircraft parked on the runway, the runway was closed until the aircraft could be towed the apron.	
	Reference	Feature 3 (page 7)	
9	Date and location	Operator	Aircraft registration number and aircraft type
	December 4, 2020 In the vicinity of Miyato Kokegaura, Matsushima City, Miyagi Prefecture and an altitude of about 90 m	Toho Air Service Co., Ltd.	JA504D Airbus Helicopters AS350B3 (Rotorcraft)
	Summary	The rotorcraft departed a temporary airfield in Matsushima City, Miyagi Prefecture to transport approximately 380 kg of deadwood hanging from the rotorcraft, when a portion of cargo weighing about 30 kg dropped onto the rice field described above.	

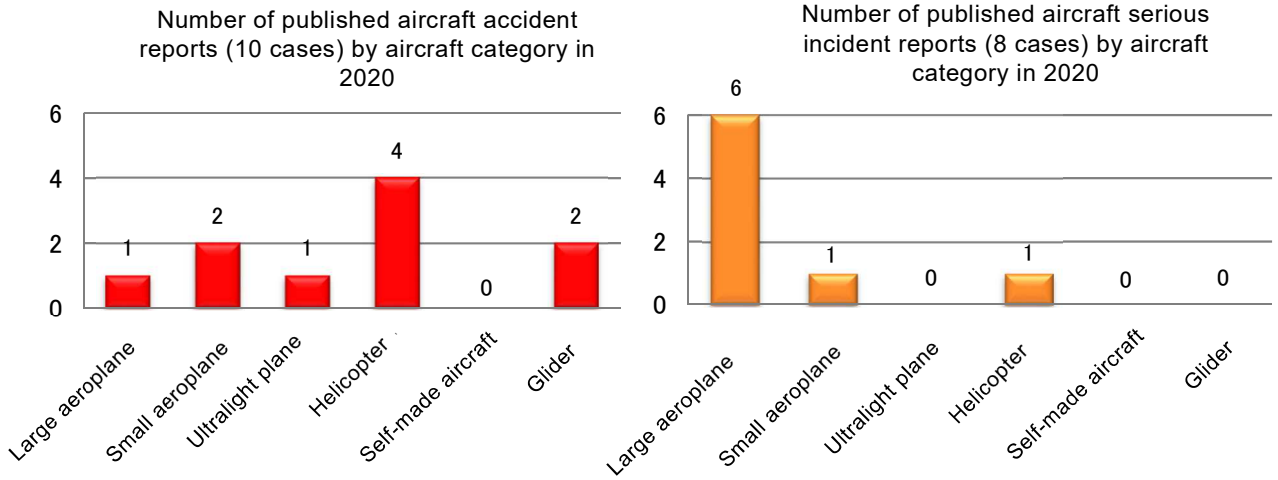
6 Publication of investigation reports

The number of investigation reports of aircraft accidents and serious incidents published in 2020 was 18, consisting of 10 aircraft accidents and 8 aircraft serious incidents.

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

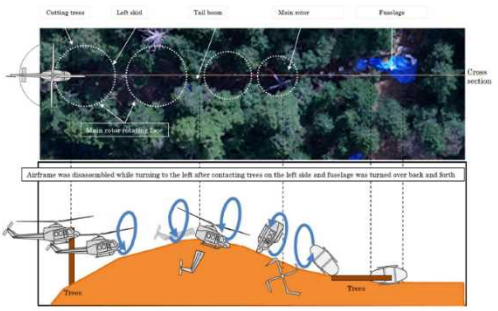
Note: In Aircraft accidents and serious incidents, two or more aircraft are sometimes involved in a single case. See page 44 to 50 for details.

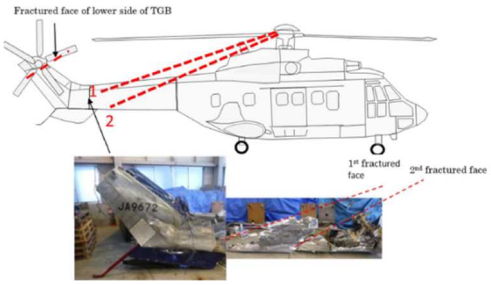
In the 10 accidents, the number of casualties was 17, consisting of 13 deaths and four injuries.



The aircraft accidents and serious incidents which occurred in 2020 are summarized as follows.

Aircraft accident investigation reports published in 2020

1	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	February 27, 2020	June 7, 2018 On the Sea Near 41 km Northwest of Naha Airport	Excel Air Service Inc.	JA350D Eurocopter AS350B3 (Rotorcraft)
	Summary	The aircraft ditched near 41 km northwest of Naha airport while flying for Aguni airport after take-off from Naha airport, and sank in the sea. The pilot was seriously injured. 		
	Probable Causes	In this accident, it is probable that NR of the main rotor was reduced during the flight and flight altitude became unable to maintain, which led to ditching at the excessive speed and descent rate and caused damage to the airframe, followed by sinking. It is likely that the reduced NR of the main rotor was caused by some kind of malfunction occurring with engine system; however, it could not be determined in which section of the engine malfunction occurred and what caused it.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA350D.pdf		
	Reference	Chapter 2 (page 25), Case Studies (page 57)		
2	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	February 27, 2020	August 10, 2018 Vicinity of About 2 km Northeast of Mt. Yokote in Nakanojo Town, Agatsuma County, Gunma Prefecture	Gunma Prefectural Disaster Prevention Aviation Unit	JA200G Bell 412EP (Rotorcraft)
	Summary	The aircraft operated by Gunma Prefectural Disaster Prevention Aviation Unit, took off from Gunma heliport in Shimoauchi-machi, Maebashi City, Gunma Prefecture to explore and identify dangerous spots in preparation for rescue activities on the trails on the ridge lines of Gunma Prefectural border and crashed into the mountain slope in the vicinity of about 2 km northeast of Mt. Yokote in Nakanojo Town, Agatsuma County, Gunma Prefecture on around 10:01 JST.  There were nine persons in total were on board, consisting of a captain, a mechanic A in charge, a chief air rescuer, an air rescuer and five firefighters, and all of them were killed. The helicopter was destroyed, however, there was no outbreak of fire.		
	Probable Causes	In this accident, it is probable that, while flying over mountainous areas for exploration of mountain climbing trail, the Helicopter entered the cloudy airspace and was unable to continuously recognize the ground surface due to lowered visibility, and the captain who was exposed to spatial disorientation could not perform an appropriate maneuvering to maintain the attitude of the Helicopter that subsequently crashed into the slope of the mountain. It is probable that losing continuous visual recognition of the ground surface in the lowered visibility were caused by delayed decision to return and continuing flight in the situation that it was getting difficult to maintain VMC.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA200G.pdf https://www.mlit.go.jp/jtsb/aircraft/p-pdf/AA2020-1-2-p.pdf (Explanatory Materials (Japanese only))		
	Reference	Feature 4 (page 10)、Chapter 2 (page 27)、Case Studies (page 58)		
3	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type

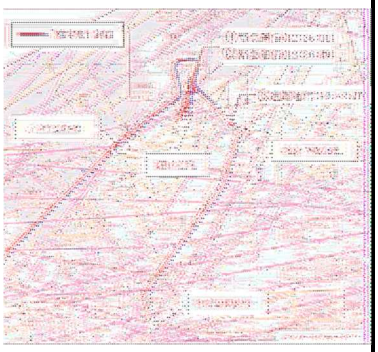
	April 23, 2020	November 8, 2017 Ueno-mura, Tano County, Gunma Prefecture	Toho Air Service Co., Ltd.	JA9672 Aerospatiale AS332L (Rotorcraft)
	Summary	While the aircraft was flying from helipad in Hayakawa Town, Minami-koma County, Yamanashi Prefecture, to Tochigi heliport for ferry flight, the tail rotor was separated from the airframe over Ueno-mura, Tano County, Gunma Prefecture, and the aircraft became uncontrollable and crashed around 14:29 JST on November 8, 2017. Four crew members, consisting of a captain, a mechanic in charge and two mechanics were on board, and all of them were killed. The aircraft was destroyed and there occurred the outbreak of fire. 
	Probable Causes	In this accident, it is highly probable that, when the Helicopter attempted an emergency landing due to abnormal vibrations occurring in the airframe in flight, the tail rotor was separated leading to loss of control and subsequent crash. It is highly probable that the separation of the tail rotor from the airframe was caused by imbalanced rotation of the tail rotor due to the fracture of the spindle bolt of the flapping hinge of the White Blade, which generated excessive vibrations and damaged the section attached to the tail rotor. It is highly probable that the fractured spindle bolt was caused by damaged and stuck bearings of the flapping hinge. Besides, it is highly probable that this resulted from the fact that the damaged condition of the bearings was not grasped in inspections and maintenance work performed on the Helicopter and the appropriate measures were not taken.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA9672.pdf https://www.mlit.go.jp/jtsb/aircraft/p-pdf/AA2020-2-1-p.pdf (Explanatory Materials (Japanese only))		
	Reference	Chapter 2 (page 28)、Case Studies (page 59)		
4	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	April 23, 2020	December 18, 2019 Ryugasaki Airfield in Ryugasaki City, Ibaraki Prefecture	New Central Airservice Co., Ltd.	JA3962 Cessna 172P (Small aeroplane)
	Summary	The Aircraft collided with a bird during the takeoff from the airfield, and consequently sustained damage to the structure. There were three persons on board, consisting of a captain, a trainee and a passenger, and there were no dead and injured.		
	Probable Causes	In this accident, it is certain that the structure was damaged because the Aircraft collided with the bird immediately after the take off.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA3962.pdf		
5	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	June 25, 2020	June 2, 2019 Inashiki City, Ibaraki Prefecture	Privately owned	JR1102 Birdman Chinook Plus R582LS (Ultralight plane)
	Summary	For solo flight training, the plane with the pilot in the front seat took off from water in the vicinity of Miho-mura, Inashiki District, Ibaraki Prefecture. During flight, the pilot attempted a right turn but the plane lost altitude and crash-landed on the water. It was heavily damaged and the pilot was seriously injured. 		
	Probable Causes	It is probable that this accident occurred as follows: Due to the pilot's failure to coordinate control the three rudders during the right turn with inadequate airspeed, the right roll angle increased, causing a stall. Since the pilot did not immediately perform corrective control, the right roll angle further increased, the plane lost altitude and crashed onto the water surface. Probably the impact heavily damaged the plane and seriously injured the pilot.		

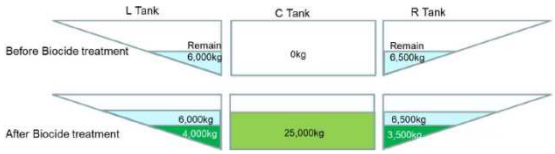
	Report	https://www.mlit.go.jp/jtsb/aircraft/rep-acci/AA2020-3-1-JR1102.pdf (Japanese only)		
6	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	July 30, 2020	September 25, 2017 Satsuma Iojima Airport in Mishima-mura, Kagoshima-gun, Kagoshima Prefecture	New Japan Aviation Co., Ltd.	JA4062 Cessna 172P (Small aeroplane)
	Summary	The Aircraft took off from Kagoshima Airport for passenger transport with a total of three persons on board, consisting of a captain and two passengers. It made a hard touchdown while landing at Satsuma Iojima Airport, and consequently sustained damage to the airframe.		
	Probable Causes	In this accident, it is probable that the airframe was damaged because it fell into a state of porpoising during landing, and the nose wheel touched down severely.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA4062.pdf		
7	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	July 30, 2020	May 2, 2019 Over Hitachiota City, Ibaraki Prefecture	T'way Air	HL8021 Boeing 737-800 (Large aeroplane)
	Summary	The aircraft, as a scheduled flight 201 took off from Incheon International Airport with a total of 186 persons on board, consisting of the Pilot in Command (PIC), five other crew members and 180 passengers. The aircraft encountered shaking during the descent to Narita International Airport, which caused a flight attendant to fall down resulting in her injury.		
	Probable Causes	In this accident, it is highly probable that the Aircraft was shaken by severe atmospheric disturbance it encountered during the descent, which caused Flight Attendant A who was ensuring safety in the cabin to lose her balance after feeling like floating and fall down severely backward, which resulted in her injury in the right ankle.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/HL8021.pdf		
8	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	August 27, 2020	May 2, 2019 Matsumoto City, Nagano Prefecture	Central Japan Aeronautic Association, Gifu Division	JA505G Glaser-Dirks DG-500 Elan Orion (Glider, Two-seater)
	Summary	The aircraft, while flying a leisure flight, suffered substantial damage to the aircraft when attempted a forced landing to the south slope of Mt. Yakedake.		
	Probable Causes	This accident occurred while flying ridge soaring, the Glider wandered into the downdraft zone on the lee side of the ridge and lost altitude. As the captain tried to make a forced landing to the forest, it is highly probable that the Glider collided with trees, causing damage. Concerning the reason why the Glider wandered into the downdraft zone on the lee side of the ridge, it is highly probable that he lost his position because the captain did not have sufficient knowledge on the landscape as he had never flown and additionally he was flying without confirming the heading and position with instruments.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA505G.pdf		
9	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	August 27, 2020	July 29, 2019 Chikusei City, Ibaraki Prefecture	S･G･C Saga Aviation Co., Ltd.	JA9252 Aerospatiale AS350B (Rotorcraft)
	Summary	The aircraft, being operated as a pesticide spray flight, contacted with a power line and crashed into a nearby paddy field. 		

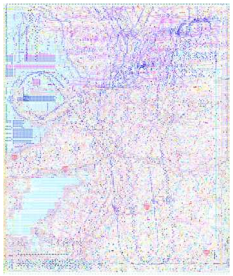
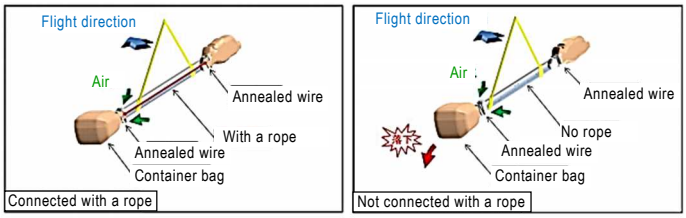
	Probable Causes	It is highly probable that in this accident, as the rotorcraft was coming close to the power lines while flying for a pesticide spray, the captain tried to perform an evasive maneuver just in front of the power lines, but a part of its airframe contacted with a power line, the rotorcraft lost its balance and crashed. It is probable that the rotorcraft came close to the power lines because the captain failed to change direction at the right position to make a 180° turn.
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA9252.pdf

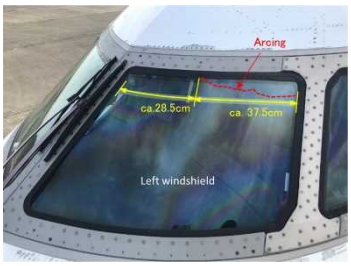
10	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	October 1, 2020	August 27, 2019 Nishio City, Aichi Prefecture	Privately owned	JA2529 Scheibe SF-25C Falke (Motor Glider, Two-Seater)
	Summary	The aircraft took off from Kohnan Aerodrome in Okayama Prefecture to make a ferry flight, to Makabe Gliderport. On the way, the Aircraft landed for refuel on riverbed of the Yahagi River in Nishio-city, Aichi Prefecture. After refueling, when the Aircraft tried to take off from the riverbed, the left wing and left outrigger*1 were entangled with the tall grass, and the Aircraft veered to the left and fell down from the riverbed and stopped, which resulted in the damage to the main wings and propellers. The captain and one passenger on board the Aircraft suffered no injury. 		
	Probable Causes	In this accident, when the Aircraft tried to take off, it is highly probable that it was not able to accelerate enough within the riverbed length, plunged into tall grass area before airborne, therefore its left main wing and left outrigger were entangled with tall grass, and veered to the left and fell down from the riverbed, which resulted in the damage to the main wings and propellers. Concerning the reason why the Aircraft did not accelerate within riverbed length, it is likely that it might involve the following facts; the wet ground created a big drag, the wings were wet by rain and reduced lift, and the weight exceeded the maximum takeoff weight.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA2529_190827.pdf		

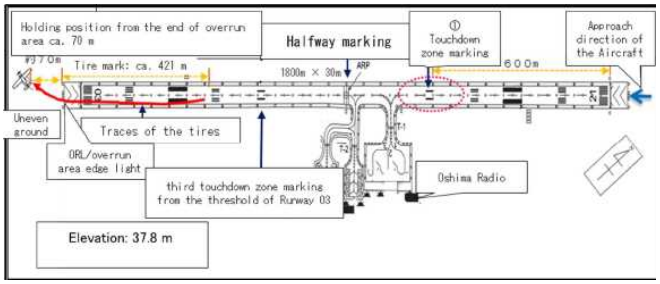
Aircraft serious incident investigation reports published in 2020

1	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	January 30, 2020	July 8, 2018 About 15 nm North of Toyama Airport at an Altitude of About 9,600 ft	CHINA AIRLINES	B18667 Boeing 737-800 (Large aeroplane)
	Summary	The aircraft, as a scheduled flight 170, changed the destination to Chubu Centrair International Airport, because the aircraft performed approaching to Toyama airport three times, but it could not land at the airport due to wind. The aircraft declared an emergency due to insufficient remaining fuel quantity while flying to Chubu Centrair International Airport and landed at the airport at 13:10. 		
	Probable Causes	It is highly probable that the serious incident was caused by the landing conducted in the situation that the remaining fuel quantity was close to FINAL RESERVE after emergency communications. It is likely that consuming a fairy quantity of the reserve fuel when attempting to land at the destination airport multiple times contributed to the remaining fuel quantity at landing, which was close to FINAL RESERVE. Besides, it is highly probable that the aircraft was not in shortage		

		of fuel since the remaining fuel quantity at the time of landing was not below FINAL RESERVE.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/B18667.pdf		
2	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	June 25, 2020	March 29, 2019 At About 3,600 m altitude over About 90 km Southwest of Kansai International Airport	Jetstar Airways Pty Ltd.	VHVKJ Boeing 787-8 (Large aeroplane)
	Summary	The aircraft, as a scheduled flight JQ15, departing Cairns Airport for flight to Kansai International Airport, had the left engine temporarily fall below idle during the descent at an altitude of about 4,900 m, followed by the right engine temporarily falling below idle as well. The aircraft then landed at Kansai International Airport. 		
	Probable Causes	In this serious incident, it is highly probable that, when the Aircraft was descending for landing, there occurred oscillation in rpm of each engine causing both engines to temporarily fall below idle at separate times because Residue primarily composed of magnesium salts accumulated in spools impeded movement of spools that involved in fuel metering of both engines. As for the higher accumulation of Residue primarily composed magnesium salts in spools, it is likely that the fuel with a higher concentration ratio of biocide, which was loaded in the biocide treatment two days before the serious incident, did not mixed evenly with the remaining fuel in wing tanks, and was fed to the engines.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/VHVKJ.pdf		
3	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	July 30, 2020	April 11, 2018 About 3.5 nm Northeast of Tokyo International Airport at altitude of 300ft.	Thai Airways International Public Co., Ltd.	HS-TGX Boeing 747-400 (Large aeroplane)
	Summary	The aircraft, as a scheduled flight 660 for Tokyo International Airport, executed a go-around as an emergency operation to avoid crash into the ground in approach to Runway 16L. The aircraft thereafter requested an approach to land on Runway 22 and landed on Runway 22 around 00:04 on the following day. There were 384 persons onboard, consisting of the PIC, 18 flight crew members and 365 passengers. No one was injured and there was no damage to the Aircraft. 		
	Probable Causes	In this serious incident, it is probable that the Aircraft maneuvered an emergency operation to avoid crash into the ground because it came close to the ground surface in approach to Runway 16L at Tokyo International Airport. It is probable that coming close to the ground was caused by the PIC's concentration on modifying the lateral flight path continuing descent without paying an appropriate attention to the descent path, and by the FO's unawareness of the too low descent path due to his concentration on monitoring the lateral path course.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/HS-TGX.pdf https://www.mlit.go.jp/jtsb/aircraft/p-pdf/AI2020-3-1-p.pdf (Explanatory Material (Japanese only))		
	Reference	Case Studies (page 60)		
4	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	July 30, 2020	May 24, 2018 At Altitude of About 7,500 ft About 6 km Southwest of Kumamoto	Japan Airlines Co., Ltd.	JA8980 Boeing 767-300 (Large aeroplane)

		Airport		
	Summary	The aircraft had noise accompanied by vibration as well as reduced rpm of No. 1 engine (left side) indicated on instrument panel during the climb after the take-off from Kumamoto Airport. The Aircraft therefore set engine thrust idle and returned to the Airport for landing after air traffic control priority was granted. The post-flight inspection revealed that high-pressure and low-pressure turbines of the engine were damaged in several stages and a hole was generated in the engine casing. Besides, fragments of inner parts exhausted from the engine damaged windows and roofs of buildings and windshield of vehicles on the ground. 		
	Probable Causes	It is highly probable that this serious incident was caused by the fractured blade #13 on HPT (high pressure turbine) stage 2 of No. 1 engine (left side), when the Aircraft was climbing, that damaged blades and stator vanes of aft stages, fragments of which collided with LPT (low pressure turbine) casing and generated a hole (crack). It is highly probable that the fractured blade #13 was caused by cracks that were generated on TA (Turning Around (branching and turning around of cooling air flowing inside blades)) area and progressed thereafter. It is likely that cracks generated on TA area were caused by hot corrosion swelling (blister) generated on the coating layer of the blades and low-cycle fatigue initiating from the cracks.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA8980.pdf https://www.mlit.go.jp/jtsb/aircraft/p-pdf/AI2020-3-2-p.pdf (Explanatory Material (Japanese only))		
	Reference	Case Studies (page 61)		
5	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	August 27, 2020	July 16, 2019 Komatsu City, Ishikawa Prefecture	Nakanihon Air Service Co., Ltd.	JA9478 Fuji-Bell 204B-2 (Rotorcraft)
	Summary	During flight above a mountain forest in Ikenojo-machi, Komatsu City, Ishikawa Prefecture, a container bag covering the material suspended from the rotorcraft dropped. There was no damage to people or property on the land. 		
	Probable Causes	It is highly probable that this serious incident occurred as follows: The rotorcraft was flying while suspending material (steel tower components) from it. As it accelerated and wind pressure increased, air entered the container, inflating it and allowing both the bag and a length of annealed wire to separate from the steel tower component and fall to the mountain forest. It is probable that the container bag and annealed wire dropped from the iron tower component was due to inadequate drop prevention measures that did not take into consideration wind pressure increases from acceleration.		
	Report	https://www.mlit.go.jp/jtsb/aircraft/rep-inci/AI2020-4-1-JA9478.pdf (Japanese only)		
6	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	October 1, 2020	October 30, 2019 Over Ohnan-cho, Ohchi-gun, Shimane Prefecture, FL260	IBEX Airlines Co., Ltd.	JA11RJ Bombardier CL-600-2C10 (Large aeroplane)

	Summary	The aircraft took off from Sendai Airport as a scheduled flight 16 of the operator, and was flying at FL 340 to Fukuoka Airport, but the Pilot in Command found something like cracks in a cockpit windshield on his side. 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 10,000 ft. In an emergency descent, the oxygen masks in the cabin were automatically deployed. The aircraft kept on flying and then landed at Fukuoka Airport.
	Probable Causes	It is highly probable that this serious incident occurred because an arcing occurred in the left windshield while the aircraft was flying at FL 340, and the PIC performed the operation to raise the cabin altitude in accordance with the check list, resulting in abnormal decompression inside the aircraft. It is also highly probable that the abnormal decompression inside the aircraft occurred because irrespective of the flight altitude, the procedure in the check list would require the pilot to perform the set to climb the cabin altitude at the maximum climb rate without any exception. 
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA11RJ.pdf

7	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	October 29, 2020	May 4, 2019 Oshima Airport	Privately owned	JA121C Piper PA-46-350P (Small aeroplane)
	Summary	The aircraft took off from Yao Airport to make a leisure flight. When landing on Runway 21 at Oshima Airport, it overran the runway and was disable to perform taxiing. A total of five persons on board the aircraft, including a captain and other four passengers, and there were no injuries. 
	Probable Causes	In this serious incident, it is highly probable that because the Aircraft touched down in a tail wind at an excess speed at the point beyond the halfway marking on the runway when landing at Oshima Airport, it overran the runway and was disable to perform taxiing with its gears damaged.
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA121C.pdf

8	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	November 26, 2020	June 1, 2019 At FL 430 About 280 nm Northeast of Narita International Airport	All Nippon Airways Co., Ltd.	JA828A Boeing 787-8 (Large aeroplane)
	Summary	The aircraft took off from San Jose International Airport, USA bound for Narita International Airport. When it was flying over at FL 430 over the Pacific Ocean about 280 nm northeast of Narita International Airport, both of the two air conditioning systems became inoperative.		
	Probable Causes	In this serious incident, it is highly probable that both of the two air conditioning systems shut down at the same time because the Left air conditioning system was unable to restart and the normally having been working Right air conditioning system also shut down during the reset of air conditioning systems of the Aircraft after the Left air conditioning system shut down. It is highly probable that the Left air conditioning system was unable to restart and the normally having been working Right air conditioning system also shut down because the reset of air conditioning systems was performed at high altitude and under environmental conditions where the CACs tend to more sensitive to surge.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA828A.pdf		

7 Actions taken in response to recommendations in 2020 (aircraft accidents and serious incidents)

A summary of the actions taken in response to recommendations in 2020 is hhh.

(1) Aircraft accident involving Eurocopter AS350B3, operated by Excel Air Service Inc.
(Safety recommendations on February 27, 2020)

See "Chapter 2. Summary of recommendations and opinions issued in 2020 (one recommendation) (page 25 (3))."

(2) Aircraft accident involving Aerospatiale AS332L, operated by Toho Air Service Co., Ltd.
(Safety recommendations on April 23, 2020)

See "Chapter 2. Summary of recommendations and opinions issued in 2020 (one recommendation) (page 28 (5))."

8 Provision of factual information in 2020 (aircraft accidents and serious incidents)

The JTSB provided information for one case in 2020. Its contents are follows:

(1) Information provided by the JTSB on an aircraft serious incident that occurred in December 4 involving a Japan Airlines Boeing 777
(Information provided on December 28, 2020)

Summary of the aircraft serious incident

At around 11:51 on December 4 (Friday), during its ascent about 100 km north of Naha Airport (the airport of departure) and at an altitude of about 5,000 m, a Japan Airlines Boeing 777 aircraft Flight No. 904 bound for Tokyo International Airport experienced a left engine malfunction necessitating its return to Naha Airport. An inspection to the aircraft after its return to the airport, revealed engine damage.

Provided information

JTSB's investigation conducted so far revealed the following facts (see the Appendix below):

・Fan blades of the left engine were damaged.

・Damaged sections of the fan blades and damage to the aircraft are shown in the Appendix below.

The JTSB will investigate the causes of the damage in detail.

Appendix

Each engine has 22 fan blades (made of titanium alloy). Blades Nos. 15 and 16 were damaged from the middle and base sections respectively. While a beach mark and a radial mark characteristic of fatigue fracture were observed on the fracture surface of blade No. 16, no such mark was observed on blade No. 15.

The engine type of the aircraft is PW4074 manufactured by Pratt & Whitney. The total operating hours of the fan blades of the left engine were 43,060 hours, and the total flight times of the aircraft were 33,518.

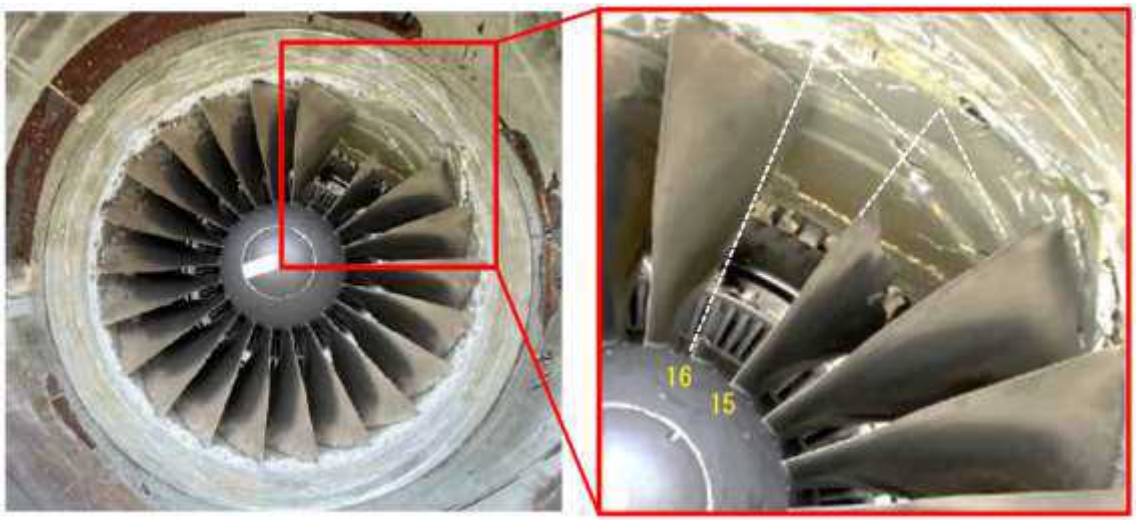


Figure 1. Left engine inlet

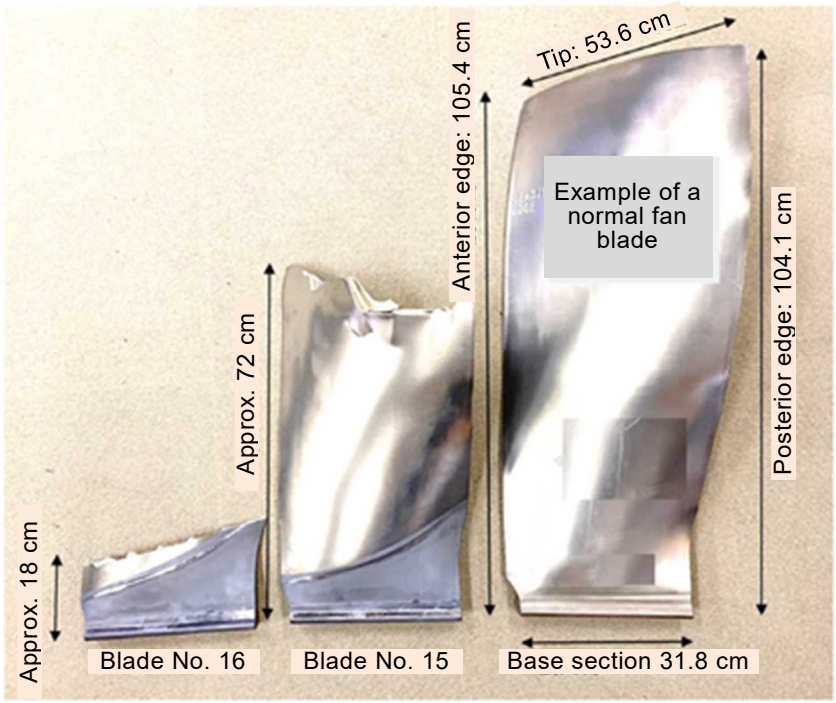


Figure 2. Damaged fan blade

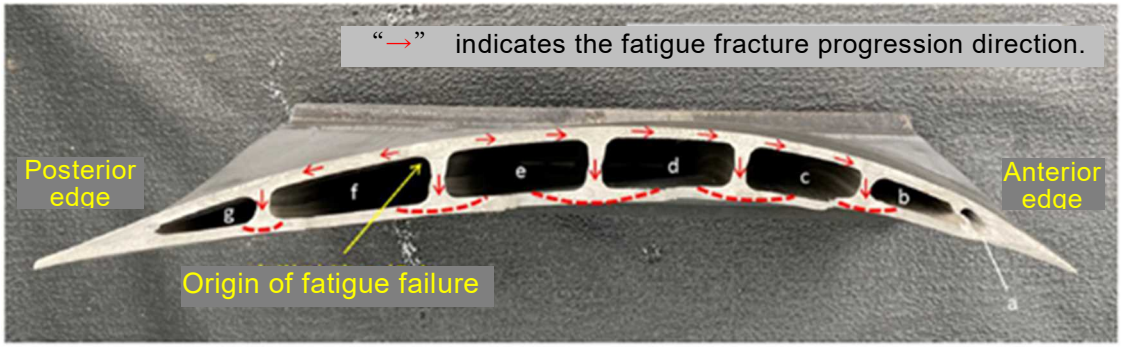


Figure 3. Fractured surface of blade No. 16

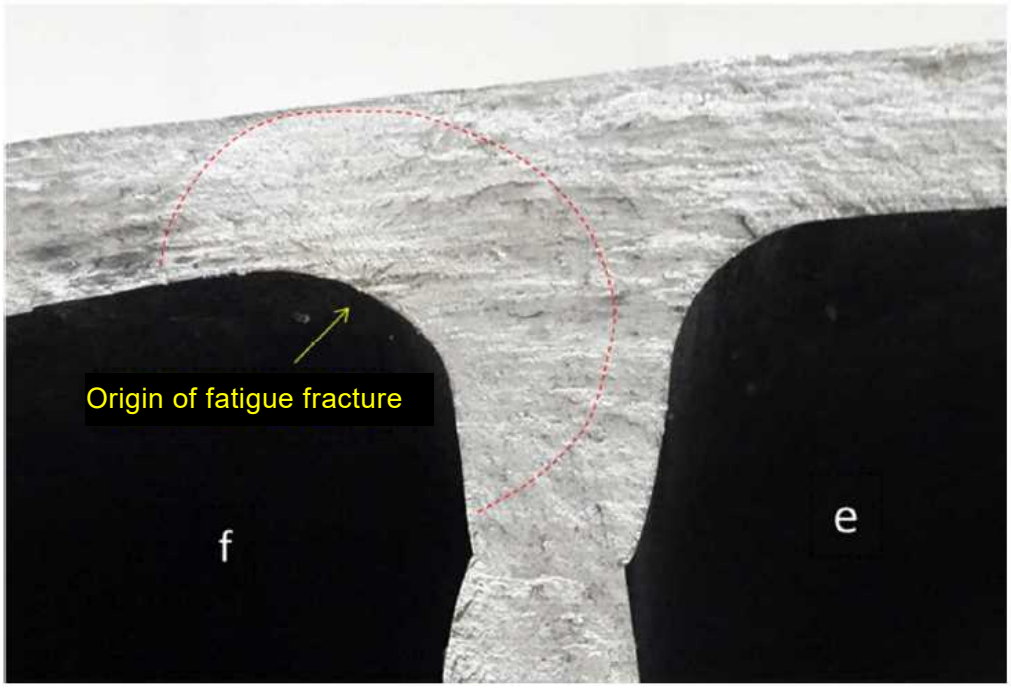


Figure 4. Closeup photo of the fracture surface of blade No. 16

In addition to the damage to the fan blades, damage to the aircraft body (engine cowl, horizontal stabilizer and fuselage) was found.

Figure 5. Damaged engine cowl

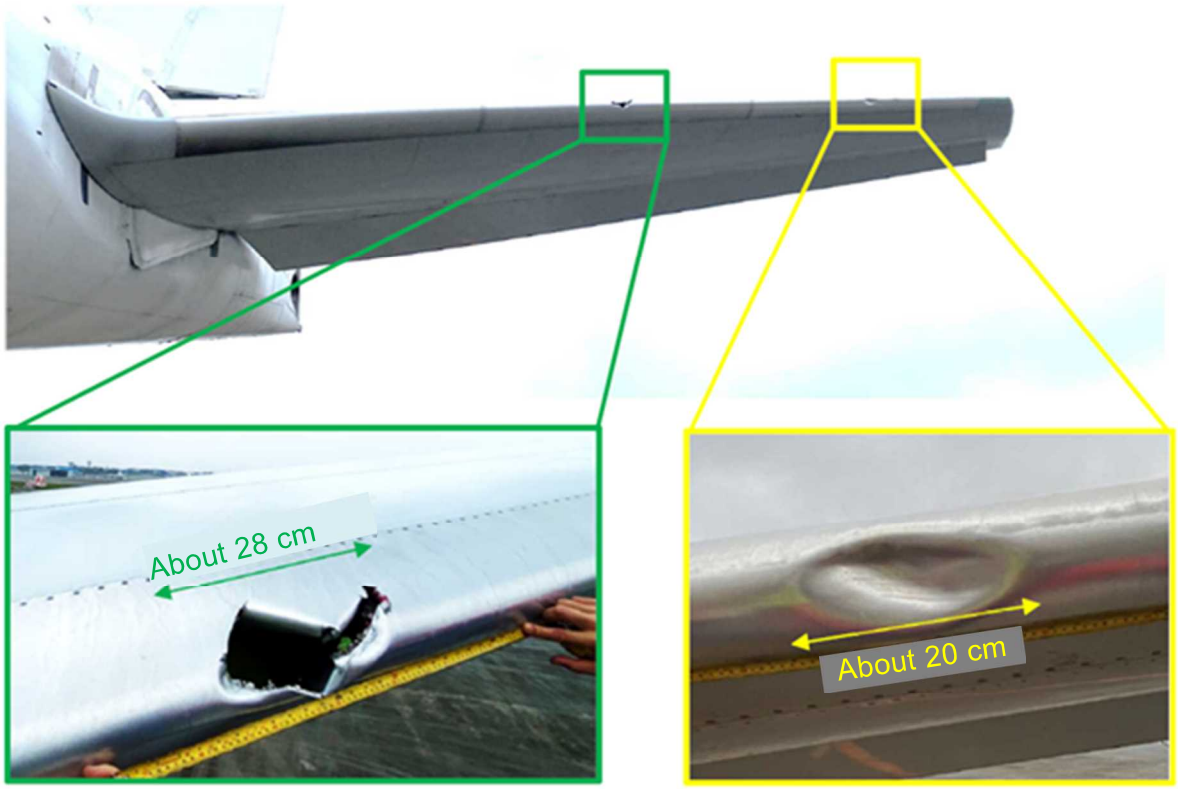


Figure 6. Damaged horizontal stabilizer

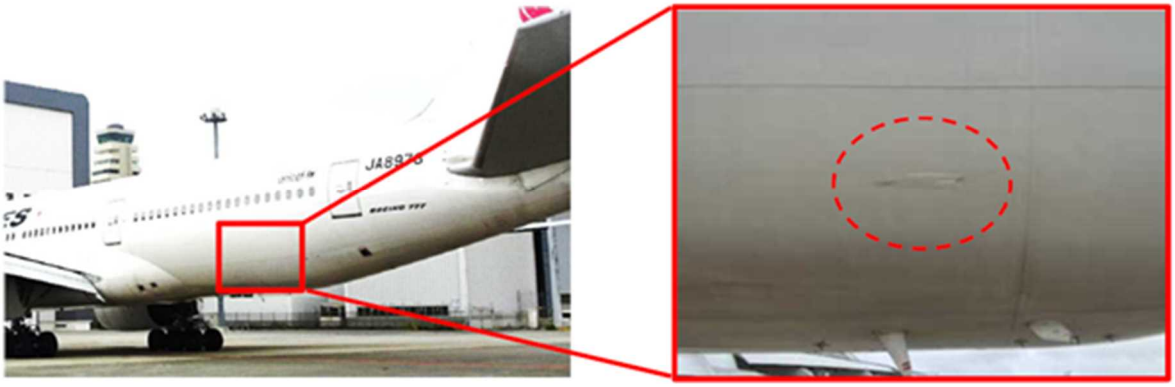


Figure 7. Damaged fuselage

* Related information provided by the JTSB is available at its website:
https://www.mlit.go.jp/jtsb/iken-teikyo/JA897820201204.pdf (Japanese only)

Column

A training course participated by accident investigators at an overseas institution

Aircraft Accident Investigator

Do you know what “blue lights” mean? I don’t mean the harmful blue light emitted from a smartphone screen. This is one of words that bewildered me during my visit to the UK to receive participate in a training course.

In this column, I will introduce you to a short-term course at Cranfield University to which the JTSB dispatched an aircraft accident investigator and a marine accident investigator in 2020.

1 Regarding Cranfield University

Cranfield University has an airfield in the premises, which are located about 70 km northwest of London.

The university’s training course in which we participated for six weeks starting in February 2020 is a world-famous aircraft accident investigation course that began in 1977.

This course hosted 23 persons from 9 countries, consisting of national accident investigators like us, members of the military, commercial airline captains, aircraft/engine manufacture engineers and graduate students. All had very different careers and experiences.

2 Regarding the training course

The course provided lectures regarding not only “investigation methods” and “analysis methods” but also subjects such as accident pathology, communication with victims and their families, and relationships with regulatory authorities and interested parties, many of which I had been barely conscious of as an accident investigator.

To prevent accidents and serious incidents or mitigate their damage, the Japan Transport Safety Board is dispatching their staff members to schools and other institutions as “deliveries of lectures,” but I was surprised at the fact that this university has this kind of training even though it is not a professional accident investigation organization capable of investigating accidents on its own. What I learned in this course was that there many types of research that only universities can do. This university in particular is utilizing human connections accumulated over the years to invite instructors with expertise in the latest accident investigation methods and tools and reflected in lectures what has obtained by studying problems along with the lessons learned from wide-ranging accident investigation results.

3 Simulated one-week aircraft accident investigation

The main event of this course is a week-long simulated accident investigation using the skills learned in the course.

In this practical training, a simulated aircraft accident site is set up on the university’s airfield. The aircraft wreckage and scattered pieces arranged on the site were collected from an actual accident site and used by instructors to reproduce the scene whenever the exercise is held. In this simulation, every component of the site is a target to be analyzed toward the identification of the accident cause, including

positioning and facing direction of each piece of wreckage, the relationship of broken pieces with the ground, baggage, tools, etc. left inside the aircraft wreckage, scratch marks and bloodstains. We felt the passion of the trainers trying to precisely reproduce the actual accident site to enhance the effectiveness of the practical training. We were impressed when an instructor said, “After each practical training, we clean the dirt from each piece to prevent corrosion and deterioration and then store them next time.”

In this practical training, I joined a team consisting of members from the UK, Australia, Saudi Arabia, Chili, Hong Kong and Japan.

The team’s investigation is not limited to onsite investigation training, but also includes requesting accident-related documents and materials, their detailed check and accident investigation planning. In the process, I encountered the term “coordination with ‘blue lights” that I mentioned at the top. Blue lights refer to organizations such as firefighting and law enforcement organizations that are dispatched at times of emergency. According to the instructors the origin of the term comes from flashing blue lights used on emergency vehicles in Western countries.

The practical training included processes of eyewitness interviews, work with local media (informal and formal interviews) in conjunction with site investigations and data analyses. Finally, the team compiled a report and made a presentation.

In the process of investigating accident factors, we used the sticky note analysis method. In Japan, we usually use sticky notes with a whiteboard. But in England, they stick them to windows and doors. I found this a novel idea.

For this course, an accident investigation that would normally take a long time is concentrated into just one week, so we had more opportunities for information sharing using SNS and discussions among the team members in our campus hotel rooms. Although our nationalities and ages were varied, our exchanges deepened, sometimes while drinking beer together.

4 After the training course

Fortunately, the training course was completed before the COVID-19 pandemic started, and thus proceeded successfully. Although I have explained the course as if I understood all of its contents, but in fact I participated while battling a language barrier. However, since I have seen, learned and experienced too many things to describe in this column, I will utilize them in our future accident investigations.

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

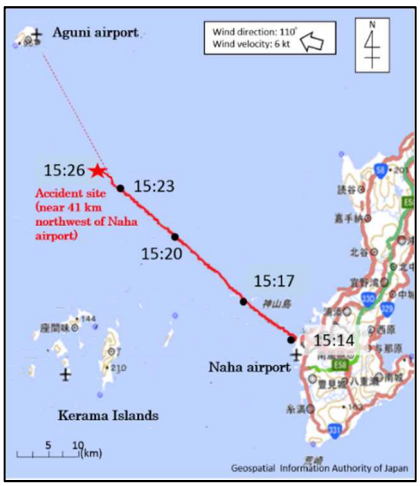
DAMAGE TO AIRFRAME IN DITCHING
EXCEL AIR SERVICE INC., EUROCOPTER AS350B3 (ROTORCRAFT), JA350D

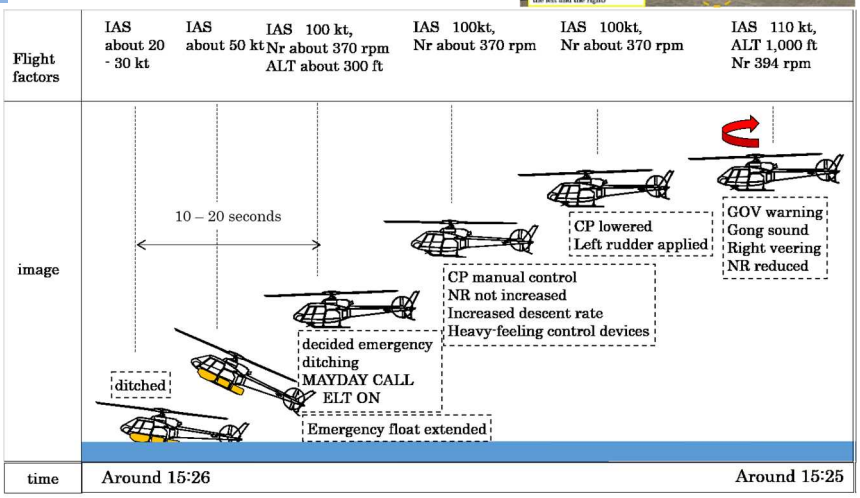
Summary: On Thursday, June 7, 2018, a Eurocopter AS350B3, registered JA350D, operated by Excel Air Service Inc., ditched near 41 km northwest of Naha airport while flying for Aguni airport after take-off from Naha airport, and sank in the sea. The pilot was seriously injured.

JA350D parking on the ground (right)

Findings

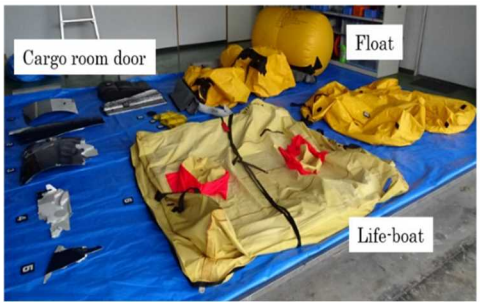
History of the flight





Estimated flight route (Upper left)
From GOV warning activation to ditching of JA350D (Upper right)
Floating wreckage gathered (Right)

※ "GOV (governor)" denotes a sensing device that senses the rpm of main rotor and engine and automatically controls fuel flow in order to keep main rotor rpm constant



Analysis

○ It is likely that, during the flight, a GOV warning went off, the nose of the helicopter veered rightward, the rpm of the main rotor decreased and the output of the engine dropped.

○ The engine's failure to recover from its low output state was likely due to the manual throttle control (for increasing output) failed, or because adequate fuel flow could not be achieved. In the end, the helicopter subsequently sank into the water and therefore further physical investigations into the causes of the malfunction were not possible.

○ To maintain the rpm of the main rotor, it was necessary for the pilot to check flight parameters (e.g., speed and altitude) and control the helicopter accordingly. In this case, it is likely that if the pilot had maintained the main rotor rpm by reducing air speed and thereby decreasing the descent rate, he has had adequate time to take emergency action.

○ It is highly probable that the captain elected to attempt an emergency water landing and therefore performed emergency operations, (i.e., sending out a mayday call and readying his emergency floatation equipment) but failed to decelerate in time and ditched the helicopter into the sea at an excessive descent rate, resulting in damage to the emergency floatation equipment and subsequent sinking of the helicopter.

In the water, the captain managed to unbuckle his shoulder harness and seat belt and exit the aircraft but was unable to retrieve his life jacket from under the right pilot seat (according to the captain's post-accident testimony).

Probable Causes: In this accident, it is probable that NR of the main rotor was reduced during the flight and flight altitude became unable to maintain, which led to ditching at the excessive speed and descent rate and caused damage to the airframe, followed by sinking. It is somewhat likely that the reduced NR of the main rotor was caused by some kind of malfunction occurring with engine system; however, it could not be determined in which section of the engine malfunction occurred and what caused it.

For details, please refer to the accident investigation report. (Published on February 27, 2020)
https://www.mlit.go.jp/jtsb/eng-air_report/JA350D.pdf

The Japan Transport Safety Board has stated recommendations to the Ministry of Land, Infrastructure, Transport and Tourism. For details, please refer to "Chapter 2: Summary of recommendations and opinions issued in 2020 (page 25)

CRASH INTO MOUNTAIN SLOPE
GUNMA PREFECTURALDISASTER PREVENTION AVIATION UNIT, BELL 412EP (ROTORCRAFT), JA200G

Summary: On Friday, August 10, 2018, a Bell 412EP, registered JA200G, operated by Gunma Prefectural Disaster Prevention Aviation Unit, took off from Gunma heliport in Shimoauchi-machi, Maebashi City, Gunma Prefecture to explore and identify dangerous spots in preparation for rescue activities on the trails on the ridge lines of Gunma Prefectural border and crashed into the mountain slope in the vicinity of about 2 km northeast of Mt. Yokote in Nakanojo Town, Agatsuma County, Gunma Prefecture. There were nine persons in total on board, consisting of a captain, a mechanic A in charge, a chief air rescuer, an air rescuer and five firefighters, and all of them were killed. The helicopter was destroyed, however, there was no outbreak of fire.

Findings

History of the flight

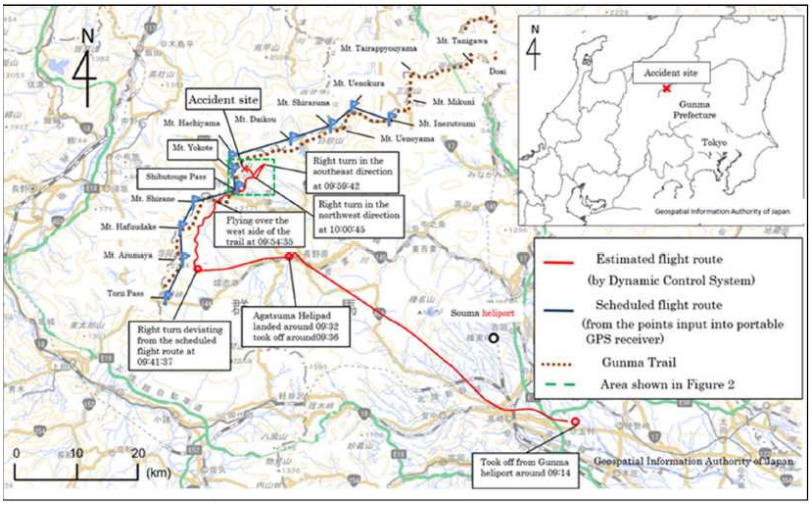
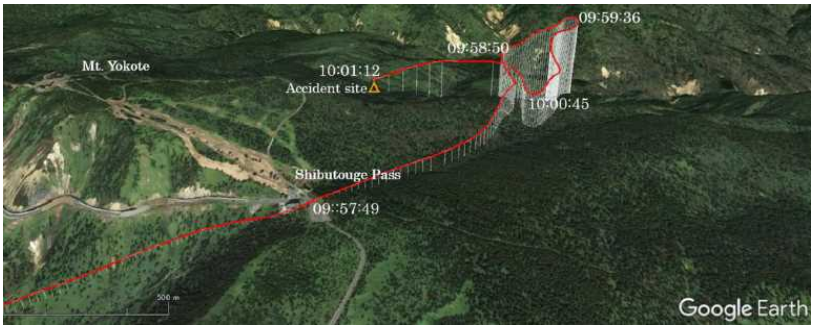


Photo taken at 10:01:07, five seconds before the crash landing
(Flight controller mode change was attempted.)



Estimated flight route of the Helicopter

Photo taken at 10:01:09, three seconds before the crash landing (descending past the cloud)

Analysis

○ It is probable that the helicopter was heading toward mountain path Shibutoge, but due to poor forward horizontal visibility, the pilot adjusted his route toward northwest. However, he still could not maintain VMC (Visual Meteorological Condition).
○ It is highly probable that, during the northwestern flight, the craft accelerated, made turns and descended beneath the clouds. The captain attempted a recovery operation, but by then the altitude was too low to recover and the helicopter crash-landed.
○ It is probable that, after the linear and angular accelerations and turns of the helicopter, the captain lapsed into spatial disorientation.

Probable Causes: In this accident, it is probable that, while flying over mountainous areas for exploration of mountain climbing trail, the Helicopter entered the cloudy airspace and was unable to continuously recognize the ground surface due to lowered visibility, and the captain who was exposed to spatial disorientation could not perform an appropriate maneuvering to maintain the attitude of the Helicopter that subsequently crashed into the slope of the mountain. It is probable that losing continuous visual recognition of the ground surface in the lowered visibility were caused by delayed decision to return and continuing flight in the situation that it was getting difficult to maintain VMC.

Safety Actions Taken by Fire and Disaster Management Agency after the accident: Fire and Disaster Management Agency defined basic items in relation to flight operations of fire and disaster prevention helicopters, and defined “Standard for flight operations of fire and disaster prevention helicopters” (Fire and Disaster Management Agency notice No. 4 on September 24, 2019) with the aim to contribute to safe and smooth implementations of aviation fire prevention activities.

For details, please refer to the accident investigation report. (Published on March 27, 2020)
https://www.mlit.go.jp/jtsb/eng-air_report/JA200G.pdf

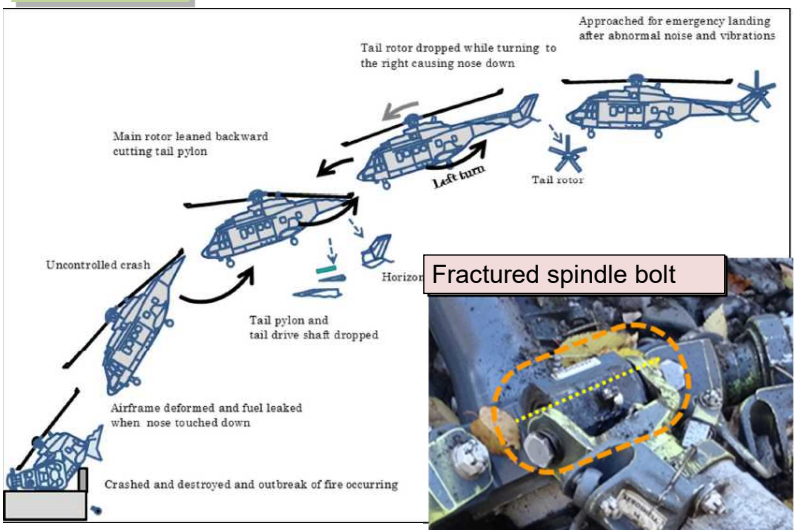
The Japan Transport Safety Board has stated recommendations to the Ministry of Land, Infrastructure, Transport and Tourism.
For details, please refer to “Chapter 2: Summary of recommendations and opinions issued in 2020 (page 27)

UNCONTROLLED CRASH
AEROSPATIALE AS332L (ROTORCRAFT), JA9672

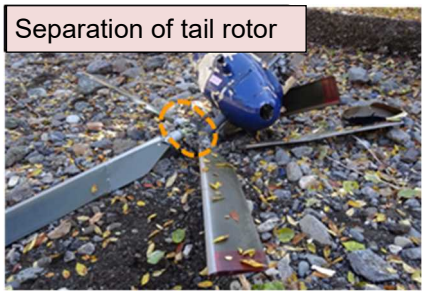
Summary: While an Aerospatiale AS332L, registered JA9672, operated by Toho Air Service Co., Ltd., was flying to Tochigi heliport for ferry flight, the tail rotor was separated from the airframe over Ueno-mura, Tano County, Gunma Prefecture, and the aircraft became uncontrollable and crashed around 14:29 JST on November 8, 2017. Four crew members, consisting of a captain, a mechanic in charge and two mechanics were on board, and all of them were killed. The aircraft was destroyed and there occurred the outbreak of fire.

Findings

Flight situation before the crash and damaged parts



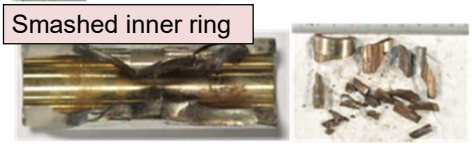
Separation of tail rotor



Fractured spindle bolt

Fractured spindle bolt

Smashed inner ring



Analysis

○ According to the results of a 10-hour inspection and 50-hour inspection carried out from July to August, 2017, it is likely that the inner rings progressively deteriorated and the flapping hinge of the white blade had frozen.
○ It is highly probable that the fracture of the spindle bolt was caused by a frozen component inside the outer ring, which accelerated the cracking of the inner ring and exerted a twisting load to the spindle bolt.
○ It is probable that the spindle bolt fracture caused an imbalance of the rotational plane of the tail rotor and its subsequent separation.

○ During maintenance work from September 20 to 23, 2017, the certifying mechanic found inner rings in a fractured state. The certifying mechanic elected to replace the defective inner rings and washers only. However, after finding defects such as these, it is probable that he should have reported them to the maintenance and management department for technical review.
○ To prevent similar malfunctions in this type of helicopter, it is probable that the maintenance and management department of Toho Air Service Co., Ltd., should have proactively made a detailed inspection of the fractured inner rings and reported all defects to their designer and manufacturer of the aircraft. Moreover, they also failed to share important information regarding the lubricants with the site mechanics.

Probable Causes: In this accident, it is highly probable that, when the Helicopter attempted an emergency landing due to abnormal vibrations occurring in the airframe in flight, the tail rotor was separated leading to loss of control and subsequent crash. It is highly probable that the separation of the tail rotor from the airframe was caused by imbalanced rotation of the tail rotor due to the fracture of the spindle bolt of the flapping hinge of the White Blade, which generated excessive vibrations and damaged the section attached to the tail rotor.
It is highly probable that the fractured spindle bolt was caused by damaged and stuck bearings of the flapping hinge. Besides, it is highly probable that this resulted from the fact that the damaged condition of the bearings was not grasped in inspections and maintenance work performed on the Helicopter and the appropriate measures were not taken.

For details, please refer to the accident investigation report. (Published on April 23, 2020)
https://www.mlit.go.jp/jtsb/eng-air_report/JA9672.pdf

The Japan Transport Safety Board has stated recommendations to the party relevant to the cause of the accident. For details, please refer to “Chapter 2: Summary of recommendations and opinions issued in 2020 (page 28)

EMERGENCY OPERATION TO AVOID CRASH INTO THE GROUND
THAI AIRWAYS INTERNATIONAL PUBLIC CO., LTD. BOEING 747-400, HS-TGX

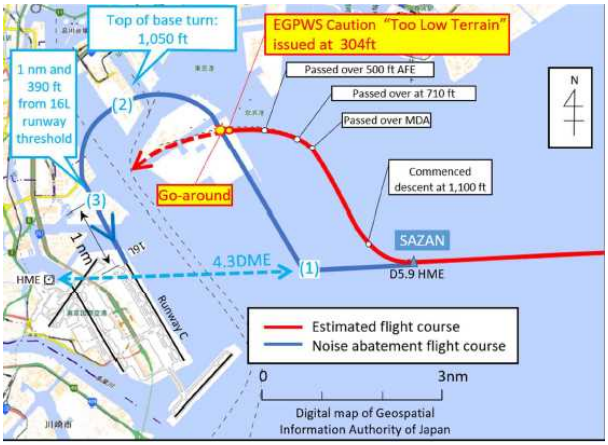
Summary: On April 11, 2018, around 23:52 JST, a Boeing 747-400, registered HS-TGX, operated by Thai Airways International Public Co., ltd. as a scheduled flight 660 for Tokyo International Airport, executed a go-around as an emergency operation to avoid crash into the ground in approach to Runway 16L. The aircraft thereafter requested an approach to land on Runway 22 and landed on Runway 22 around 00:04 on the following day. There were 384 persons onboard, consisting of the PIC, 18 flight crew members and 365 passengers. No one was injured and there was no damage to the Aircraft.

Findings

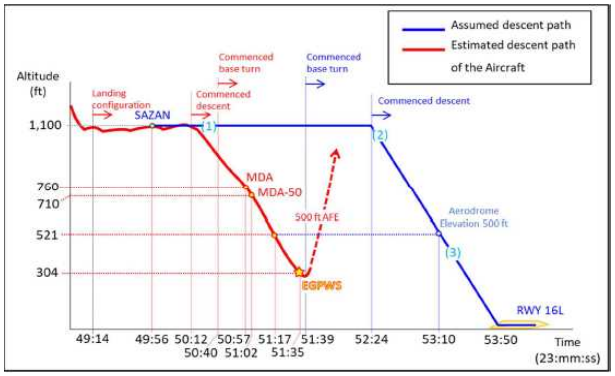
Captain's testimony (excerpt)

PIC: Approach briefing in anticipation of landing on Runway 22
→ATIS information "B" obtained
→Following tower instructions to use Runway 16L (hereinafter referred to as "16L") and VOR-A approach, the pilot instructed the co-pilot to reset the Flight Management System (FMS) and made once more called in a briefing on approach to UMUKI.
→The PIC monitored the outside of the aircraft to visually locate the runway while the FO monitored flight instruments.
→After passing SAZAN, the pilot visually confirmed Runway 16L and kept a constant visual confirmation of it from the downwind leg.
→The PIC was not able to visually confirm the approach guidance lights to the right front direction ((1) in the right figures) but visually confirmed the landmark beacon in the left front direction ((2) in the right figures).
→The PIC started a descent in VS mode so that the aircraft's altitude would be 300 ft at the final leg 1NM of 16L.
→In order to visually locate the approach guidance lights (1), the PIC instructed the FO to monitor the outside.
→Because the PIC found that the aircraft was deviating from the noise abatement flight course (hereinafter referred to as the "flight course") so he corrected left to enter the course.
→After passing an altitude of 500 ft, the PIC kept a constant visual confirmation of the runway and continued the approach.
→Tokyo Tower advised the PIC, "Your altitude is too low, confirm that you have 16L insight," but the PIC could not visually recognize the approach light beacon and also lost sight of 16L.
→When the pilot answered "Negative", EGPWS warnings "TERRAIN!" went off, so he judged that the aircraft's approach was too low and executed a go-around to avoid collision with the ground.

Estimated flight course of the aircraft



Assumed descent path and estimated descent path of the aircraft



Supplementary note: Landing at 16L via VOR-A approach is very rare—accounting for about 0.04% of the total number of landings in FY2018. Both the PIC and FO never attempted this approach at that time. Neither one had any simulator training for it. An "assumed descent route" means a descending flight route on the assumption of "after flying horizontally along the noise abatement flight course, descending at a normal descent of 3° and then landing on Runway 16L."

Analysis

It is likely that the PIC and FO did not know that Runway 16L was the preferred approach at the time of the arrival.

Turn

Immediately after passing SAZAN, the aircraft began a right turn, but it is likely that the PIC did not confirm the positional relation of the aircraft by DME display, etc.

It is highly probable that the downwind leg width was widened. The PIC noticed that the aircraft was flying outside the flight course, so he began a left turn as the base turn in attempt to fly inside the flight course.

Descent

The PIC began the final descent for landing at a 4.6 nautical miles (NMs) linear distance from 1 NM point before 16L. It is likely that he attempted the final descent by his guess without a clear descent plan.

The PIC concentrated his attention on keeping the aircraft inside the flight course on the final leg, so he continued the descent while failing to pay adequate attention to the descent route.

It is probable that the captain concentrated on correcting lateral flight path until otherwise advised by the Tokyo Tower and temporarily became less attentive to visual recognition of 16L.

The FO was concentrating on monitoring the lateral flight path, so he was not aware that descent path was too low.

Probable Causes: In this serious incident, it is probable that the Aircraft maneuvered an emergency operation to avoid crash into the ground because it came close to the ground surface in approach to Runway 16L at Tokyo International Airport. It is probable that coming close to the ground was caused by the PIC's concentration on modifying the lateral flight path continuing descent without paying an appropriate attention to the descent path, and by the FO's unawareness of the too low descent path due to his concentration on monitoring the lateral path course.

For details, please refer to the accident investigation report. (Published on July 20, 2020)
https://www.mlit.go.jp/jtsb/eng-air_report/HS-TGX.pdf

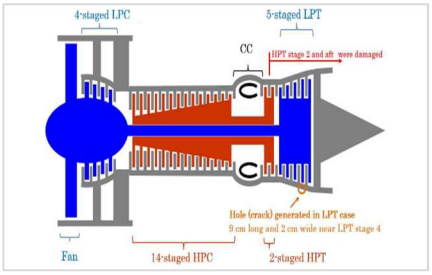
THE CASE EQUIVALENT TO DAMAGE TO ENGINE (LIMITED TO SUCH A CASE WHERE FRAGMENTS PENETRATED THE CASING OF SUBJECT ENGINE)

JAPAN AIRLINES CO., LTD. BOEING 767-300, JA8980

Summary: On Thursday, May 24, 2018, a Boeing 767-300, registered JA8980, operated by Japan Airlines Co., Ltd. had noise accompanied by vibration as well as reduced rpm of No. 1 engine (left side) indicated on instrument panel during the climb after the take-off from Kumamoto Airport. The Aircraft therefore set engine thrust idle and returned to the Airport for landing after air traffic control priority was granted. The post-flight inspection revealed that high-pressure and low-pressure turbines of the engine were damaged in several stages and a hole was generated in the engine casing. Besides, fragments of inner parts exhausted from the engine damaged windows and roofs of buildings and windshield of vehicles on the ground.

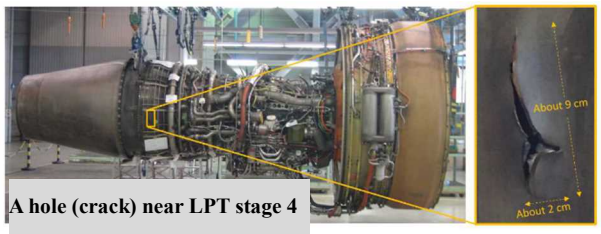
Findings **Damages**

Engine composition and damaged sections (right)



Engine damage

- The 2nd and subsequent stages of No. 1 engine high-pressure turbine (HPT) were damaged (four blades, namely blades Nos. 13, 12, 11 and 10 of the HPT stage 2 were damaged and their remaining portions less so in this order; the fracture surface of blade No. 13 had a trace of low-cycle fatigue originating from the TA section).
- LPT casing: A hole (crack) was observed near the LPT stage 4



A hole (crack) near LPT stage 4

Damaged sections originating from the 2nd stage blade (left) and No. 13 blade (right) of the HPT

Analysis

It is highly probable that No.1 engine damage originated from a No. 13 blade (P03) fracture.

It is highly probable that No. 13 blade fractured because a crack generated on the coating layer of the TA section* progressed to its base material.

- It is likely that blade No. 13 fractured due to a low-cycle fatigue originating from the coating layer damage (swelling and cracking due to high-temperature corrosion).

* TA section: section where cooling air flowing inside the blade branches or turns back

It is highly probable that reasons why the coating layer crack progressed to the base material are as follows:

- A possibility of the impact of increased operating cycles

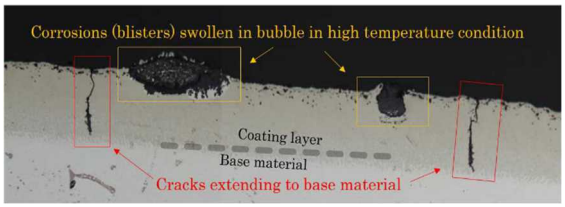
⇒ Coating quality deterioration, base material cracking and its progress

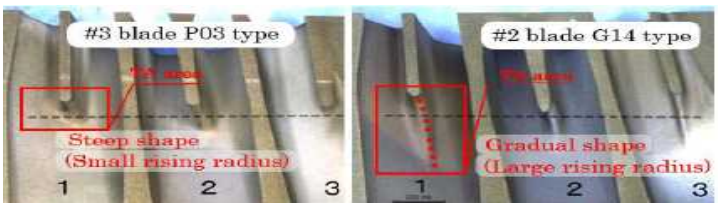
- It is likely that the steep rising shape of the cooling air passage bulkhead became a contributing factor.

⇒Stress concentration on the section, cracking the base material

- It is likely that the large thickness of the coating layer became a contributing factor.

⇒A thick coating layer is prone to cracking.





The cross section of the coating layer near the fracture origin (above) and the shape of P03-type TA section (right)

Probable Causes: It is highly probable that this serious incident was caused by the fractured blade #13 on HPT (high pressure turbine) stage 2 of No. 1 engine (left side), when the Aircraft was climbing, that damaged blades and stator vanes of aft stages, fragments of which collided with LPT (low pressure turbine) casing and generated a hole (crack). It is highly probable that the fractured blade #13 was caused by cracks that were generated on TA (Turning Around (branching and turning around of cooling air flowing inside blades)) area and progressed thereafter. It is likely that cracks generated on TA area were caused by hot corrosion swelling (blister) generated on the coating layer of the blades and low-cycle fatigue initiating from the cracks.

For details, please refer to the accident investigation report. (Published on July 30, 2020)
https://www.mlit.go.jp/jtsb/eng-air_report/JA8980.pdf

Chapter 4 Railway accident and serious incident investigations

1 Railway accidents and serious incidents to be investigated

< Railway accidents to be investigated >

◎Article 2 ,paragraph (3), 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 2 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 Article 2, paragraph (3) of the Act for Establishment of the Japan Transport Safety Board)

1 The accidents specified in Article 3, paragraph (1), items (i) through (iii) 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 Article 3, paragraph (1), items (iv) through (vi) 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 Article 3, paragraph (1), items (iv) through (vii) of the Ordinance which are found to be particularly rare and exceptional;

4 The accidents equivalent to those specified in Article 3, paragraph (1), items (i) through (vii) 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 (i) through (iii) 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 Article 3, paragraph (1), each items of the Ordinance on

Report on Railway Accidents, etc.

item (i): Train collision

item (ii): Train derailment

item (iii): Train fire

item (iv): Level crossing accident

item (v): Accident against road traffic

item (vi): Other accidents with casualties

item (vii): 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 Article 2, item (v) of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board)

1 From among the accidents specified in Article 1, paragraph (1), items (i) through (vi) 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 Article 1, paragraph (1), items (i) through (vii) 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 Article 3, paragraph (1) of the Ordinance on Tramway Operations, the accidents equivalent to those specified in Article 1, items (i) through (iii) of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board.

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

item (i): Vehicle collision

item (ii): Vehicle derailment

item (iii): Vehicle fire

item (iv): Level crossing accident

item (v): Accidents against road traffic

item (vi): Other accidents with casualties

item (vii): 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 2-1]</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 2-2]</td><td></td></tr>
<tr><td colspan="4">Accidents that are particularly rare and exceptional
[Ordinance 2-3]</td></tr>
<tr><td>Dedicated railway</td><td colspan="8">Accidents that are particularly rare and exceptional [Ordinance 2-4]</td></tr>
<tr><td rowspan="2">Tramway [Ordinance 2-5]</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 2-1]
However, accidents that are particularly rare and exceptional are to be investigated. [Ordinance 2-3]

*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 >

◎Article 2, paragraph (4), item (ii), 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 3 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 Article 2, paragraph (4), item (ii) of the Act for Establishment of the Japan Transport Safety Board)

【JTSB Website: https://www.mlit.go.jp/jtsb/example.pdf (See cases ①～⑩.) (Japanese only)】

1 The situation specified in Article 4, paragraph (1), item (i) of the Ordinance on Report 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." (case ①)]

2 The situation specified in Article 4, paragraph (1), item (ii) 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." (case ②)]

3 The situation specified in Article 4, paragraph (1), item (iii) 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." (case ③)]

4 The situation specified in Article 4, paragraph (1), item (vii) 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." (case ⑦)]

5 The situation specified in Article 4, paragraph (1), item (viii) 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 a vehicle: Referred to as "Dangerous trouble in vehicle." (case ⑧)]

6 The situation specified in Article 4, paragraph (1), items (i) through (x) of the Ordinance which is found to be particularly rare and exceptional; and
[These are referred to as: item (iv) “Main track overrun” (case ④); item (v) “Violating closure section for construction” (case ⑤); item (vi) “vehicle derailment” (case ⑥); item (ix) “Heavy leakage of dangerous object” (case ⑨); and item (x) “others,” (case ⑩)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 Article 3, item (vii) 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 Article 2, item (i) 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 Article 2, item (iv) 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 Article 2, item (v) 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 Article 2, items (i) through (vii) of the Ordinance which is found to be particularly rare and exceptional; and
[These are referred to as: item (ii) “Violating red signal;” item (iii) “Main track overrun;” item (vi) “Heavy leakage of dangerous object;” and item (vii) “others,” respectively.]

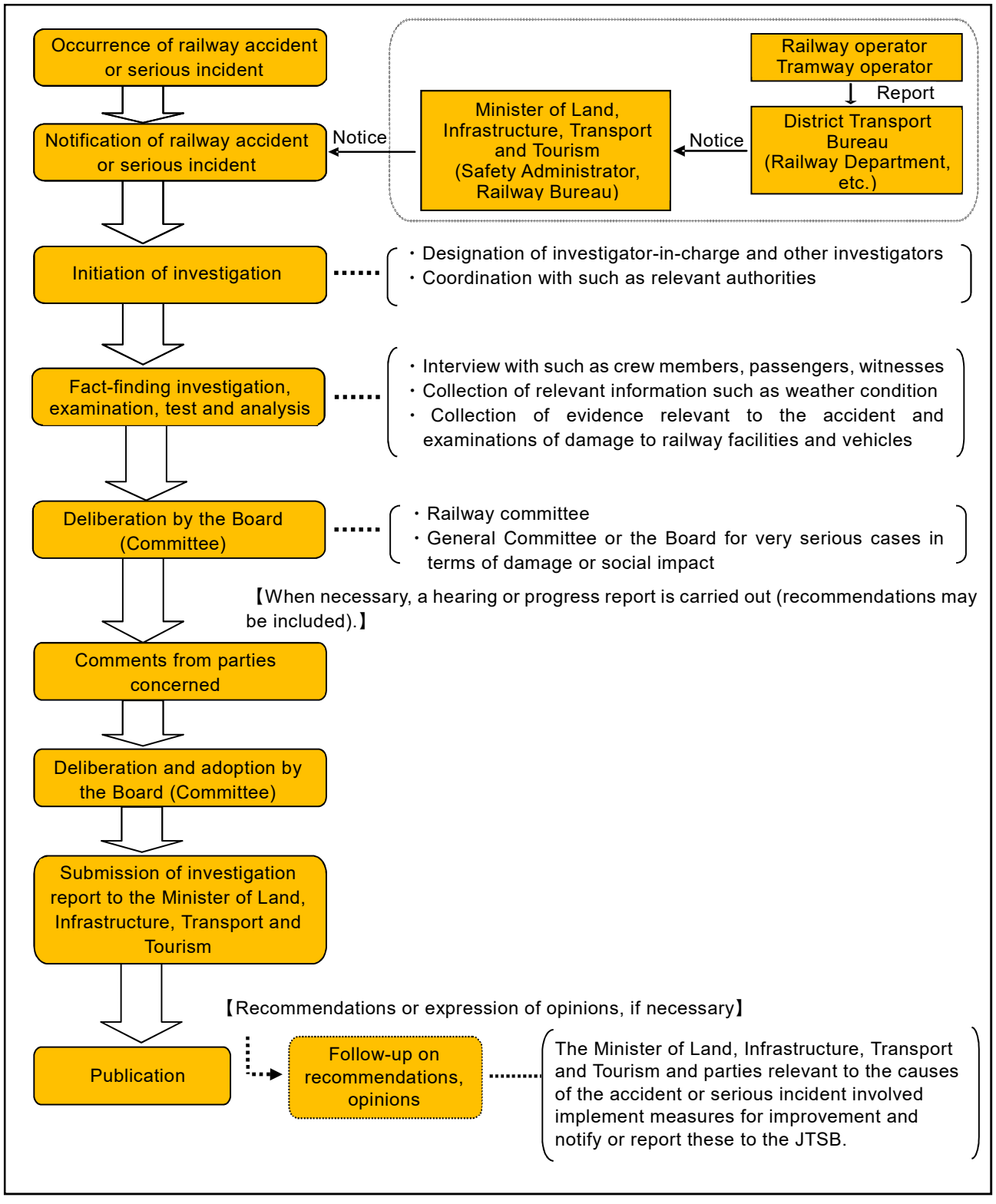
5 From among the situations occurring on a tramway operated under the application of the Ministerial Ordinances to provide Technical Regulatory Standards on Railways mutatis mutandis as specified in Article 3, paragraph (1) of the Ordinance on Tramway Operations, the situations equivalent to those specified in Article 2, items (i) through (vi) 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 3-1, 3-2, and 3-3]</td><td colspan="2">Risk of collision, derailment or fire [Ordinances 3-4 and 3-5]</td><td></td></tr>
<tr><td colspan="5">Incidents that are particularly rare and exceptional [Ordinance 3-6]</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 3-7]</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



* Opinions may be expressed in a flow chart (as above) or whenever and however necessary to prevent accidents or incidents or mitigate damage thereof.

3 Statistics of investigations of railway accidents and serious incidents

The JTSB carried out investigations of railway accidents and serious incidents in 2020 as follows:

15 accident investigations were carried over from 2019, and 13 accident investigations were newly launched. Among these, 14 investigation reports were published in 2020, and 14 accident investigations were carried over to 2021.

Moreover, two railway serious incident investigations were carried over from 2019, and two serious incident investigations were newly launched in 2020. Among these, two investigation reports were published in 2020, and two investigations were carried over to 2021.

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

Investigations of railway accidents and serious incidents in 2020

(Cases)

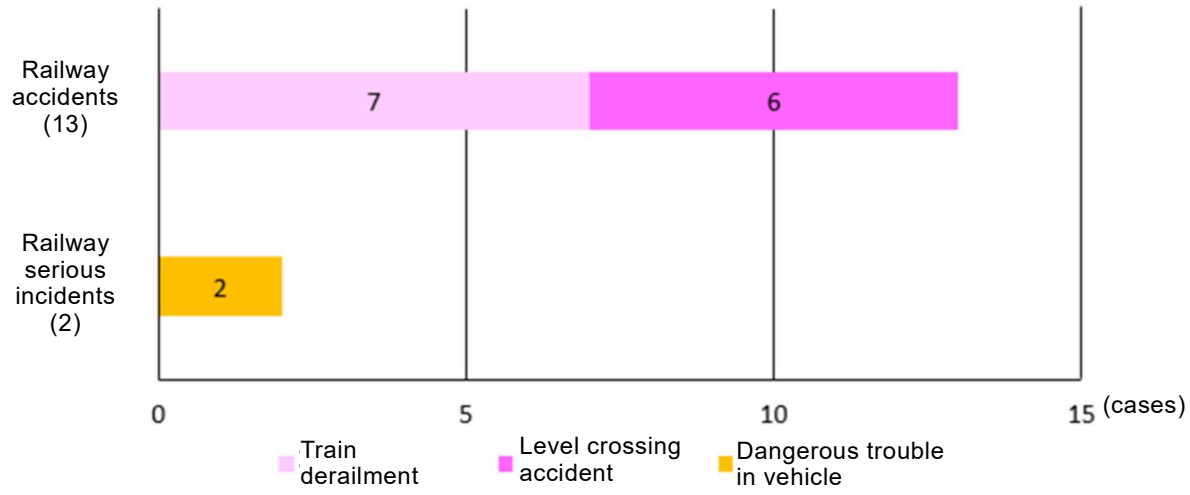
Category	Carried over from 2019	Launched in 2020	Total	Published investigation reports	(Recommendations)	(Opinions)	Carried over to 2021	(Interim report)
Railway accident	15	13	28	14	(0)	(0)	14	(0)
Railway serious incident	2	2	4	2	(0)	(0)	2	(0)

4 Statistics of investigated railway accidents and serious incidents in 2020

Regarding the number of railway accidents and incidents investigated in 2020, there were 13, a decrease of four from 17 in the previous year, and there were two railway serious incidents, the same as in the previous year.

The breakdown by type of accidents and serious incidents is as follows: The railway accidents consisted of seven derailments and six level crossing accidents. As for railway serious incidents, there was one main track overrun and one dangerous trouble in vehicle.

Number of investigated railway accidents and serious incidents by type in 2020



There were 12 persons killed or injured in 13 accidents, eight of whom were killed and four were injured.

The number of casualties (in railway accidents)

(Persons)

2020							
Category	Dead			Injured			Total
	Crew	Passenger	Others	Crew	Passenger	Others	
Casualties	0	0	8	0	4	0	12
Total	8			4			

*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 2020

The railway accidents and railway serious incidents which occurred in 2020 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 29, 2020 Level crossing accident	Willer Trains Inc.	Kamiyukou level crossing, the class 3 level crossing equipped with road warning device but without automatic barrier machine, between Shinonome station and Tangokanzaki station, Miyazu Line, Kyoto Prefecture
	Summary	See “6 Publication of investigation reports” (Page 81, No.13)	
2	Date and accident type	Railway operator	Line section (location)
	January 31, 2020 Level crossing accident	West Japan Railway Company	Niiya No.3 level crossing, the class 4 level crossing without automatic barrier machine nor road warning device, between Takamatsucho station and

			Nakahama station, Sakai Line, Tottori Prefecture
	Summary	While the train was running between Takamatsucho station and Nakahama station at the velocity of about 57 km/h, the driver of the train noticed a motorized bicycle entering Niiya No.3 level crossing, the class 4 level crossing, from left, then applied the emergency brake immediately, but the train collided with the motorized bicycle. The driver of the motorized bicycle was dead in the accident.	
3	Date and accident type	Railway operator	Line section (location)
	March 9, 2020 Train derailment	West Japan Railway Co.	Between Tojo station and Bingo-Yawata station on the Geibi Line, Hiroshima Prefecture
	Summary	When the train was traveling, it ran over earth and sand that had flowed onto the railway and all the train wheels derailed.	
4	Date and accident type	Railway operator	Line section (location)
	March 10, 2020 Train derailment	Chikuho Electric Railroad Co., Ltd.	Between Chikuho-Katsuki station and Kusubashi station on the Chikuho Electric Railroad Line, Fukuoka Prefecture Chikuho-Katsuki No. 7 level crossing (class 1 level crossing with automatic barrier machine and road warning device)
	Summary	Train No. 92 collided with an automobile at Chikuho-Katsuki No. 7 level crossing and both axles of the front bogie derailed rightward in the travel direction.	
5	Date and accident type	Railway operator	Line section (location)
	March 18, 2020 Train derailment	Nagaragawa Railway Co., Ltd	Mino-Ota station premises on the Etsumi-Nan Line, Gifu Prefecture
	Summary	Both axles of the front bogie derailed as the train ran through the Mino-Ota station premises.	
6	Date and accident type	Railway operator	Line section (location)
	May 5, 2020 Level crossing accident	East Japan Railway Company	Higashi-Yamoto station premises on the Senseki Line, Miyagi Prefecture No. 1 Shimoura level crossing (class 3 level crossing without automatic barrier machine and with road warning device)
	Summary	The driver of the train noticed a pedestrian inside the level crossing from the left side of the travel direction, and carried out an emergency stop operation but failed to avoid collision. Later, the death of the pedestrian was confirmed.	
7	Date and accident type	Railway operator	Line section (location)
	May 8, 2020 Train derailment	East Japan Railway Company	Between Awa-Kamogawa station and Awa-Amatsu station on the Sotobo Line, Chiba Prefecture
	Summary	When the train was moving, two axles of the No. 1 bogie of the first car derailed leftward.	
8	Date and accident type	Railway operator	Line section (location)
	June 12, 2020 Train derailment	Keisei Electric Railway Co., Ltd.	Inside the Aoto station premises on the main line, Tokyo
	Summary	When the train entered Aoto station, two axles of a posterior bogie of the 7th car derailed rightward in the travel direction.	
9	Date and accident type	Railway operator	Line section (location)
	July 26, 2020 Train derailment	Toyamachiho Railroad Co., Ltd.	Between Higashi-Shinjo station and Shinjo-Tanaka station on the main line, Toyama Prefecture
	Summary	When the train was moving, the No. 1 axle of the first car and Nos. 1, 2 and 3 axles of the second car derailed rightward in the travel direction.	
10	Date and accident type	Railway operator	Line section (location)
	October 18, 2020 Level crossing accident	Japan Freight Railway Company	Between Shimata station and Hikari station on the Sanyo Line, Yamaguchi Prefecture

			Hachioji No. 2 level crossing (class 4 level crossing without automatic barrier machine nor road warning device)
	Summary	The driver of the train noticed two pedestrians entering the level crossing from the right side of the travel direction and carried out an emergency stop operation but failed to avoid collision. Later, the deaths of the two pedestrians were confirmed.	
11	Date and accident type	Railway operator	Line section (location)
	November 15, 2020 Level crossing accident	Echizen Railway Co.	Between Nakatsuno station and Washizuka-Haribara station on the Mikuni Awara Line, Fukui Prefecture Nakatuno level crossing (class 4 level crossing without automatic barrier machine nor road warning device)
	Summary	The driver of the train noticed an automobile entering the level crossing from the left side of the travel direction and took emergency stop operation but failed to avoid collision. Later, the death of the driver of the automobile was confirmed.	
12	Date and accident type	Railway operator	Line section (location)
	November 23, 2020 Train derailment	Hankyu Corporation	Between Mikage station and Rokko station on the Kobe Main Line, Kobe Prefecture Takaha level crossing (class 1 level crossing with automatic barrier machine and road warning device)
	Summary	The driver of the train noticed an automobile entering the level crossing from the left side of the travel direction and carried out an emergency stop operation but failed to avoid collision. All of the No. 1 bogie axles of the first train car derailed.	
13	Date and accident type	Railway operator	Line section (location)
	December 19, 2020 Level crossing accident	Japan Freight Railway Company	Between Higashi-Okayama station and Joto station on the Sanyo Line, Okayama Prefecture Gonotsubo level crossing (class 4 level crossing without automatic barrier machine nor road warning device
	Summary	The driver of the train noticed a pedestrian entering the level crossing from the left side of the traveling direction and carried out an emergency stop operation but failed to avoid collision. Later, the death of the pedestrian was confirmed.	

(Railway serious incidents)

1	Date and incident type	Railway operator	Line section (location)
	October 4, 2020 Main track overrun	WILLER TRAINS, Inc.	Between Tango-yura station and Kunda station on the Miyazu Line, Kyoto Prefecture
	Summary	The driver of the train noticed an abnormal noise before Kunda station and applied the emergency brake, thereby stopping the train. When exiting the train to check the noise, the train started to move. So he again applied the brake—which failed. The train passed through Kunda station and came to a stop about 242 meters past it.	
2	Date and incident type	Railway operator	Line section (location)
	December 30, 2020 Dangerous trouble in vehicle	West Japan Railway Company	Honmataga station premises on the Yamaguchi Line, Shimane Prefecture
	Summary	Immediately before stopping as the train was entering Honmataga station, the driver of the train noticed that the “door-closed indicator” was off. After coming to a stop, he inspected the train and found that a rear passenger door on the right side of the travel direction, located opposite the station platform, was open about 50 cm. No passengers fell onto the railroad tracks through the open door.	

6 Publication of investigation reports

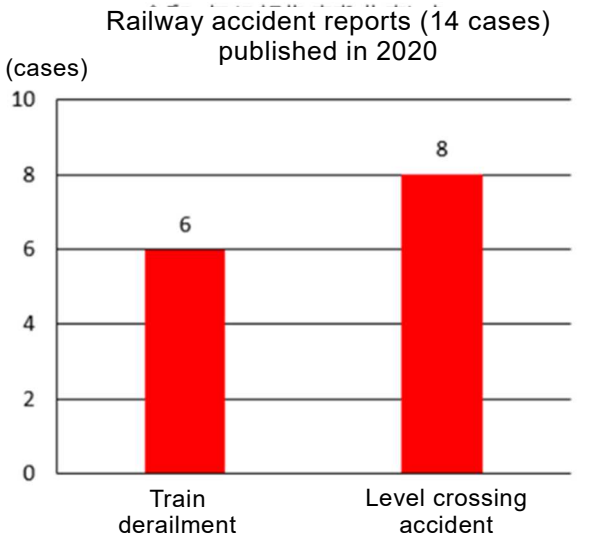
The number of investigation reports of railway accidents and serious incidents published in 2020 was

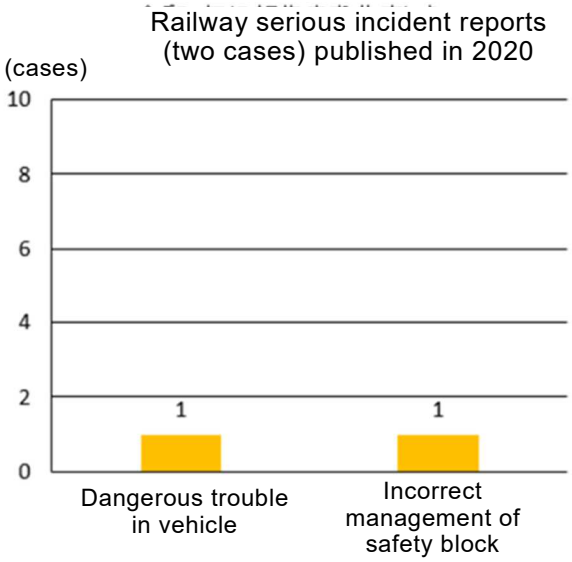
16, consisting of 14 railway accidents and two serious incidents.

Breaking them down by type, the railway accidents contained six train derailment accidents, eight level crossing accidents. The railway serious incidents contained one dangerous trouble in vehicle, and one case of incorrect management of safety block.

In the 14 accidents, the number of casualties was 14, consisting of eight deaths and six injuries.

The investigation reports on railway accidents and serious incidents published in 2020 are summarized as follows.

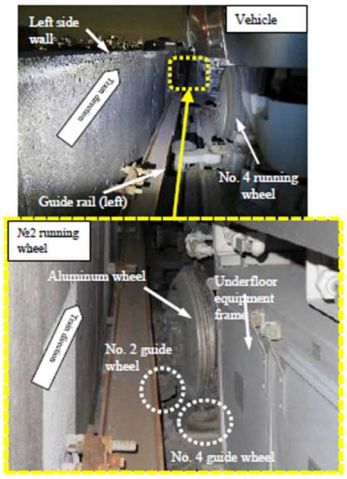




Railway accident investigation reports published in 2020

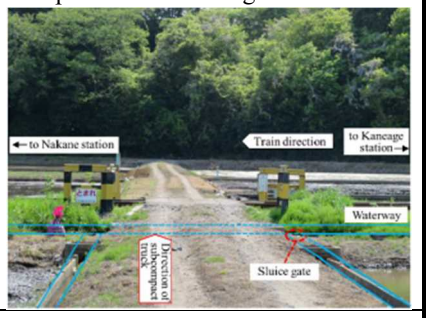
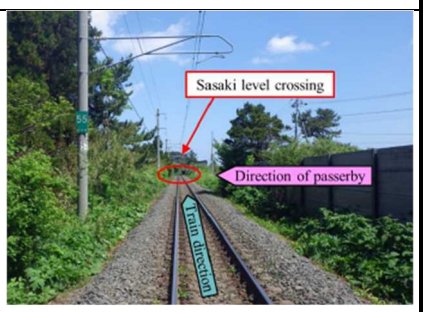
1	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	October 29, 2020	January 16, 2019 Train derailment	Saitama New Urban Transit Co., Ltd.	Between Kamonomiya Station and Tetsudohakubutsukan Station on the Ina Line, Saitama Prefecture
	Summary	The train departed Kamonomiya Station on time. The driver of the train was traveling at a speed of about 30 km/h between Kamonomiya Station and Tetsudohakubutsukan Station when he heard a strange "bong" sound from the rear of the train and then applied the brakes. After stopping, the situation was confirmed through the inside of each vehicle, and when the sixth car was seen from the gangway behind the fifth car, the front part of the vehicle body of the sixth car was tilted to the left and shifted by about 50 cm. The attendant who arrived after receiving a call from the control center confirmed that the left front of the sixth car had made contact with the side wall of the viaduct, and the left tire of the first axle had been damaged and had deviated from the running track. The coaxial right tire was also damaged. About 100 passengers and one driver were on board the train, but no one was injured. Unlike railways with steel wheels, this accident occurred on a railway that used rubber tires as wheels.		

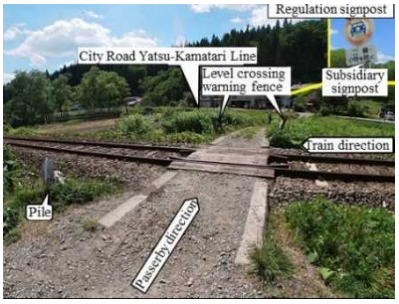
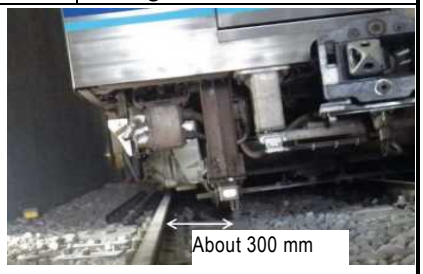
	Probable Causes	It is highly probable that the accident have occurred when the air pressure suddenly dropped due to damage to the left tire on the front axle of the vehicle, and the vehicle traveled with the damaged tire, which damaged the Nakago(safety wheel), causing the guide wheels to move off the guide rail downwards and the running wheels to deviate from the track, resulting in derailment. As for the damage to the tire, it is highly probable that the wires of the steel belt broke due to the train running with the inner surface of the tire and the Nakago(safety wheel) in contact due to extreme underinflation of the tire. With regard to the extreme underinflation of the tire, it is probable that the wires of the belt broke because the tire was run with the steel belt exposed due to wear of the tread, and some of the wires reached the inner surface of the tire, causing air leakage. As for the fact that the tires ran with the steel belt exposed due to wear in the tread area, it is probable that the depth of the main grooves was not measured during the temporary inspection, and the tires were not checked for wear during the train inspection, so they continued to be operated without sufficiently checking the situation where the main grooves in the tread area had disappeared due to wear.
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-5-1e.pdf https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-5-1-p.pdf (Explanatory materials (Japanese only))
	Reference	Column (page 96), Case Studies (page 98)



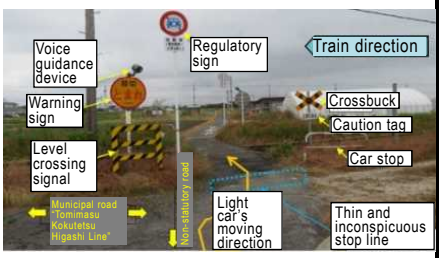
2	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	March 26, 2020	March 21, 2019 Level crossing accident	East Japan Railway Company	Yamanone level crossing, the class 4 level crossing without automatic barrier machine nor road warning device, in the premises of Zushi station, Yokosuka Line, Kanagawa Prefecture
	Summary	While the train was running in the premises of Zushi station at the velocity about 53 km/h, the driver of the train noticed the abnormal sound at around Yamanone level crossing, then operated the emergency stop procedure and the train protection radio. As the result of the investigation of the scene, the injured person was found in the railway track, and found as dead although the ambulance was called. After that it was found out by the image records that the dead person was the passerby of the level crossing entered from southward of the concerned level crossing and collided with the concerned train.		
	Probable Causes	It is highly probable that the concerned accident was caused by that the pedestrian collided with the concerned train because the pedestrian passing Yamanone level crossing, the class 4 level crossing without automatic barrier machine nor road warning machine, entered the up track in the concerned level crossing in the situation that the train was approaching in the up track. It could not be determined the precise situation why the concerned pedestrian entered the up track in the situation that the train was approaching in the up track , because the pedestrian was dead, although it is likely that the pedestrian did not notice the approaching train , and that it was related with the difficult y to cross through the concerned level crossing only by the safety check when entered the level crossing as the structure of the concerned level crossing was in the status as the main track s could not be viewed by the parking vehicles depending on the		

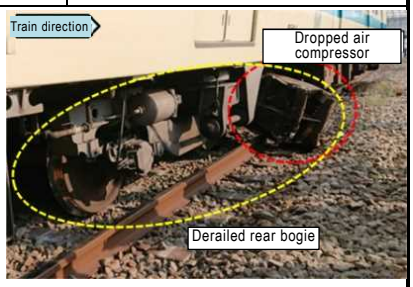
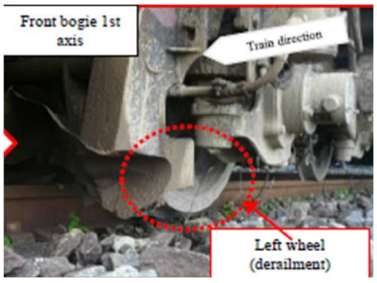
		circumstances, in addition there were many tracks to be crossed and the length of the level crossing road was long as 35.5 m.		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-2-1e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-2-1-p.pdf (Explanatory materials (Japanese only))		
	Reference	Case Studies (page 99)		
3	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	February 27, 2020	April 14, 2019 Train derailment	Konan Tetsudo Co., Ltd.	Between Chuo Hirosaki station and Hirokoshita station, Owani Line, Aomori Prefecture
	Summary	While the train was passing through the 160 m radius left curved track between Chuo Hirosaki station and Hirokoshita station at the velocity of about 30 km/h, the driver of the train noticed a shock and applied the emergency brake to stop the train. After the train stopped, the driver checked the situation and found that the 1st axle in the front bogie of the forefront vehicle had been derailed. There were 10 passengers and the driver onboard the train, but no one was injured. 		
	Probable Causes	It is probable that the concerned accident was caused as that the left wheel of the 1st axle in the front bogie of the forefront vehicle fell to inside gauge because the gauge widened significantly while the train was passing through the 160 m radius left curved track. As for the significantly widened gauge, it is probable that the gauge widened dynamically by the rail tilting, etc., due to the lateral force caused by the running train, because of the large static irregularity of gauge and the continuously existed poor sleepers and the poor rail fastening status in the concerned curved track. It is probable that the static irregularity of gauge had been large, related with that the maintenance standard value for the irregularity of gauge was larger than the appropriate value because the slack had not been considered. It is probable that the poor sleepers and the poor rail fastening status had been continuously existed, related with the insufficient repairing works for the sleepers and the rail fastening devices due to the inadequate records and measuring methods in the sleeper inspections. In addition, it is probable that the occurrence of the concerned accident was related with that the margin against the derailment to inside gauge had been small because the slack had been relatively large in the concerned curved track, and the insufficient implementation of the measures responding to the opinion for the purpose to prevent the train derailment accident due to the wide gauge, issued by the Japan Transport Safety Board on June 28, 2018.		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-1-3e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-1-3-p.pdf (Explanatory materials (Japanese only))		
4	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	February 27, 2020	May 4, 2019 Level crossing accident	Hitachinaka Seaside Railway Co., Ltd.	Mitanda No.1 level crossing, the class 4 level crossing without automatic barrier machine nor road warning device, between Kaneage station and Nakane station, Minato Line, Ibaraki Prefecture

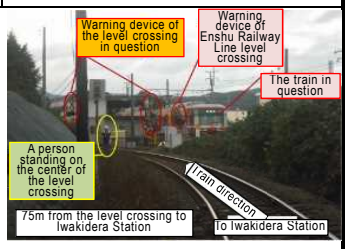
	Summary	While the train was running between Kaneage station and Nakane station at the velocity of about 60 km/h, the driver of the train noticed a subcompact truck entering Mitanda No.1 level crossing, the class 4 level crossing, then applied the emergency brake and sounded the whistle immediately, but the train collided with the subcompact truck. The driver of the subcompact truck was dead and the fellow passenger of the subcompact truck was injured in the accident. 		
	Probable Causes	It is highly probable that the subcompact truck collided with the train in the concerned accident because the subcompact truck entered Mitanda No. 1 level crossing, the 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 the reason why the subcompact truck entered the level crossing in the situation that the train was approaching, because the driver of the subcompact truck was dead, although it is likely that the driver of the subcompact truck did not notice the approaching train.		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-1-1e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-1-1-p.pdf (Explanatory materials (Japanese only))		
5	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	March 26, 2020	May 22, 2019 Level crossing accident	East Japan Railway Company	Sasaki level crossing, the class 3 level crossing equipped with road warning device but without automatic barrier machine, between Yomogita station and Gousawa station, Tsugaru Line, Aomori Prefecture
	Summary	While the train was running between Yomogita station and Gousawa station in the coasting operation at the velocity of about 73 km/h, the driver of the train noticed the abnormal sound when passed Sasaki level crossing, the class 3 level crossing, then applied the emergency brake to stop the train. After the train stopped, the driver checked around the concerned level crossing and found the passerby fallen in the track side. The concerned passerby was dead in the accident.		
	Probable Causes	It is probable that the concerned accident was caused by that the passerby collided with the concerned train because the passerby entered Sasaki level crossing, the class 3 level crossing equipped with the road warning device in the situation that the road warning device had been operating responded to the approaching train. It could not be determined the reason why the passerby entered the level crossing in the situation that the road warning device had been operating responded to the approaching train because the concerned passerby was dead, although it is likely that the passerby did not notice the approaching train. 		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-2-2e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-2-2-p.pdf (Explanatory materials (Japanese only))		
6	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	February 27,	June 1, 2019	Akita Nairiku Jukan	Kamatari level crossing, the

	2020	Level crossing accident	Tetsudo Railway Co., Ltd.	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	While the train was running between Ugo Nagatoro station and Yatsu station at the velocity of about 80 km/h, the driver of the train noticed the agricultural apparatus, i.e., a rice planting machine, halting in Kamatari level crossing, at about 150 m before Kamatari level crossing, then sounded a whistle and applied the emergency brake immediately, but the train collided with the passerby riding on the agricultural apparatus. The passerby riding on the agricultural apparatus was dead in the accident. 		
	Probable Causes	It is highly probable that the concerned accident was caused by that the train hit the passerby riding on the agricultural apparatus who had been halting in Kamatari level crossing, the 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 the reason why the passerby had been halting in the level crossing in the situation that the train was approaching, because the passerby was dead in the accident.		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-1-2e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-1-2-p.pdf (Explanatory materials (Japanese only))		
7	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	February 27, 2020	June 6, 2019 Train derailment	Transportation Bureau, City of Yokohama	Between Shimoiida station and Tateba station, Yokohama Municipal Subway No.1 Line, Kanagawa Prefecture
	Summary	After the train departed from Shimoiida station on schedule, the driver of the train received the shock as being thrusted from the floor. Therefore, the driver applied the emergency brake, and reported to the operation dispatcher that he felt the shock as being thrusted from the floor together with the extraordinary large sound then he applied the emergency brake and stopped the train. After that, obeying the instruction from the operation dispatcher, the driver implemented the measure to prevent wheel rolling of the train and let the passengers get off the train and guided to Shimoiida station in cooperation with the staffs rushed from Shimoiida station. When the driver implemented the measure to prevent wheel rolling of the concerned train, he found that the right wheel of the train ran onto the set-off device, i.e., the set-off rail, and had been derailed to left of the rail. There were 121 passengers and the driver onboard the train, and the driver was slightly injured. 		

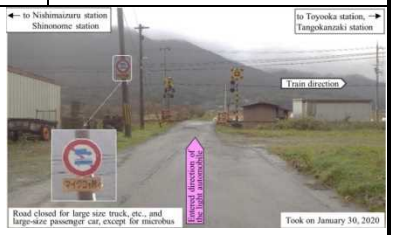
	Probable Causes	It is highly probable that the concerned accident was caused by that the plural right wheels of the concerned train ran onto the set-off rail and derailed to left, because the concerned train moved to the place where the works had finished as the set-off rail was covering right rail of the main track due to forget the put back procedure to put-back the set-off rail for the right rail of the main track, in the periodic inspection of the movable set-off device. It is highly probable that the set-off rail for right rail of the main track was forgotten to be put back, because the confirmation of the put back status of the set-off rail for right rail of the main track, which should be implemented when finished the works, was not implemented. In addition, it is likely that above situation was related with that the worker was convinced to confirm the put back status of the set-off rail by checking the turned off warning light, etc., because the concerned set-off device was composed as that the operation of the alarm lights, etc., could be stopped even in the status that the set-off rail had not been put back. Here, it is likely that the insufficient study and training to enforce the observance of the regulations, and the inadequate education etc., for the staffs who had not been charged in the periodic inspection for several years, were related to forget the confirmation procedure that should be implemented when finished the works.		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-1-4e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-1-4-p.pdf (Explanatory materials (Japanese only))		
8	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	July 30, 2020	June 7, 2019 Level crossing accident	West Japan Railway Company	Between Yumigahama station and Wadahama station on the Sakai Line, Tottori Prefecture Tomimasu No. 5 level crossing (class 4 level crossing without automatic barrier machine nor road warning device)
	Summary	When the train was traveling at the velocity of about 79 km/h between Yumigahama station and Wadahama station, the driver of the train noticed about 50 m from Tomimasu No. 5 level crossing (class 4 level crossing) a light automobile entering the level crossing from the left side of the travel direction, so he immediately sounded the whistle and applied the emergency brake but collided with the car. This accident resulted in the death of the driver of the light automobile.		
	Probable Causes	It is certain that this accident occurred when the train was approaching Tomimasu No. 5 level crossing (class 4 level crossing without automatic barrier machine nor road warning device) and a light automobile entered the level crossing, resulting in a collision with the train. It is likely that the reason the light automobile entered the level crossing despite the approaching train due to the driver concentrating on the operation of his vehicle to notice the approaching train. Since the accident resulted in the death of the driver, the definitive cause could not be determined.		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-3-1e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-3-1-p.pdf (Explanatory materials (Japanese only))		
9	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	March 26, 2020	June 19, 2019 Train derailment	Odakyu Electric Railway Co., Ltd.	Hon-Atsugi No.13 level crossing, the class 1 level crossing equipped with automatic barrier machine

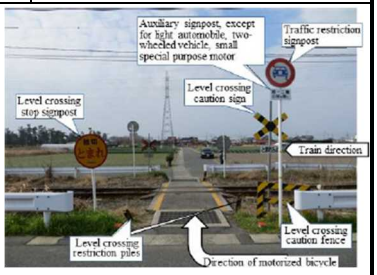


				and road warning device, between Hon-Atsugi station and Aiko-Ishida station, Odawara Line, Kanagawa Prefecture
	Summary	While the train was running between Hon-Atsugi station and Aiko-Ishida station at the velocity of about 100 km/h, the driver of the train noticed the standard sized automobile halting in Hon-Atsugi No.13 level crossing, the class 1 level crossing, then applied the emergency brake and sounded the whistle immediately, but the train collided with the automobile and all two axles in the rear bogie of the 1st vehicle derailed to left at Hon-Atsugi No.14 level crossing, the class 1 level crossing, located at 73 m beyond Hon-Atsugi No.13 level crossing. A passenger was injured in the accident.		
	Probable Causes	It is probable that the concerned train derailed at Hon-Atsugi No.14 level crossing, located at 73 m ahead of Hon-Atsugi No.13 level crossing, caused by the collision with the standard sized automobile which entered Hon-Atsugi No.13 level crossing, in the status that the road warning device was operating responded to the approaching train, and stopped in the level crossing because the crossing rod lowered before the concerned automobile went out of the level crossing, in the concerned accident. As for that the driver of the concerned automobile entered the concerned level crossing in the status as the road warning device of the concerned level crossing was operating, it is likely that it was the first time for the driver of the concerned automobile to pass the concerned level crossing by driving the concerned automobile, and his consciousness was not paid toward the on and off red flash lamps and the alarm sound of the road warning device in the concerned level crossing because his consciousness had been concentrated to drive the automobile carefully as the obstacle detection system of the concerned automobile uttered the warning sound when moved the concerned automobile into the concerned level crossing. In addition, as for that the concerned automobile stopped in the concerned level crossing, it is certain that the driver of the concerned automobile stopped the concerned automobile in the concerned level crossing because the driver of the concerned automobile did not know that the automobile can get out of the concerned level crossing as the crossing rod would be raised by pushing the cross rod by the automobile.		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-2-3e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-2-3-p.pdf (Explanatory materials (Japanese only))		
10	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	July 30, 2020	June 28, 2019 Train derailment	East Japan Railway Company	Between Shibukawa Station and Shikishima Station on the Joetsu Line, Gunma Prefecture
	Summary	The train departed Shibukawa Station on time. The train driver immediately applied the emergency brake because he found a fallen tree on the track in front of him while driving between Shibukawa Station and Shikishima Station at a speed of about 76 km / h, but it collided with dirt and sand including the fallen tree that had flowed into the track and stopped. The first axis of the front bogie of the first car derailed to the left. About 80 passengers and two crew members (driver and conductor) were on board the train, and one passenger was injured.		
	Probable Causes	It is highly probable that the accident caused the train to derail due to the collision of the train with dirt and sand including fallen trees that flowed into the track due to the collapse		

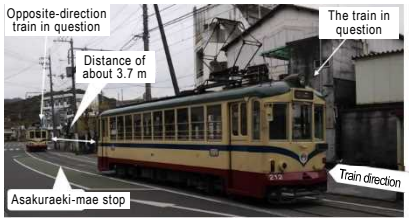
		of the slope along the railway. Regarding the collapse of the slope, fallen leaves and the like had accumulated in the waterway laid above the collapsed slope, which hindered the water flow function of the waterway, and the water overflowing from this area was discharged to the slope. It is likely that this led to the fact that the surface soil of the slope became unstable due to the increased water content of the soil.		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-3-2e.pdf https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-3-2-p.pdf (Explanatory materials (Japanese only))		
	Reference	Case Studies (page 101)		
11	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	October 29, 2020	December 2, 2019 Level crossing accident	Tenryu Hamanako Railroad Co., Ltd.	Tounokisaka level crossing, the class 3 level crossing equipped with road warning device but without automatic barrier machine, in the premises of Nishikajima station, Tenryu Hamanako Line, Shizuoka Prefecture.
	Summary	While the train was running in the premises of Nishikajima station at the velocity of about 55 km/h, the driver of the train noticed the passerby entering Tounokisaka level crossing, the class 3 level crossing, then applied the emergency brake and sounded the whistle immediately, but the train collided with the passerby. The concerned passerby was dead in the accident.		
	Probable Causes	It is highly probable that the concerned accident was caused as that the passerby entered Tounokisaka level crossing, the class 3 level crossing equipped with road warning device but without automatic barrier machine, in the situation that the road warning device had been operating responded to the approaching train, and collided with the concerned train. As for the reason why the concerned passerby entered the concerned level crossing in the situation that the road warning device had been operating responded to the approaching train, it is likely that the concerned passerby misunderstood the situation because the level crossing protection device of the class 1 level crossing of the other railway operator, located ahead of the concerned level crossing, started its operation earlier. In addition, it is likely that the concerned passerby did not notice the operation of the road warning device in the concerned level crossing related with the external factors such as the weather, the structural factors of the concerned level crossing, and physical factors of the concerned passerby, but it could not be determined, because the concerned passerby was dead.		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-5-2e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-5-2-p.pdf (Explanatory materials (Japanese only))		
12	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	November 26, 2020	December 24, 2019 Train derailment	Aizu Railway Co. Ltd.	Between Tonohetsuri station and Yagoshima station, Aizu Line, Fukushima Prefecture
	Summary	While the train was passing the 200 m radius right curved track between Yagoshima station and Tonohetsuri station at the velocity of about 44 km/h, the driver of the train felt the impact, then operated the		

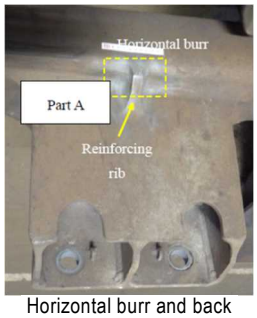
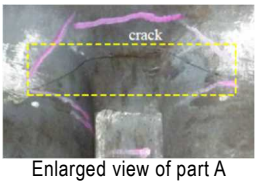
		emergency brake to stop the train. When inspected the vehicle after stopped, it was found that the 1st axle in the front bogie of the vehicle had been derailed to left. There were three passengers and two train crews boarded on the train, but there was no injured person.
	Probable Causes	It is probable that the concerned accident was caused as that right wheel of the 1st axle in the front bogie fell to inside gauge because the gauge widened significantly while the train was passing through the 200 m radius right curve. It is probable that the gauge widened significantly because the rail tilting and the lateral displacement of rails occurred due to the lateral force acted while the train was running caused by the continuously existed poor sleepers and the floating spikes in the rail fastening devices, in addition to the large track irregularity of gauge in the concerned curved track. It is likely that the poor sleepers and the floating spikes of the rail fastening devices had been existed continuously, because the track maintenance responding to the status had not been implemented, as the status of the sleepers and the rail fastening devices, i.e., the level and the continuity of the poor status, considering the risks against the wide gauge, were not comprehended well in the sleeper inspection, etc. In addition, it is likely that the occurrence of the concerned accident was related by that the works to replace the wooden sleepers by the PC sleepers had not been completed before the occurrence of the concerned accident because the steep curved section where is dangerous for the wide gauge was not considered as higher priority, although there was the plan to replace the wooden sleepers by the PC sleepers.
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-6-1e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-6-1-p.pdf (Explanatory materials (Japanese only))

13	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	October 29, 2020	January 29, 2020 Level crossing accident	Willer Trains Inc.	Kamiyukou level crossing, the class 3 level crossing equipped with road warning device but without automatic barrier machine, between Shinonome station and Tangokanzaki station, Miyazu Line, Kyoto Prefecture
	Summary	While the train was operating in the coasting operation between Shinonome station and Tangokanzaki station at the velocity of about 55 km/h, the driver of the train noticed a light automobile entering Kamiyukou level crossing, the class 3 level crossing, from right, at before the concerned level crossing, then applied the emergency brake and sounded the whistle, but the train collided with the light automobile and stopped. After the train stopped, the driver reported to the train dispatcher on the accident, checked the status of the driver of the light automobile, and asked the arrangement of the ambulance. The driver of the light automobile was dead and two passengers of the concerned train were slightly injured in the accident.		
	Probable Causes	It is probable that the concerned accident was caused as that the light automobile entered Kamiyukou level crossing, the class 3 level crossing equipped with road warning device, from right in the situation that the road warning device was operating responded to the approaching train, and collided with the train. It could not be determined the reason why the light automobile entered the concerned level crossing in the situation that road warning device was operating responded to the approaching train, because the driver of the light automobile was dead, although it is likely that the driver of the light automobile did not notice the approaching train.		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-5-3e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-5-3-p.pdf (Explanatory materials		

		(Japanese only))		
14	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	October 1, 2020	January 31, 2020 Level crossing accident	West Japan Railway Company	Niiya No.3 level crossing, the class 4 level crossing without automatic barrier machine nor road warning device, between Takamatsucho station and Nakahama station, Sakai Line, Tottori Prefecture
	Summary	While the train was running between Takamatsucho station and Nakahama station at the velocity of about 57 km/h, the driver of the train noticed a motorized bicycle entering Niiya No.3 level crossing, the class 4 level crossing, from left, then applied the emergency brake immediately, but the train collided with the motorized bicycle. The driver of the motorized bicycle was dead in the accident. 		
	Probable Causes	It is certain that the concerned accident was caused as that the train collided with the motorized bicycle because the motorized vehicle entered Niiya No.3 level crossing, the 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 the details why the motorized bicycle entered the concerned level crossing in the situation that the train was approaching, because the driver of the motorized bicycle was dead, although it is likely that the driver of the motorized bicycle entered the concerned level crossing without noticed the approaching train.		
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-4-1e.pdf (Synopsis) https://www.mlit.go.jp/jtsb/railway/p-pdf/RA2020-4-1-p.pdf (Explanatory materials (Japanese only))		

Railway serious incident investigation reports published in 2020

1	Date of Publication	Date and serious incident type	Railway operator	Line section (location)
	July 30, 2020	March 25, 2019 Incorrect management of safety block	Tosaden Traffic Co., Ltd.	Between Asakura stop and Yashiro stop, Ino Line, Kochi Prefecture
	Summary	The vehicle to depart from Asakura stop, located in the single track section, without carrying the tablet in the situation that vehicles should be operated in the tablet instrument block system instead of the pilot system that had been enforced temporary between Kagamigawabashi stop and Asakura stop.  After that, while the concerned driver moved the vehicle to about 6 m before Asakuraeki-mae stop, he found the facing outbound 332 vehicle, composed of one vehicle started from Ino stop bound for Monjudori stop, in ahead, then he stopped the 333 vehicle immediately. On the other hand, the driver of the 332 vehicle, while running in Asakura intersection, located between Asakurajinja-mae stop and Asakuraeki-mae stop, noticed the 333 vehicle halting in ahead, then stopped the 332 vehicle at about 5 m before Asakuraeki-mae stop after passed the concerned intersection. There were eight passengers and the driver boarded on the 333 vehicle, and five passengers and the driver boarded on the 332 vehicle, but there was no injured person.		
	Probable Causes	It is certain that the concerned serious incident occurred because the driver of the 333 vehicle started the 333 vehicle from Asakura stop, in the single track section between Asakura stop and		

<table>
<tr><td></td><td></td><td colspan="3">Yashiro stop where the tablet instrument block system was enforcing, without carrying the tablet by himself and entered the safety section where the 332 vehicle was existed.
It is probable that the driver started the 333 vehicle from Asakura stop without carrying the tablet by himself, related to that the mutual confirmation on the noticed contents, such as to let the driver of the 333 vehicle recite the notified contents which is the fundamental procedure, was not implemented after the stationmaster of Kagamigawabashi stop notified the safety block system to the driver of the 333 vehicle, in addition to that the driver could not judge and apply, responding to the situation, the contents that the drivers were educated on the pilot system and the tablet instrument block system.
As for that the driver could not judge and apply the educated contents on the pilot system and the tablet instrument block system responding to the situation and that the mutual confirmation on the noticed contents by the stationmaster of Kagamigawabashi stop was not implemented, it is likely that the system and the contents of the education for the drivers and the stationmasters on the handling of train operation in the concerned company had been insufficient.</td></tr>
<tr><td></td><td>Report</td><td colspan="3">https://www.mlit.go.jp/jtsb/eng-rail_report/English/RI2020-1-1e.pdf (Synopsis)
https://www.mlit.go.jp/jtsb/railway/p-pdf/RI2020-1-1-p.pdf (Explanatory materials (Japanese only))</td></tr>
<tr><td></td><td>Reference</td><td colspan="3">Case Studies (page 100)</td></tr>
<tr><td>2</td><td>Date of Publication</td><td>Date and serious incident type</td><td>Railway operator</td><td>Line section (location)</td></tr>
<tr><td></td><td>November 26, 2020</td><td>August 24, 2019
Dangerous trouble in vehicle</td><td>Nankai Electric Railway Co., Ltd.</td><td>Suminoe inspection ward, Osaka Prefecture</td></tr>
<tr><td></td><td>Summary</td><td colspan="3">Train Rapit β 41 left the Nankai Main Line Namba Station on time. While traveling between Sakai Station and Kishiwada Station, the conductor noticed the sound of rub against the connecting part of the 2nd and 3rd cars (hereinafter, vehicles etc. are counted from the outbound direction, and the left and right are based on the traveling direction of the outbound train). After that, while the train bounded for Namba Station (the train number went up and became No. 250 train) after arriving at Kansai Airport Station was running, the same conductor confirmed the same sound from the connection between the 2nd and 3rd cars between Kishiwada Station and Sakai Station. For this reason, the conductor reported the occurrence of abnormal noise to the transport commander via train radio. The commander sent two car inspection staff from Izumisano Station to the train bound for Kansai Airport Station (the train number went down and became No. 249 train) after arriving at Namba Station. They checked the condition of the vehicle, but there was no abnormality. Therefore, they instructed to check the vehicle after the operation on the day.
After the operation, when the car inspection staff checked the vehicle again at the Suminoe inspection area, a crack of about 140 mm was found on the back of the 1st axis traction motor seat of the 2nd bogie of the 2nd car.
 
Horizontal burr and back of traction motor seat
 
Enlarged view of part A</td></tr>
<tr><td></td><td>Probable Causes</td><td colspan="3">It is highly probable that this serious incident was caused by the cracks that occurred in the weld between the side of the bogie frame of the vehicle and the reinforcing ribs on the back of the traction motor seat, which developed due to fatigue and reached the outer surface.
Regarding the fact that a crack occurred in the welded part between the side of the bogie and the reinforcing rib on the back of the traction motor seat, it is highly probable that it occurred because the groove processing was not performed when the manufacturer attached the reinforcing rib to the back of the traction motor seat, which resulted in the crack.
Regarding the fact that the groove processing was not carried out, there is no description about the groove in the work plan issued by the bogie technical management office of the bogie manufacturer to the welding workplace where the groove processing is performed, and there is no clear work instruction. Therefore, it is probable that it was related to the fact that the workers in the welding workplace did not know that the groove had to be processed.
In addition, the part where the crack occurred was not designated as a priority inspection part after reinforcement, and the magnetic particle inspection was not conducted, so even if the</td></tr>
</table>

		crack had already occurred at the time of the regular inspection, it is likely that this could not be found.
	Report	https://www.mlit.go.jp/jtsb/eng-rail_report/English/RI2020-2-1e.pdf https://www.mlit.go.jp/jtsb/railway/p-pdf/RI2020-2-1-p.pdf (Explanatory materials (Japanese only))
	Reference	Feature 4 (page 9), Case Studies (page 102)

7 Actions taken in response to recommendations in 2020 (railway accidents and serious incidents)

A summary of the actions taken in response to recommendations and opinions in 2020 is as follows.

(1) Opinions on the improvement of safety of the freight train operation

(Opinions on December 17, 2015)

The JTSB published their accident investigation reports and provided their opinions to the Minister of Land, Infrastructure, Transport and Tourism on December 17, 2015, regarding three cargo train derailments that had occurred on the Esashi Line in April to June, 2012 and received the ministry's notification regarding the following measures taken based on the JTSB's opinions:

○ Summary of the Accidents

The first of the three accidents (Esashi I)

The 3061 train, high speed freight train composed of 20 cars, starting from Hiroshima Freight Terminal station bound for Sapporo Freight Terminal station, departed from Aomori signal station at 03:52 on schedule, and arrived at Goryokaku station at 06:13, April 26, 2012.

The transport staff waiting for the train at Goryokaku station found smoke rose from the freight wagon, 18th car of the arrived train, and notified to the station office. The rushed station staffs fought the fire of the freight wagon that the smoke rose from around the bogie.

On the other hand, the switching malfunction of the turnout occurred in the premises of Kamaya station, Esashi Line, at 05:09 of the same day. The track maintenance staffs of Hokkaido Railway Company checked track condition in the premises of Kamaya station, and found that the turnout was damaged and there were traces of derailment on the sleepers around it.

The freight wagon emitting smoke at Goryokaku station was not derailed but judged as it had derailed once, by the results of the inspection about status of the wheels of the freight wagon.

A train driver was onboard the train, but there was no injury.

The second of the three accidents (Esashi II)

On September 11, 2012, the inbound High Speed Freight 2050 train, composed of 21 vehicles, starting from Goryokaku station bound for Miyagino station of Japan Freight Railway Company, departed from Goryokaku station at 18:58, 62 minutes behind the scheduled time, i.e., 17:56. As the

train stopped by an emergency brake acted automatically at around the up line starting signal in Izumisawa station, the train driver got off the locomotive and check the situation of the train according to the instruction from the train dispatcher, and found that the coupler of the brake pipe hose between the 9th and the 10th vehicle, freight wagons, was decoupled and all two axles in the rear bogie of the 9th vehicle derailed to left.

There were the driver in charge and the other driver scheduled to operate the other train from Aomori signal station to Goryokaku station, but there was no casualty.

The third of the three accidents (Esashi III)

On June 22, 2014, the High Speed Freight 7066 train, composed of 21 vehicles, starting from Sapporo Freight Terminal station bound for Utsunomiya Freight Terminal station of Japan Freight Railway Company, departed from Goryokaku station at 03:38, on schedule.

The train, while running at about 69 km/h in the premises of Satsukari station, the brake pipe pressure decreased suddenly and, at the same time, an emergency brake acted automatically, and stopped.

After the train stopped, the driver checked the train and found that the all two axles in the rear bogie of the 20th vehicle, freight wagon, derailed to right. Furthermore, the 21th vehicle, freight wagon, decoupled from the 20th vehicle and stopped at about 17 m behind the 20th vehicle.

There was the train driver onboard the train, but he was not injured.

○ Probable Causes

The first of the three accidents (Esashi I)

It is probable that the outside wheel climbed up to the top of outside rail, i.e., it was the flange climb derailment, by the increased derailment coefficient for the outside wheel, because the lateral force acting on the outside wheel had increased by the increased wheel load of the inside wheel, and the wheel load of the outside wheel had decreased, due to the large unbalance in the static wheel loads between right and left wheels of the freight wagon loaded containers, compared to the wagon with balanced static wheel load, while the train passed in the curved track of 300m radius, in this accident.

It is highly probable that the uneven loading in the containers caused the large unbalance in the wheel loads in the derailed freight wagon.

In addition, it is likely that the combination of track alignment and cross-level, which should be managed in the section where freight trains are operated, had relatively large at the point climbing up by the wheel started, promoted the decrease of wheel load of the outside wheel.

The second of the three accidents (Esashi II)

It is probable that the accident occurred as the first axle in the rear bogie of the Ko-Ki 106 type freight wagon climbed up the outer rail and derailed, because the wheel load of the outer rail side wheel reduced at the accident site while the train passed the 300 m radius right curved track.

It is probable that the wheel load acting on the outer rail side wheel reduced by a large rolling

vibration of the freight wagon running around the accident site.

Although statuses of the train operation, the maintenance of the vehicles and the railway track were implemented in accordance with the regulations of Japan Freight Railway Company and Hokkaido Railway Company, established based on the ministerial ordinance, it is probable that the freight wagon vibrated in rolling mode significantly by the combination of the following factors.

[1] The specification of the suspension device of the Ko-Ki 106 type freight wagon was that the rolling motion of the vehicle body would not converged in a short time, as the damping was small compared to the Ko-Ki 104 type freight wagon, when the loaded weight is relatively light.

[2] The load was relatively light and the center of gravity of the freight wagon was in a high position.

[3] The combination of alignment and cross-level at around the accident site, which were relatively large as close to their maintenance standard values, and were distributed along the track including the wave length components liable to introduced rolling motion of the body against the balanced speed in the curved track, had possibilities to promote the generation of rolling motion of the body.

The third of the three accidents (Esashi III)

It is likely that the accident occurred as the wheel in the outer rail side of the Ko-Ki 107 type freight wagon, climbed up the rail and derailed to right because the derailment coefficient increased due to the decrease of the wheel load and increase of the lateral force for the outer rail side wheel, as the body of the freight wagon was excited to vibrate in rolling mode significantly while the train was running in the 350 m radius left curved track.

It is probable that the significant roll vibration was excited to the vehicle body due to the existence of the large combination of alignment and cross-level which should be maintained, in the track before the point where the wheel started climbing up the rail.

It is likely that the existence of the large alignment to shorten the radius of curvature effected to increase the lateral force in the outer rail side wheels.

It is likely that the large combination of alignment and cross-level which should be maintained had existed because the on-site track maintenance section could not understand the existence of the plural kinds of the combination of alignment and cross-level measured by the high speed track inspection car, and these situation was caused in relation with the improper method to decide the necessity of the maintenance work by communication of the inspected results to the on-site track maintenance section, and a lack of the knowledge about the combination of alignment and cross-level in the on-site track maintenance section.

Although it could not be determined whether the unbalanced loading actually related to the occurrence of derailment, it is likely that the status of loading just before the accident became to a factor to promote derailment.

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

The three derailment accidents by the freight train, which occurred from April, 2012, to June, 2014

at Esashi Line, have the common situation such as that the outer rail side wheels of the freight wagon in the freight train running in relatively sharp curve near the limited speed, derailed by flange climbing.

As the probable causes for each accident were described in each investigation report, it was probable that these accidents were caused by complex combination of the factors, such as vehicle, track, loading of the freight etc., although their effected levels were different.

In addition, the Japan Transport Safety Board analyzed the issues to be dealt with cooperation by the parties concerned towards the improvement of the safety and the prevention of the derailment accidents of the freight train due to the complex combination of the factors such as vehicle, track, freight loading, etc., based on the knowledge obtained from the previous investigations, integrating the investigated results of these three derailment accidents of the freight train occurred in Esashi Line. (Refer to the attachment.)

The railway system is the integration of the various technology area, such as civil engineering, vehicle technology, electric engineering, operation, etc. Hence, the interested parties of the freight railway transportation, such as the passenger railway operators charged with track maintenance, the freight railway operators charged with vehicle management and operation etc., the freight transporters and the freight senders charged with loading freight and the railway vehicle makers manufacturing the freight wagons, are related with each other.

So that, in view of the results of these accident investigations, the Japan Transport Safety Board expresses its opinion as follows to the Minister of Land, Infrastructures, Transport and Tourism, pursuant to Article 28 of the Act for Establishment of the Japan Transport Safety Board in order to promote the parties concerned to consider the issues analyzed by the Board to improve safety for the freight train operation.

Here, when some measures were implemented according to the following opinions, please notify the Board.

1. Let the context of the accident investigation reports about the three derailment accidents of freight train occurred in Esashi Line and the attached Opinion, well known widely, to the railway operators provided tracks to freight train operation, freight railway operators, freight transporters using freight trains, railway vehicle manufacturers, etc.
2. To supervise and guide the railway operators based on the laws and ordinances, to implement smoothly the required measures for prevention of recurrence described in each accident investigation report.
3. To promote the persons concerned in railway operators, railway vehicle manufacturers, freight transporters using freight trains, freight senders, research and development organization, etc., to investigate in cooperated with each other, about the issues related with vehicles such as design of freight wagon, issues related with track such as track category and track technology in each section, issues related with freight such as loading methods, etc., towards the improvement of safety for the freight train operation.

(Attachment)

Improvement of safety of the freight train operation

Summary

Three derailment accidents of the freight train occurred in Esashi Line, from April, 2012, to June, 2014. It is probable that these accidents were caused by complex combination of the factors, such as vehicle, track, loaded freight, etc.

To prevent recurrence of the same sort of the accidents and to improve running safety of freight train further, it is required for the parties concerned in railway operators providing their tracks for freight train operation, freight train operators, freight transporters using freight trains, freight senders, railway vehicle manufacturers, research and development organizations, etc., in cooperated with each other, to grapple with issues related with vehicles such as design methods of suspension device for freight wagons, issues related with tracks such as maintenance methods for track irregularity, and issues related with loading freights such as the loading methods considering prevention of unbalanced loading and height of the gravity center of freights etc., based on the analyzed results during investigation of the derailment accidents in Esashi Line, and obtain appropriate margins against derailment as a whole. The Ministry of Land, Infrastructure, Transport and Tourism is expected to implement the proper management to promote these activities steadily.

1. Preface

A series of derailment accidents of freight trains composed of container-carrying wagons, occurred in Esashi Line, denoting in the following text as "the Esashi Line derailment accidents" which is a set of three accidents, i.e., "Esashi I" accident occurred on April 26, 2012[1], "Esashi II" accident occurred on September 11, 2012[2], and "Esashi III" accident occurred on June 22, 2014[3], have the common situation that the outer rail side wheels of the freight wagon in the freight train running in relatively sharp curve at near the limited speed, derailed by flange climbing, denoting as “Flange climb derailment accidents of freight wagon,” in the following text. As the probable causes of these accidents are described in each investigation report, it is probable that these accidents were caused by complex combination of the factors, such as vehicle, track, loading freight etc.

The results of analyses about "the Esashi Line derailment accidents" and the similar accidents occurred in the past, and the issues towards measures to prevent recurrence of the accidents required to examine in the future, are shown in the following text.

(Refer to the Attached table "Summary of the Esashi Line derailment accidents")

2. Flange climb derailment accidents of freight wagon and already implemented measures to prevent derailment

Figure 1 shows the data about flange climb derailment accidents and the similar accidents occurred

after FY1952[4]-[6]. The flange climb derailment accidents of freight wagons at main tracks had occurred frequently until around 1980, and probable causes of these accidents were determined as combination of various factors while the vehicles and the tracks were maintained within the criterion values for control, and so called as "multiple-factor derailments". The Tsurumi accident, occurred in Tokaido Main Line in November, 1963, was the multiple collision accident originated by derailment of freight wagon, and became to the disastrous accident killing 161 people. To respond this accident, Japan national railway, at that time, established the investigate committee to conduct a variety of examination including on-track tests, and implemented the measures to prevent multi-factor derailments from the viewpoints of both vehicle and track[7], i.e., softened spring constants of the secondary suspension of the TR-41 series bogie, remodeled to use with oil dampers, added the combination of alignment and cross-level to the items in the management of track irregularity, etc. As the results of implementation of these measures, there was no multiple-factor derailment accident after FY1982, however, in recent years, the same sort of derailment accidents came to happen again.

As shown in Table 1, seven accidents of the same sort of derailment occurred from 1998 to the present, and the recent three accidents occurred at Esashi Line. Here, Esashi Line became to the track section where freight trains run very frequently after connected with Kaikyo Line in 1988, has the features that there are many relatively sharp curves. Generally, margins against derailment is reduced in the curved section of small radius with large track irregularity, then it is somewhat likely that there were the trends liable to reduce margins against derailment in Esashi Line, compared with the other section. Here, although further precise analyses are needed, it is required to investigate on the same sort of derailment in the track sections where freight trains are operated, as it is probable that these situations are not peculiar to Esashi Line only

The types of the derailed freight wagons were Ko-Ki 106, Ko-Ki 107 and Ko-Ki 200*. All of them are relatively new type freight wagons manufactured after 1997, i.e., the first Ko-Ki 106 type freight wagon was manufactured in 1997, the first Ko-Ki 200 type wagon was manufactured in 2000, and the first Ko-Ki 107 type wagon was manufactured in 2006.

* "Ko-Ki": "Ko" means freight wagon for containers, "Ki" means loading capacity over 25 tons

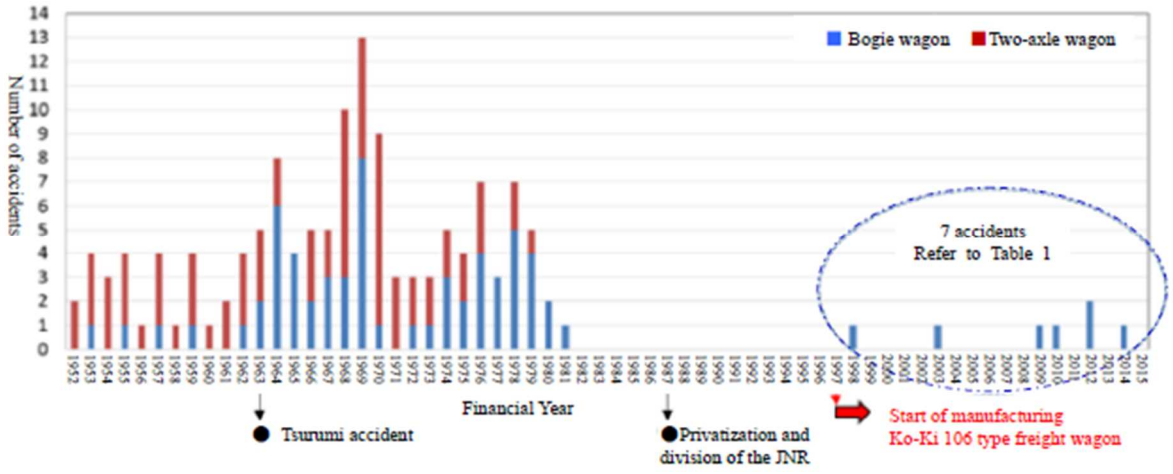


Figure 1 Changes of flange climb derailment and similar derailment accidents of freight wagon

Table 1 Recent flange climb derailment accidents of freight wagon

No	Date of accident	Line name	Accident site	Wagon type	Velocity	Radius of curve	Operators * (vehicles - track)	Remarks
1	Aug. 26, 1998	San-yo Line	Between Seno station and Hachihommatsu station	Ko-Ki 106	55 km/h	300 m	JR Freight - JR West	
2	May 22, 2003	Tokaido Line	In the premises of Tokyo Freight Terminal station	Ko-Ki 106	42 km/h	About 268 m	JR Freight -JR Freight	# Simple turnout No.12
3	Dec. 19, 2009	Nippo Line	Between Sotaro station and Ichitana station	Ko-Ki 200	60 km/h	300 m	JR Freight - JR Kyushu	
4	Mar. 10, 2011	Narita Line	Between Kuzumi Station and Namegawa station.	Ko-Ki 200	57 km/h	406 m	JR Freight - JR East	
5	Apr. 26, 2012	Esashi Line	Between Izumisawa station and Kamaya station	Ko-Ki 107	57 km/h	300 m	JR Freight - JR Hokkaido	"Esashi I"
6	Sept. 11, 2012	Esashi Line	Between Kamaya station and Izumisawa station	Ko-Ki 106	59 km/h	300 m	JR Freight - JR Hokkaido	"Esashi II"
7	Jun. 22, 2014	Esashi Line	Between Izumisawa station and Satsukari station	Ko-Ki 107	63 km/h	350 m	JR Freight - JR Hokkaido	"Esashi III"

* JR Freight : Japan Freight Railway Company, JR West : West Japan Railway Company, JR East : East Japan Railway Company, JR Kyushu : Kyushu Railway Company, JR Hokkaido : Hokkaido Railway Company.

3. Toward prevention of recurrence.

It is probable that the Esashi Line derailment accidents were caused by complex combination of the factors, such as vehicle, track, loading freight etc., as their degrees of influence differ in each accident. In this chapter, analyses are implemented about issues to be investigated, related with vehicle, track, and loading freight, that the party concerned should grapple in cooperated with each other, to improve margins against derailment as a whole, to prevent recurrence of the same sort of the accidents and further improvement of running safety of the freight train, based on the analyzed results about vehicles, track, and loading freight in the Esashi Line derailment accidents.

[Refer to the Attached diagram "Factors of the Esashi Line derailment accidents and their degrees of influence, etc."]

3.1 Issues related with vehicles

According to investigation results about the accidents "Esashi II" and "Esashi III", it was found that Ko-Ki 106 type freight wagons and wagons manufactured after that still used coil spring type secondary suspension with enlarged spring constant as to load heavy international ISO standard type containers, etc., under restriction of height of the couplers, responding the needs such as higher efficiency, faster speed, and internationalization in the freight transport market, while the bolster dampers were designed to select conventional devices aiming to use common parts.

When the freight wagons of these types run on the track where there is combination of alignment and cross-level having the property to excite rolling motion of vehicle bodies largely, there are the cases to decrease running safety by the significantly decreased dynamic wheel loads due to enlarged rolling notion of the vehicle body, compared with the freight wagons equipped with smaller spring constant type secondary suspensions [8]-[12]. It was found from the investigation results of the

accident “Esashi II”, that there exists “the disadvantageous situation against running safety”, in which the damping characteristics of the bolster damper could not demonstrate its ability well according to situation of loaded freight, and these trends become remarkable especially in Ko -Ki 106 type freight wagons and wagons manufactured after that. Here, in the “Esashi II” accident, it is probable that the freight wagon derailed by the combination of relatively large combination of alignment and cross-level in relatively sharp curve, relatively light loaded freight and their gravity center was in higher position, in addition to above mentioned factors.

Then, as for the vehicle, the parties concerned should investigate to use the suspension device with proper damping characteristics and to equip suspension device which can obtain proper damping characteristics regardless of quantity of loaded freight, referring to methods of freight loading and situation of the track section where freight trains are operated, etc., to realize safe operation of the concerned freight wagons with proper margins against running safety.

3.2 Issues related with Tracks

It is probable that the decreased wheel load promoted by the large combination of alignment and cross-level will effect relatively large as the factors related to tracks in the probable causes of the flange climb derailment accidents of freight wagons.

The management system for combination of alignment and cross-level was investigated and implemented for bogie wagons using TR41 series bogie or two-axle wagons of Wa-La-1 type, etc., as one of the measures preventing recurrence of multiple-factor derailment described in the above Chapter 2, and was introduced in around 1980, in almost the same contents with the present system. The present management system can be estimated as effective at a certain level, because the multiple-factor derailment accidents were extremely reduced after the present management system was introduced, and the similar accidents did not happen until recent years, provided that the freight wagons, which were the target of improvement at that time, became not in use at present.

On the other hand, a part of flange climb derailment accidents of freight wagons, occurred in recent years, were caused by the combination of alignment and cross-level which were not satisfied the values of the maintenance standard. It is suggested that there is the possibility to reduce margins for safety by the management methods covered by the present management system of combination of alignment and cross-level, provided that there are the other factors than the track, for example, unbalance of loaded freight in the accident "Esashi I" and lack of damping in suspension device in the accident "Esashi II".

Then, in the issues related with track, in addition to implement proper management of combination of alignment and cross-level based on the present management system, including general measures such as investigation about the range to install guard angle, the parties concerned in railway operators and research institutes are required to investigate the management system of track irregularity in the section where freight trains are operated, considering the characteristics of freight wagons based on characteristics of track section and loading methods of freight loads.

3.3 Issues related with loading freight

In the issues related with loading freight, there are issues such as unbalanced loading of freight and height of the gravity center of loaded freight.

As for the unbalanced loading of freight, the following measures are described in the investigation report about “Esashi I” accident, these are, Japan Freight Railway Company asked the transport operators using railway to let noticed their employees well the context of the contract on freight transport such as prevention of unbalanced loading and confirmation of loaded status, and Japan Freight Railway Company will confirm the status of loaded freight in corporation with the transport operators using railway, from viewpoints of preventing unbalanced loading in the containers to avoid large unbalance of static wheel weight in freight wagons. In response to these activities, at present, the Ministry of Land, Infrastructure, Transport and Tourism and the operators concerned established "Investigation meeting on measures against unbalanced loading in railway freight transport", and the measures at a certain level were implemented based on the intermediate summaries of the meeting.

As for the height of the gravity center of loaded freight, it was found by the investigation results on the accident "Esashi II" that there is the case that rolling motion of the vehicle cannot be damped well by poor damping characteristics when the weight of loaded freight is relatively light, due to the switching condition of damping characteristics of the bolster damper of freight wagons, and the margins against derailment will be reduced when the gravity center of vehicle body is high even when weight of loaded freight is relatively light, in these situation.

Then, as for the issues related with loading freight, the "Investigation Committee on measures against unbalanced loading in railway freight transport" is expected to investigate successively about introduction of the system that can detect easily the unbalance of wheel weight of the wagon loaded containers, in addition to the measures to prevent unbalanced loading. Furthermore, the meeting is also required to investigate the loading methods considering weight and the height of the gravity center of loaded freight, adding the characteristics of the freight wagon in operation.

4. Conclusion

Railway is the integrated system of various technology areas, such as civil engineering, vehicle technology, electric engineering, operation, etc., then it is very important to obtain safe operation that every technology divisions corporate with each other. In the railway freight transportation, the passenger railway operators charged with track maintenance etc., the freight railway operators charged with vehicle management and operation etc., the freight transporters and the freight senders charged with loading freight, and the railway vehicle makers manufacturing the freight wagons, are related.

After this, the research institutes in addition to these parties concerned with freight transport are requested to grapple with each other towards the further improvement of running safety of freight trains, obtaining proper margins against derailment as the whole, considering possibilities of realization based on the status of characteristics and operation of freight wagons, and the status of track maintenance etc., in the investigation of various issues including the issues analyzed in the

previous Chapter 3. Ministry of Land, Infrastructure, Transport and Tourism is expected to take proper responses to promote steady implementation of these activities.

References

[1] Japan Transport Safety Board: "Railway accident investigation report, RA2014-7-2, train derailment, between Izumisawa station and Kamaya station, Esashi Line, Japan Freight Railway Company", published on July 25, 2014, in Japanese.

[2] Japan Transport Safety Board: "Railway accident investigation report RA2015-9-2, train derailment, between Kamaya station and Izumisawa station, Esashi Line, Japan Freight Railway Company", published on December 17, 2015, in Japanese.

[3] Japan Transport Safety Board: "Railway accident investigation report RA2015-9-3, train derailment, between Izumisawa station and Satsukari station, Esashi Line, Japan Freight Railway Company", published on December 17, 2015, in Japanese.

[4] K. Miyashita, T. Kageyama, M. Osanai: "Management of track irregularity", Railway Track, Vol.32, No.9, September, 1984 – Vol.33, No.5, May, 1985, in Japanese.

[5] Railway Technical Research Institute: "Railway safety database", in Japanese.

[6] URL for searching railway accident investigation report published by Japan Transport Safety Board, http://jtsb.mlit.go.jp/jtsb/railway, in Japanese.

[7] T. Miyamoto, K. Watanabe, "Railway track", Sankaido, p.419-421, July, 1980, in Japanese.

[8] Ibaraki University: "Research report on dynamic simulation of freight train related with derailment accident in Esashi Line of Japan Freight Railway Company", October, 2015, in Japanese.

[9] M. Ikemori, "Research on maintenance of waveform of track irregularity", RTRI Report, No.1038, March, 1977, in Japanese.

[10] M. Matsuo: "Phenomena of decreased wheel load of freight wagon and measures preventing derailment", Railway Technology, 43-2, February, 1986, in Japanese.

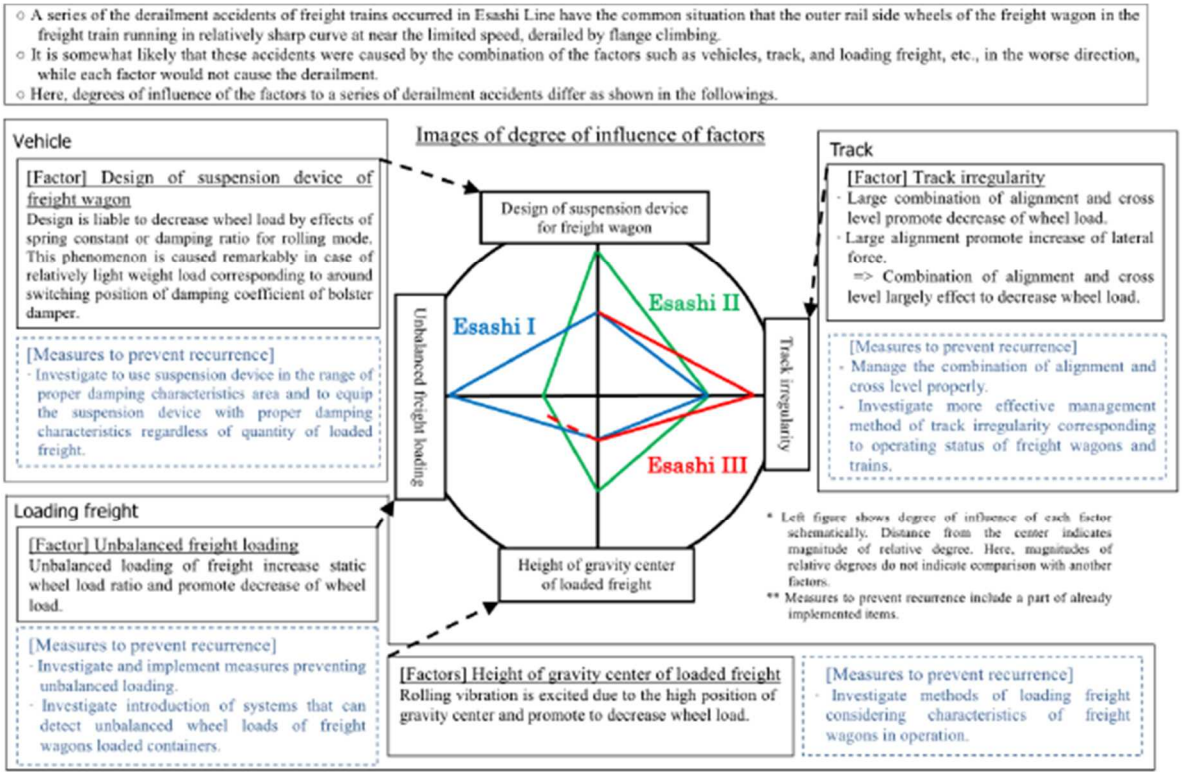
[11] M. Ikemori: "Correlation between track irregularity and running safety of two-axle freight wagon in the tests at Karikachi test line", RTRI Report, No.776, October, 1971, in Japanese.

[12] S. Matsui: "Research on multiple factor derailment of two-axle freight wagon", RTRI Report, No.827, January, 1973, in Japanese.

Attached table: Summary of the Esashi Line derailment accidents

	Esashi-I (Occurred on April 26, 2012)	Esashi-II (Occurred on September 11, 2012)	Esashi-III (Occurred on June 22, 2014)
Track	Left curve of 300m radius with 100mm cant.	Right curve of 300m radius with 100mm cant.	Left curve of 350m radius with 90mm cant.
	Enhancement of track strength and minor improvement of track shapes were implemented in the construction works improving Esashi Line from class 4 (Hei) to class 2, along with connection to Kaikyo Line.		
Wagon type	Ko-Ki 107 type	Ko-Ki 106type	Ko-Ki 107 type
Derailed vehicle	18th vehicle of 20 vehicle train set.	9th vehicle of 21 vehicle train set.	20th vehicle of 21 vehicle train set.
First derailed axle	Front axle in the rear bogie (3rd axle)	Front axle in the rear bogie (3rd axle)	Front axle in the rear bogie (3rd axle)
Velocity	About 57 km/h	About 59 km/h	About 63 km/h
Probable causes	It is probable that the outside rail side wheel climbed up to the top of the rail and derailed, due to the increased derailment coefficient for the outside wheel, because the lateral force acting on the outside wheel had increased by the increased wheel load of the inside wheel, and the wheel load of the outside wheel had decreased, due to the large unbalance in the static wheel loads between right and left wheels of the freight wagon loaded containers, compared to the wagon with balanced static wheel load, while the train passed in the curved track of 300m radius, in this accident. It is highly probable that the unbalanced loading in the containers caused the large unbalance in the static wheel loads in the derailed freight wagon. In addition, it is somewhat likely that the combination of alignment and cross-level, which should be managed in the section where freight trains are operated, had relatively large at the point before the wheel started to climb up, promoted the decrease of wheel load of the outside wheel.	It is probable that the accident occurred because wheel loads of outer rail side wheel in the first axle in the rear bogie of the Ko-Ki 106 type freight wagon was decreased at around the accident site, while the train passed the 300 m radius right curved track, and the wheel climbed up the outer rail and derailed. It is probable that the wheel load acting on the outer rail side wheel reduced by a large rolling vibration of the freight wagon running around the accident site. Although statuses of the train operation, the maintenance of the vehicles and the railway track were implemented in accordance with the regulations of Japan Freight Railway Company and Hokkaido Railway Company, established based on the ministerial ordinance, it is probable that the freight wagon vibrated in rolling mode significantly by the combination of the following factors. [1] The specification of the suspension device of the Ko-Ki 106 type freight wagon was that the rolling motion of the vehicle body would not converged in a short time, as the damping was small compared to the Ko-Ki 104 type freight wagon, when the loaded weight is relatively light. [2] The load was relatively light and the center of gravity of the freight wagon was in a high position. [3] The combination of alignment and cross-level at around the accident site, which were relatively large as close to their maintenance standard values, and were distributed along the track including the wave length components liable to introduced rolling motion of the body against the train velocity, had possibilities to promote the generation of rolling motion of the body.	It is somewhat likely that the accident occurred as the outer rail side, right, wheel of the Ko-Ki 107 type freight wagon, climbed up the rail and derailed to right because the derailment coefficient increased due to the decrease of the wheel load and increase of the lateral force for the outer rail side, right, wheel, as the body of the freight wagon was excited to vibrate in rolling mode significantly while the train was running in the 350 m radius left curved track. It is probable that the significant roll vibration was excited to the vehicle body due to the existence of the large combination of alignment and cross-level which should be maintained, in the track before the point where the wheel started climbing up the rail. It is somewhat likely that the existence of the large alignment to shorten the radius of curvature effected to increase the lateral force in the outer rail side wheels. It is somewhat likely that the large combination of alignment and cross-level which should be maintained had existed because the on-site track maintenance section could not understand the existence of the plural kinds of the combination of alignment and cross-level measured by the high speed track inspection car, and these situation was caused in relation with the improper method to decide the necessity of the maintenance work by communication of the inspected results to the on-site track maintenance section, and a lack of the knowledge about the combination of alignment and cross-level in the on-site track maintenance section. Although it could not be determined whether the unbalanced loading actually related to the occurrence of derailment, it is somewhat likely that the status of loading just before the accident became to a factor to promote derailment.

Attached diagram: Factory of the Esashi Line derailment accidents and their degree of influence, etc.



○Measures taken by the Minister of Land, Infrastructure, Transport and Tourism in response to the JTSB's opinions

The minister issued instructions "Regarding Railway Accident Investigation Reports on Train

Derailment Accidents on the Esashi Line Operated by Japan Freight Railway Company" (Kokutetsuan Nos. 62, 62-2 and 62-3) dated on December 17, 2015 to inform domestic railway business operators, railroad vehicle manufacturers and consigned freight transportation business operators of the JTSB's railway accident investigation reports and opinions.

The minister checked the railway accident investigation reports based on Article 5 of the Ordinance on Report on Railway Accidents, etc. (submitted from Japan Freight Railway Company to the Hokkaido District Transport Bureau Director) and confirmed that the measures against the recurrence of the accidents in question were completed. The ministry will continue administrative guidance to the companies involved in the accidents and railway business operators who own facilities similar to those involved in the accidents by conducting safety inspections and other means when necessary.

The "Review Meeting for Improving Cargo Train Operation Safety" the members of which consist of railway business operators, consigned freight transportation business operators, other relevant bodies and research institutions as well as the Ministry of Land, Infrastructure, Transport and Tourism was set up. The results of its review of the above measures were compiled in and issued as the "Safety Improvement of Cargo Train Operations" (kokutetsugi No. 66 and Kokutetsushi No. 141) dated September 30, 2020. The ministry instructed the aforementioned railway business operators to take on measures consistent with the contents compiled by the review.

On the basis of the "Safety Improvement of Cargo Train Operations" (administrative circular) dated on September 30, 2020, the ministry will develop implementation plans on measures for train vehicles and railway trucks and monitor their progress.

8 Provision of factual information in 2020 (railway accidents and serious incidents)

The JTSB provided no factual information in 2020.

Colum

Investigations of derailment accidents involving trains using rubber wheels

Railway Accident Investigator

There are railways on which trains run with rubber tires, not iron wheels, such as guide rail-type railways (e.g. new transportation system) and monorails. In this column, I will show some examples of new transportation system derailments that occurred due to tire damage.

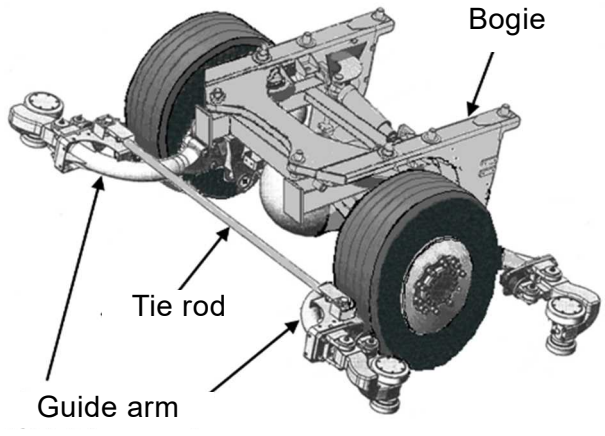
An example of a running wheel being used on the new transportation system

Functions such as operation control and safety devices for new transportation system vehicles we investigated were similar to those of common railway vehicles, but the parts that are most integral to locomotion (wheels) are almost identical to those of automobiles.

Therefore, tires for the new transportation system are hardly different from those of common automobiles and each of them has a "Nakago," (Safety wheel) made of cast aluminum alloy that makes it possible for the train to continue on a short distance even if puncture—to a rail yard for example.

In most of the accidents sites we investigated, railway tracks were strewn with debris of various sizes from tires and safety wheel over areas of more than 700-meters. Various damages to railroad components also noted.

An example of a traveling section used for the new transportation system



Key points in the estimation of the chain of events leading to derailments are the locations and sizes of the tire and safety wheel pieces, the degree of damage to railroad components and their relative positions. In our investigations, we made a point of not overly focusing on damage to each tire and safety wheel, while estimating various factors that likely led to tire damage without excluding potentially relevant factors. We subsequently eliminated less potentially factors one by one. (see page 66 for causes and factors in investigation reports).

Since it is often difficult to determine which tire and safety wheel was damaged first, for example, we checked their structural integrity based on their mechanical properties, such as component material and strength of the safety wheel.

If damage to the tire of a running wheel was only due to puncture, the vehicle would be able to continue on, but if the tire is torn and the concrete road surface and the safety wheel come into direct contact, the Nakago is likely to be damaged even after a short distance.

On the other hand, since the analysis of a rubber tire requires technical knowledge that is different from that required for an iron wheel analysis, we requested that damaged tires be inspected by the Japan Automobile Tyre Manufacturers Association (general incorporated association) toward the identification of factors resulting in their damage.

There are only eight domestic business operators using the new transportation system (side guide rail type railways). To collect as much information as possible regarding other business operators' maintenance management methods, malfunction records and the situation of puncture-detection device installation, the JTSB conducted questionnaire research for such information with their cooperation.

I would like to take this opportunity to thank parties involved in our research, including the Japan Automobile Tyre Manufacturers Association, for their vital cooperation.

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

Derailment due to punctured tires on the new transportation system

A train derailment that occurred between Kamonomiya Station and Tetsudo-Hakubutsukan Station on the Ina Line of Saitama New Urban Transit Co., Ltd.

Summary: On January 16, 2019, during travel, the driver heard a strange sound like “bang” from the rear of the train, so he applied the brake. After stopping, the situation was confirmed through the inside of each vehicle, and when the sixth car was seen from the gangway behind the fifth car, the front part of the vehicle body of the sixth car was tilted to the left and shifted by about 50 cm. The attendant who arrived after receiving a call from the control center confirmed that the left front of the sixth car had made contact with the side wall of the viaduct, and the left tire of the first axle had been damaged and had deviated from the running track. The coaxial right tire was also damaged.

About 100 passengers and one driver were on board the train, but no one was injured.

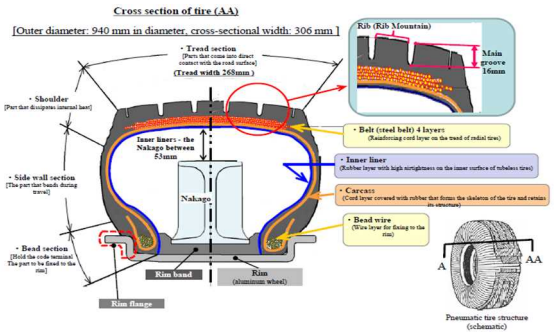
Findings

Damage to the tire on the left side of the front axle

- A fracture on the curcass and peel-off of tread occurred.
- Damage was more conspicuous at the tread section than the side section. The whole inner surface of the tread was damaged.
- The steel belt was exposed due to tread wear.

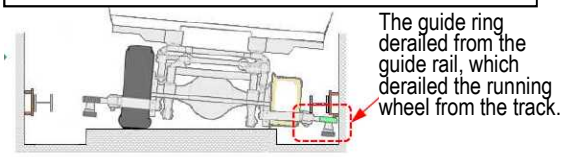
It is highly probable that, after losing air pressure, the train kept running while the inner surface off the tire and the Nakago (safety wheel) were in contact with the rail, which ultimately resulted in damage to the Nakago.

- Some tires with worn tread patterns were found on other vehicles.
- In the extraordinary inspection carried out nine days before the accident, the inspector did not measure the depth of the tread patterns and, after visual inspection, replaced only tires with exposed steel belts .



- In inspections performed every 90 days, only grooves with the least wear among the four were measured.
- In inspections performed every eight days, tire wear was not checked.

An image of post-accident tire without safety wheel



Due to main tire groove inspections often failing to include the most severely worn portions and due to the inspection intervals being long relative to travel distances, it is probable that the tire wear situation was not discovered in a timely

Probable causes: It is highly probable that the accident occurred when the left tire on the front axle of the vehicle was damaged, causing the air pressure to drop drastically, and the vehicle ran with the tire damaged, causing the safety wheel to break, the guide wheels to come off the guide rail below, and the running wheels to deviate from the track, resulting in derailment.

As for the damage to the tire, it is highly probable that the wires of the steel belt broke due to running with the inner surface of the tire and the safety wheel in contact due to extreme under inflation of the tire.

With regard to the extreme air pressure shortage of the tire, it is probable that the wires of the belt were broken because the tire was run with the steel belt exposed due to wear of the tread section, and some of the wires reached the inner surface of the tire, causing air leakage.

As for the fact that the train was running with the steel belt exposed due to wear of the tire tread, it is probable that the depth of the main grooves was not measured during the temporary inspection, and the wear condition of the tires was not checked during the train inspection, so the situation where the main grooves of the tread had disappeared due to wear was not sufficiently confirmed and that they continued to operate the trains without sufficiently checking the condition of the main grooves on the treads.

See the accident investigation report published on October 29, 2020 for detailed investigation results at the following:
https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-5-1e.pdf

Train collision with a pedestrian entering a class 4 level crossing

A level crossing accident at Yamanone level crossing inside the yard of Zushi Station on the Yokosuka Line of East Japan Railway Company

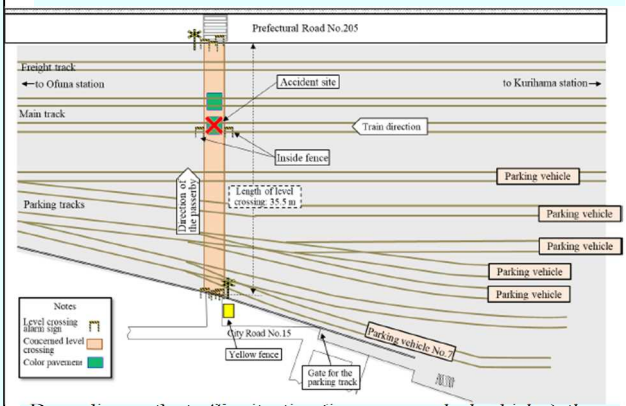
Summary: On March 21, 2019, while the train was operating in the yard of Zushi Station, the operator noticed an abnormal sound near Yamanone level crossing, so he carried out an emergency stop and activated a wireless alarm. As the result of the investigation of the scene, an injured person was found in the railway track, and found as dead although the ambulance was called. After that it was found out by the image records that the dead person was a passerby having entered the level crossing from its south side and collided with the concerned train.

Findings

- It is highly probable that the speed of the train at the time of the accident was 53 km/h.
- The length of the level crossing is 35.5 m.
- The line-of-sight distance from the location where the pedestrian entered to a train of the same travel direction is 300 m.
- The level crossing has structural problems related to the large volume of lines that cross it and its excessive length of 35.5 m, which make it difficult for pedestrians to view the overall traffic situation.

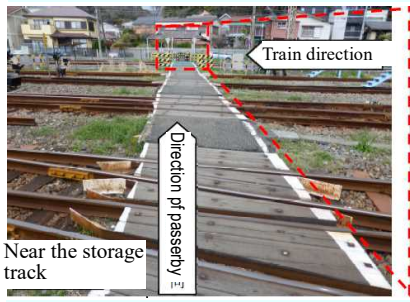
Due to these structural problems, it is probable that the pedestrian could not have reached the opposite side before being struck, even if the pedestrian had checked both ways before entering the level crossing.

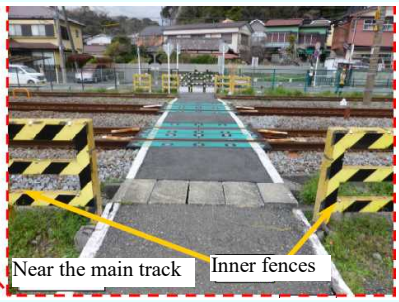
A prefectural road (without a sidewalk) running parallel with the railroad and located north of the level crossing has no place to install a level crossing safety appliance within the railroad yard.



Depending on the traffic situation (i.e., many parked vehicles), there are many potential blind spots for pedestrians.

Even as the accident occurred, the business operator managing the level crossing (hereinafter referred to as the "company") was aware of this dangerous situation and was proposing its abolition to the municipal government and others but the negotiations did not progress quickly enough, then accident occurred.





The JTSB recommended the following desirable measures for preventing the recurrence of the level crossing accident

- Emergency measures taking into account the special characteristics of the level crossing, such warning users of the danger
- The necessity of parties concerned, including the company, Zushi City and local residents to prioritize safety by discussing the abolition of the level crossing, the construction of an alternative railroad crossing facility and other safety measures, proceed with the discussion, decide policy promptly and implement concrete measures

Probable causes: It is highly probable that the concerned accident was caused by that the pedestrian collided with the concerned train because the pedestrian passing Yamanone level crossing, the class 4 level crossing without crossing gate nor road warning machine, entered the up track in the concerned level crossing in the situation that the train was approaching in the up track.

It could not be determined the precise situation why the concerned pedestrian entered the up track in the situation that the train was approaching in the up track, because the pedestrian was dead, although it is likely that the pedestrian did not notice the approaching train , and that it was related with the difficulty to cross through the concerned level crossing only by the safety check when entered the level crossing as the structure of the concerned level crossing was in the status as the main track s could not be viewed by the parking vehicles depending on the circumstances, in addition there were many tracks to be crossed and the length of the level crossing road was long as 35.5 m.

See the accident investigation report published on March 26, 2020 for detailed investigation results at the following:
https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-2-1e.pdf (Synopsis)

Departure without carrying a tablet and entry into a safety block section where another vehicle was present

A serious incident (incorrect management of safety block) between Asakura Stop and Yashiro Stop on the single-track Ino Line, Tosaden Traffic Co., Ltd.

Summary: On March 25, 2019, the driver (A) of train A departed Asakura stop (a single track section) without carrying a tablet although he was supposed to drive the train after shifting from the pilot system (ad-hoc safety block) to the tablet system required between Kagamigawabashi stop and Asakura stop. When the train A came to within six meters before Asakuraeki-mae stop, driver A noticed the oncoming inbound single-vehicle (train B) and immediately stopped the train. At the same time, while train B was running through Asakura Intersection, the driver noticed the train A standing at the front, so he stopped his train past the intersection (about five meters before Asakuraeki-mae stop). Eight passengers plus driver A were on board train A and five passengers plus driver B were on board train B but nobody was injured.

Findings

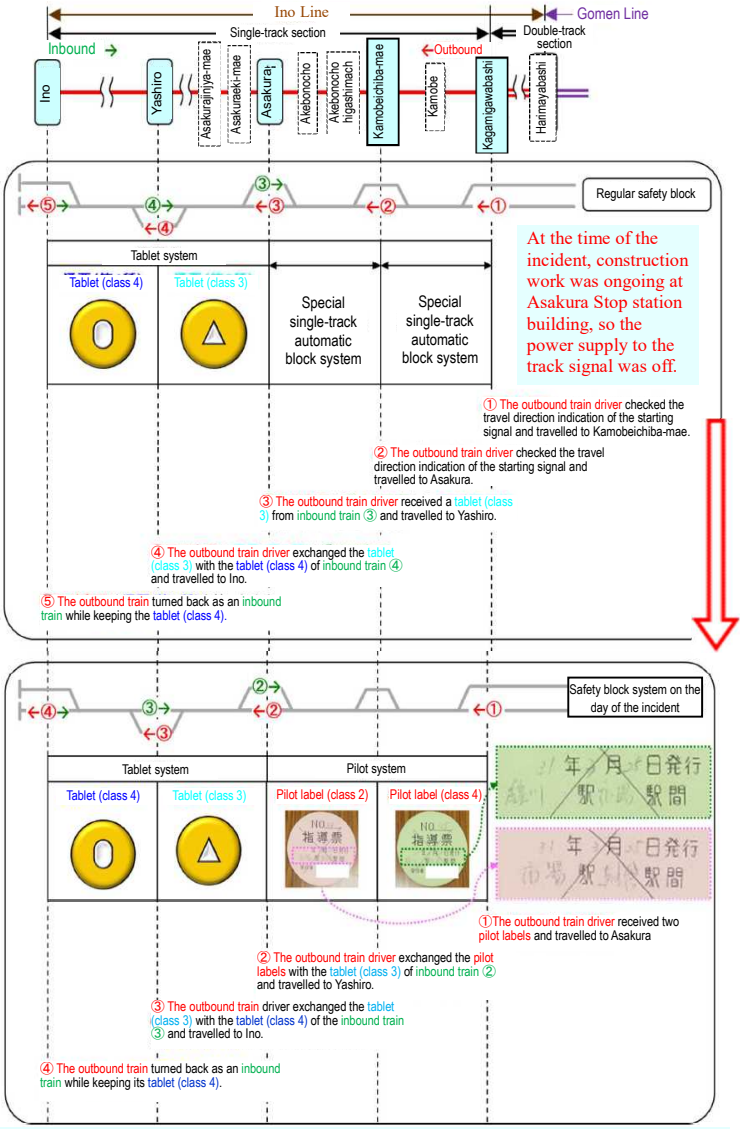
Testimony by driver A
"The train operation that resulted in this serious incident was my first time driving a train by the pilot system."

Testimony of the driver who was on board the train A as driver A's instructor for pilot system
"In a single-track section, a train operation tends to get delayed even with a skilled driver, so I thought it difficult for a newcomer to drive without a delay while learning the pilot system and I myself drove the train instead of him to show him a good example."

Testimony by Kagamigawabashi Stop Stationmaster
"A safety-block shift to the pilot system was carried and notified several times in the past, but I have never been instructed as to how I should communicate data from an operation notification ticket or how to confirm whether or not they were understood."

After the stationmaster notified driver A of the safety-block shift, he failed to have driver A recite his notification and mutually check the contents of the notification.

The video image recorded before the train A departed Asakura Stop shows that driver A picked up and checked the pilot label but failed to carry the tablet and perform "finger pointing and call" in front of the train operation timetable.



It is probable that driver A did not correctly understand the track section described in the pilot label and the operation notification ticket nor the meaning of "finger pointing and call" using the train operation timetable.

Probable causes: In this serious incident, it is certain that the driver of train A departed Asakura Stop (section between Asakura Stop and Yashiro Stop: a single-track section where the tablet system was in force) without carrying a tablet and entered a safety block section where oncoming train B was present. Regarding the driver started train A from Asakura Stop without his tablet, it is probable that he could not appropriately judge and apply what he was instructed regarding the pilot and tablet systems and because, after the Kagamigawabashi Stop stationmaster notified the safety block to the driver, he neglected to engage in basic mutual checks such as making the driver recite his notification. As for the reasons why the driver could not judge and apply according to the situation what he was educated regarding the pilot and tablet systems and why the stationmaster neglected the mutual check of the notification contents, it is likely that the company's train operation education system for both drivers and stationmasters was inadequate.

For detailed investigation results, see the accident investigation report published on July 30, 2020 at the following:
https://www.mlit.go.jp/jtsb/eng-rail_report/English/RI2020-1-1e.pdf (Synopsis)

Train derailment after encountering soil and sand from a collapsed slope

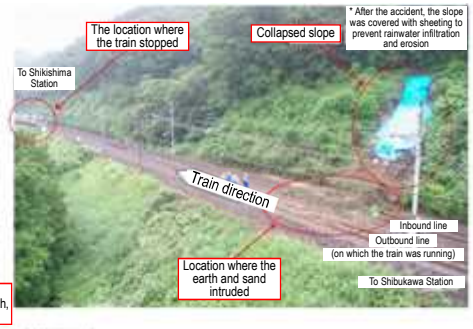
Train derailment accident between Sibukawa and Shikishima Stations on the Joetsu Line, East Japan Railway

Summary: On June 28, 2019, when the driver was operating the train at about 76 km/h between Shibukawa Station and Shikishima Station, he saw a fallen tree ahead on the railroad, so he immediately applied emergency brake but the train collided with earth and sand that had fallen with the fallen tree onto the railroad before stopping. The first axle of the front bogie of the first train derailed leftward.

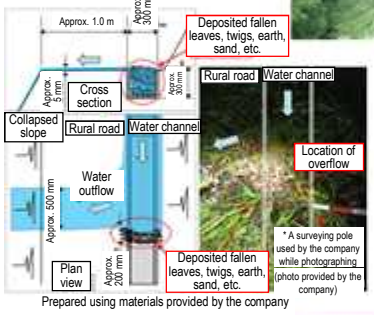
About 80 passengers and 2 crew members (the driver and conductor) were on board and one passenger was injured.

Findings

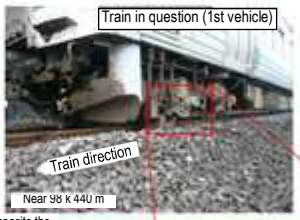
It is likely that a relatively large amount of rainfall had occurred at the site before the accident. A water channel is present at the upper side of the collapsed slope, so it is probable that intense water outflow from the channel spilled onto the rails.

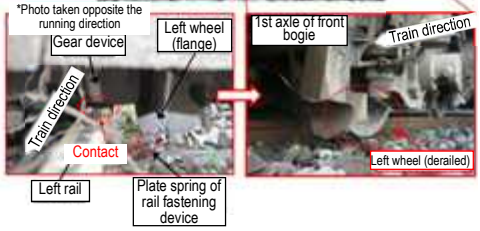


The above-mentioned water channel is an open conduit without a screen (i.e., a weir) and was managed by its users on a voluntary basis. Therefore, branches and leaves easily deposited inside it. It is probable that it was not appropriately managed despite its deposition-prone structure.



Prepared using materials provided by the company





It is probable that the intense flow of water from the water channel flooded the rails. It is likely that the slope collapsed due to an increased amount of water saturated into surface soil which destabilized it.

The JTSB pointed out as follows, measures for preventing the recurrence of this accident.

- The owner of this water channel should discuss problems with concerned parties including users to structurally strengthen the channel and prevent blockage of water flow. It is also necessary for the owner to cooperate with concerned parties to continuously manage and maintain daily functions by means of inspections and appropriate dredging.
- It is recommended that measures be taken such as installing equipment for disaster detection at the slope in question and providing slope-protecting measures. When vital railroad accident prevention measures are outside sites owned by the company, the company should request the cooperation of and provide information to relevant land managers and discuss the measures with parties concerned.
- It is desirable for the company to investigate locations similar to the accident site and take preventive measures such as identifying railroad facilities where focused patrols and monitoring are necessary according to water passage structures and surrounding situations.
- It is also desirable for the company to make further efforts for accident prevention, for example by not only investigating and assessing the risks of nearby water channels in order to ascertain unstable locations to the extent possible but also by utilizing obtained data especially from regular slope inspections.

Probable causes: It is highly probable that this accident occurred due to the collapsed slope and fallen tree near the rail track along with soil and sand from the collapse were impacted by the train.

Due to fallen leaves and other sediments accumulating inside the water channel installed on the upper part of the slope in question, it is likely that water flow was blocked and an intense overflow traveled over the slope, which destabilized and collapsed the slope.

For detailed investigation results, see the accident investigation report published on July 30, 2020 at the following:
https://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2020-3-2e.pdf

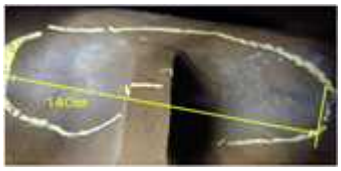
An abnormal noise during a train operation – A crack found by a post-operation vehicle check
A serious incident (vehicle damage) in Suminoe inspection ward, Nankai Electric Railway Co., Ltd.

Summary: The train left the Nankai Main Line Namba Station on time on August 23, 2019 (Friday). While traveling, the conductor noticed the sound of rub against the connecting part. After that, while the train was running, the same conductor confirmed the same sound from the connection. For this reason, the conductor reported the occurrence of abnormal noise to the transport commander via train radio. The commander sent two car inspection staff to the train. They checked the condition of the vehicle, but there was no abnormality. Therefore, they instructed to check the vehicle after the operation on the day.
After the operation, when the car inspection staff checked the vehicle again at the Suminoe inspection area, a crack of about 140 mm was found on the back of the 1st axis traction motor seat of the 2nd bogie of the 2nd car. (Around 0:10 on August 24, 2019)

Findings

The crack was found at the weld spot connecting the side of the bogie and the reinforcing rib of the back of the main (traction) motor seat.

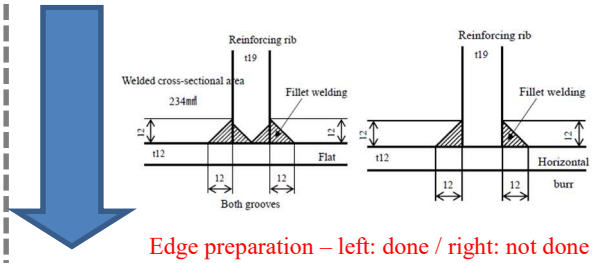
When a crack was found on a traction link (traction rod) seat, the bogie frame was reinforced as a preventive measure (by a bogie manufacturer in 2005).
・A reinforcing rib was attached to the back of the main motor seat.



The crack part (reinforcing rib welded part)
Traction motor seats are welded on the horizontal burr

(See Feature: bogie models (page 9))

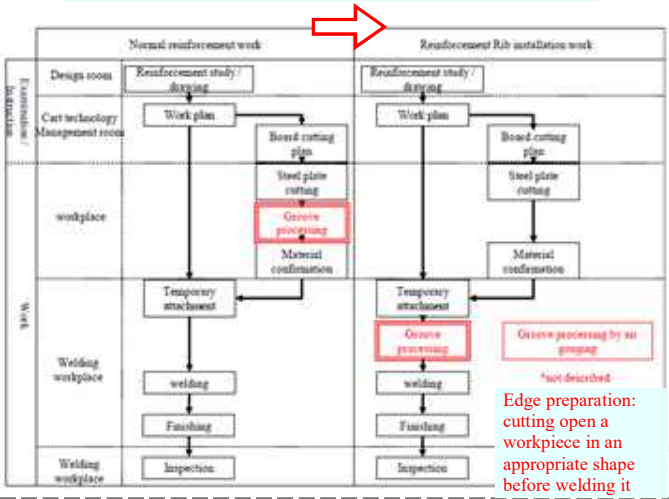
The procedure proposed to the weld shop did not mention edge preparation. It is likely that the bogie technology management office did not adequately explain edge preparation to the work manager.
It is likely that the welder who was instructed by the work manager temporarily welded reinforcing rib (tack welding) in a way similar to normal reinforcement work and then welded it without edge preparation.



Edge preparation – left: done / right: not done

It is highly probable that, as a result of welding without edge preparation, the weld spot between the side of the bogie and the reinforcing rib became defective.

The member is too small for the equipment of the cutting workshop to process it.



Edge preparation: cutting open a workpiece in an appropriate shape before welding it

Probable cause: It is highly probable that this serious incident was caused by the cracks that occurred in the weld between the side of the bogie frame of the vehicle and the reinforcing ribs on the back of the traction motor seat, which developed due to fatigue and reached the outer surface.
Regarding the fact that a crack occurred in the welded part between the side of the bogie and the reinforcing rib on the back of the traction motor seat, it is highly probable that it occurred because the groove processing was not performed when the manufacturer attached the reinforcing rib to the back of the traction motor seat, which resulted in the crack.
Regarding the fact that the groove processing was not carried out, there is no description about the groove in the work plan issued by the bogie technical management office of the bogie manufacturer to the welding workplace where the groove processing is performed, and there is no clear work instruction. Therefore, it is probable that it was related to the fact that the workers in the welding workplace did not know that the groove had to be processed. In addition, the part where the crack occurred was not designated as a priority inspection part after reinforcement, and the magnetic particle inspection was not conducted, so even if the crack had already occurred at the time of the regular inspection, it is likely that this could not be found.

For detailed investigation results, see the accident investigation report published on November 26, 2020 at the following:
https://www.mlit.go.jp/jtsb/eng-rail_report/English/RI2020-2-1e.pdf

Chapter 5 Marine accident and incident investigations

1 Marine accidents and incidents to be investigated

<Marine accidents to be investigated>

◎Article 2, paragraph (5) 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>

◎Article 2, paragraph (6), item (ii) 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 4 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 Article 2, paragraph (6), item (ii) 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.

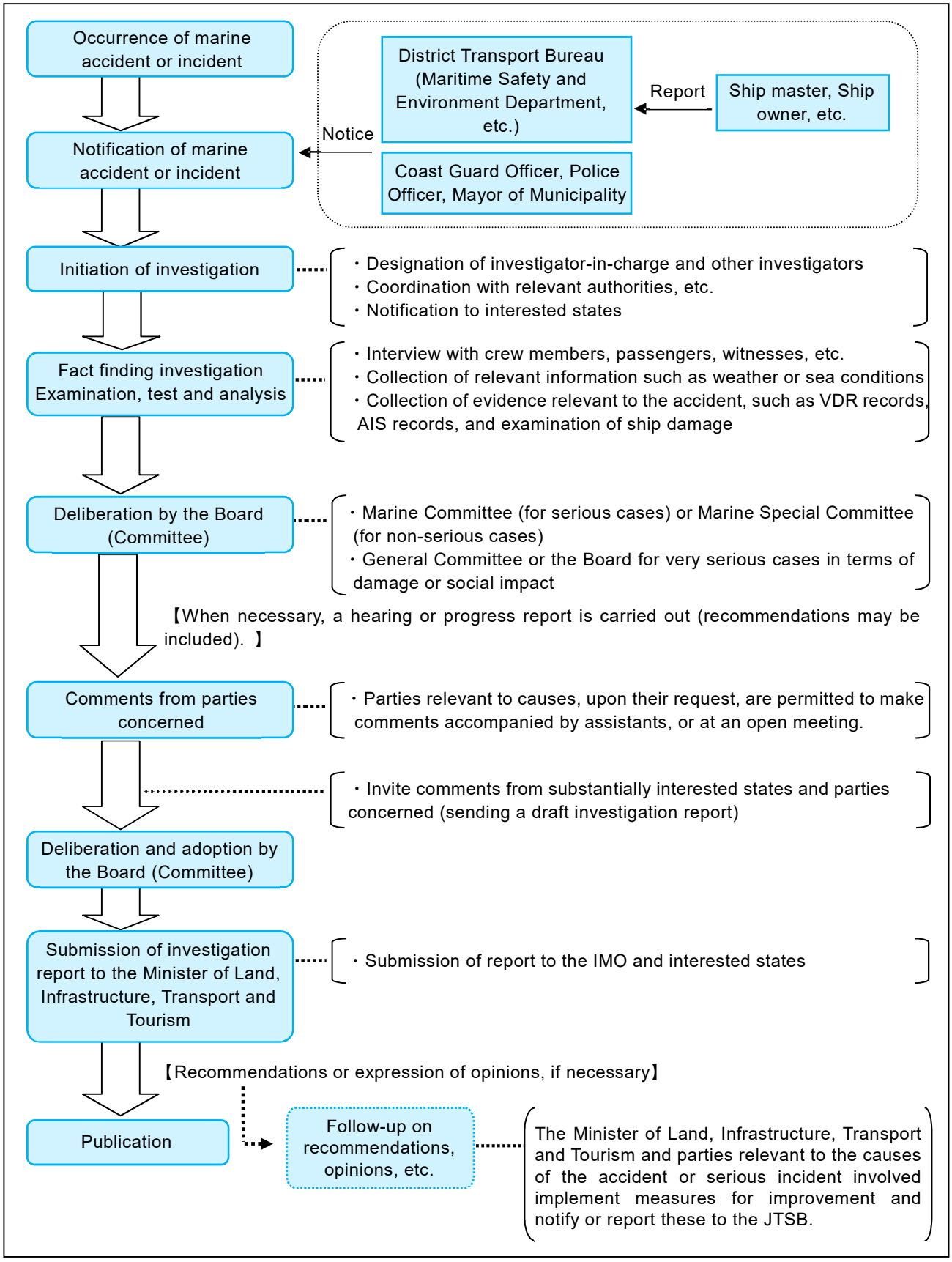
2 The situation where a ship grounded without any damage to the hull; and

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

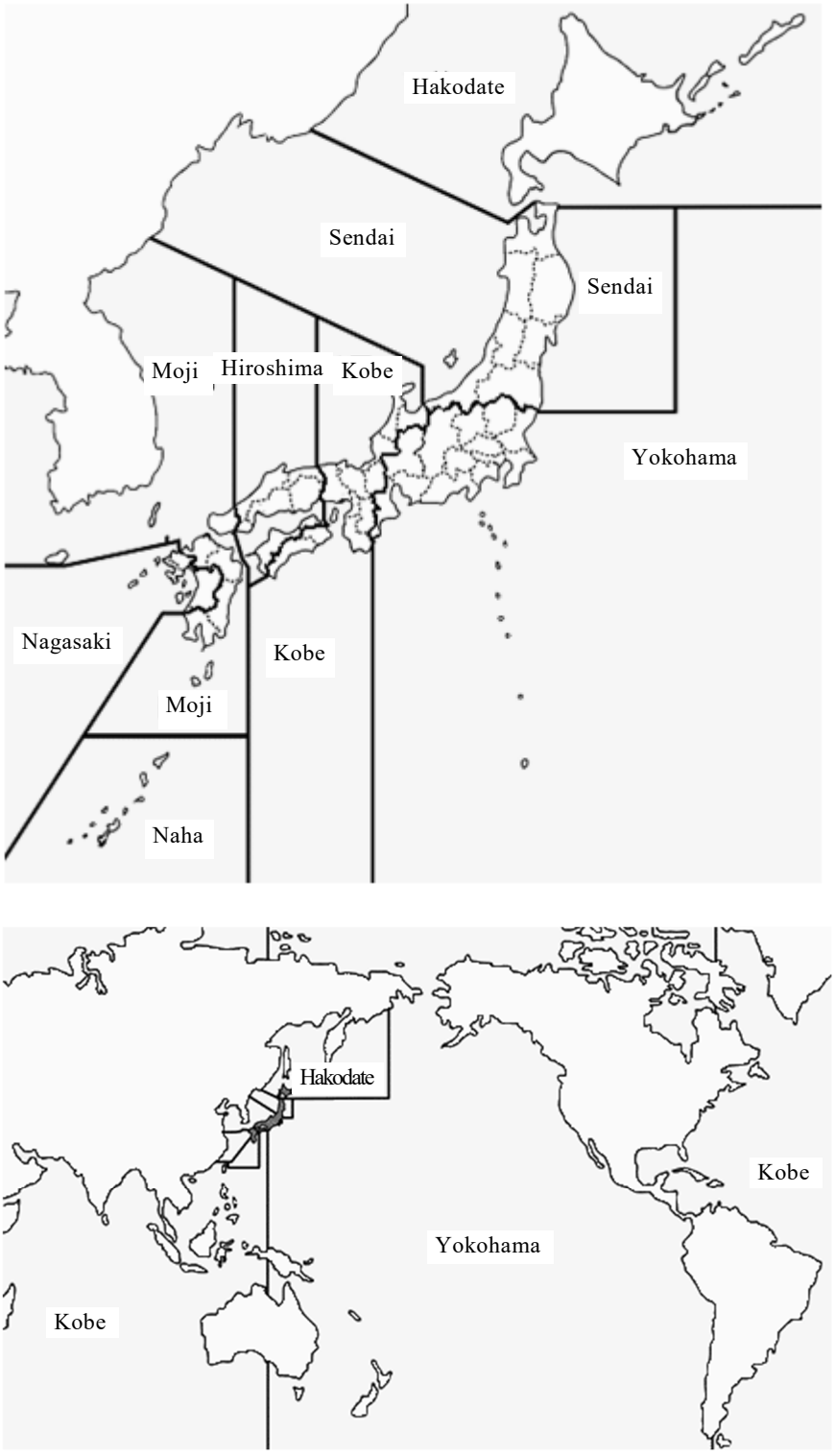
2 Procedure of marine accident/incident investigation



* Opinions may be expressed in a flow chart (as above) or whenever and however necessary to prevent accidents or incidents or mitigate damage thereof.

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 2021)

The JTSB carried out investigations of marine accidents and incidents in 2020 as follows:

In 2020, 590 accident investigations had been carried over from 2019, and 732 accident investigations were newly launched. Besides, 708 investigation reports were published in 2020, and thereby 611 accident investigations were carried over to 2021.

Moreover, 151 incident investigations were carried over from 2019, and 173 incident investigations were newly launched in 2020. Furthermore, 187 investigation reports were published in 2020 and thereby 135 incident investigations were carried over to 2021.

Among the 708 investigation reports published in 2020, two were issued with recommendations, one with safety recommendation and none was issued with opinions.

Investigations of marine accidents and incidents in 2020

(Cases)

Category	Carried over from 2019	Launched in 2020	Not applicable	Transferred to Tokyo Office	Total	Publication of investigation report	(Recommendations)	(Safety recommendations)	(Opinions)	Carried over to 2021	(Interim report)
Marine accident	590	732	△3	0	1,319	708	(2)	(1)	(0)	611	(0)
Tokyo Office (Serious cases)	24	12	0	2	38	15	(2)	(1)	(0)	23	(0)
Regional Offices (Non-serious cases)	566	720	△3	△2	1,281	693				588	
Marine incident	151	173	△2	0	322	187	(0)	(0)	(0)	135	(0)
Tokyo Office (Serious cases)	1	0	0	0	1	0	(0)	(0)	(0)	1	(0)
Regional Offices (Non-serious cases)	150	173	△2	0	321	187				134	
Total	741	905	△5	0	1,641	895	(2)	(1)	(0)	746	(0)

Note 1. The figures for “Launched in 2020” includes cases which occurred in 2019 or earlier, and which the JTSB was notified of in 2020 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.

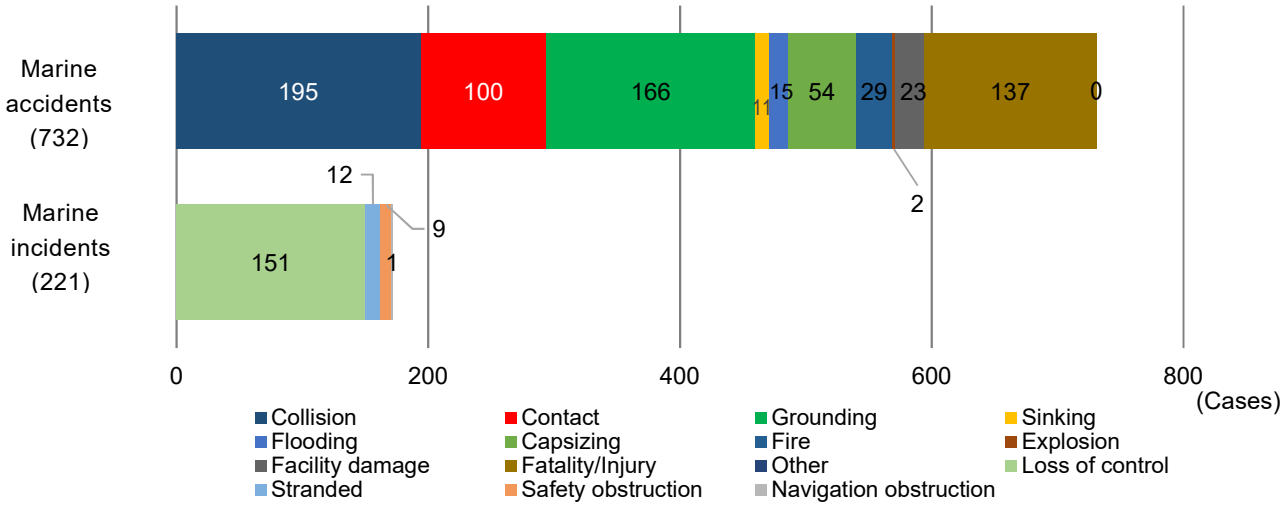
6 Statistics of investigated marine accidents and incidents in 2020

(As of end of February 2021)

(1) Types of accidents and incidents

The breakdown of the 905 investigations launched in 2020 by type of accidents and incidents is as follows: The marine accidents included 195 cases of collision, 166 cases of grounding, 137 cases of fatality/injury (not involved in other types of accidents), and 100 cases of contact. The marine incidents included 151 cases of loss of control, 12 cases of stranded, and nine cases of navigation obstructions. Objects that collided with ships included quays in 25 cases, buoys in 20 cases, and breakwaters in 14 cases.

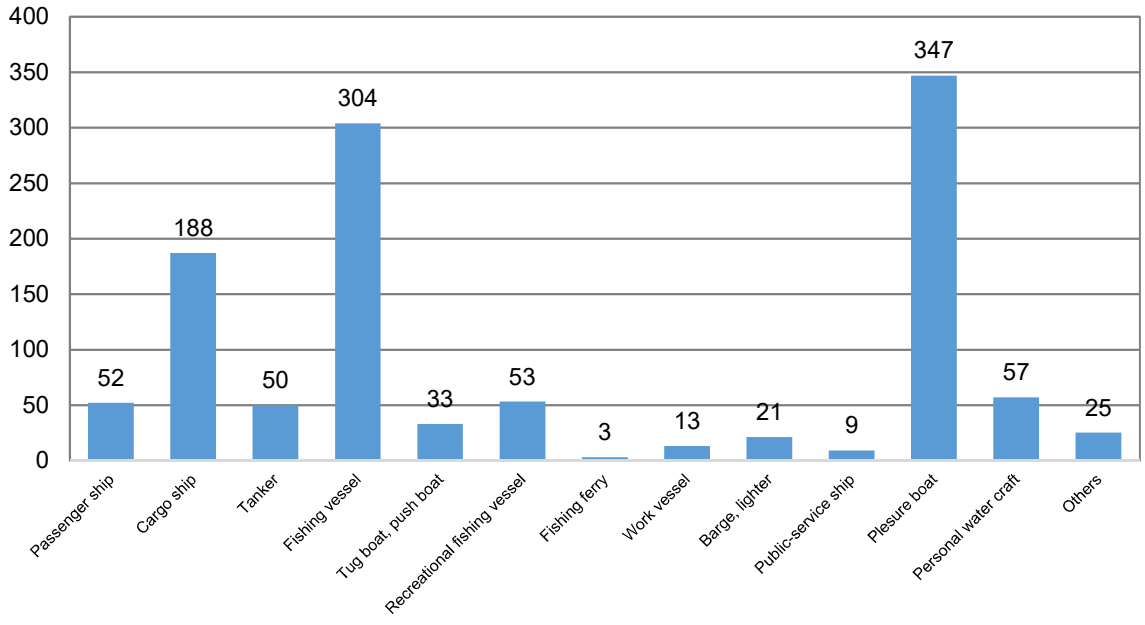
Number of investigated marine accidents and incidents by type in 2020



(2) Types of vessels

The number of vessels involved in marine accidents and incidents was 1,155. By type of vessel, they included 347 pleasure boats, 304 fishing vessels, 188 cargo ships, 57 personal water craft and 53 recreational fishing vessels.

Number of vessels involved in marine accidents and incidents by type in 2020



The number of foreign-registered vessels involved in marine accidents and incidents was 51, and they were classified by accident type as follows: 28 vessels in collision, nine vessels in contact and six vessels in grounding. As for the flag of vessels, 20 vessels were registered in Panama, 12 vessels in Republic of Korea, four vessels in Belize.

Number of foreign-registered vessels by flag

(Vessels)

Panama	20	Republic of Korea	12	Belize	4
Singapore	2	Bahamas	2	Others	11

(3) Number of casualties

The number of casualties was 346, consisting of 84 deaths, 35 missing persons, and 227 injured persons. By type of vessel, 111 persons in fishing vessels, 104 persons in pleasure boats and 36 persons in cargo ships. By type of accident, 158 persons in fatality/injury, 89 persons in collision, 47 persons in contact, 23 persons in capsizing, and 18 persons in grounding.

With regard to the number of person's dead or missing, 64 persons were involved in fishing vessel accidents, 22 persons in pleasure boat accidents, 20 persons in cargo ship accidents, indicating dead or missing cases occurred frequently in fishing vessels.

Number of casualties (marine accident)

(Persons)

2020										
Vessel type	Dead			Missing			Injured			Total
	Crew	Passengers	Others	Crew	Passengers	Others	Crew	Passengers	Others	
Passenger ship	1	0	0	0	0	0	2	6	8	17
Cargo ship	2	0	2	16	0	0	11	0	5	36
Tanker	1	0	0	0	0	0	1	0	0	2
Fishing vessel	46	0	0	18	0	0	44	0	3	111
Tug boat, push boat	1	0	0	0	0	0	1	0	0	2
Recreational fishing vessel	0	2	0	0	0	0	6	21	0	29
Fishing ferry	1	0	0	0	0	0	0	1	0	2
Work vessel	0	0	4	0	0	0	0	0	1	5
Barge, lighter	0	0	0	0	0	0	0	0	1	1
Public-service ship	0	0	0	0	0	0	0	0	0	0
Pleasure boat	11	0	10	1	0	0	35	3	44	104
Personal water craft	1	0	1	0	0	0	11	0	21	34
Others	1	0	0	0	0	0	2	0	0	3
Total	65	2	17	35	0	0	113	31	83	346
	84			35			227			

※ 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 2020

The serious marine accidents which occurred in 2020 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
	February 16, 2020 North from No.2 small-ships basin of Hokkai-hama, Kashima Port, Ibaraki Prefecture	SAKURAIMARU No. 27, Recreational fishing vessel Collision (breakwaters)
	Summary	The vessel was returning to Kashima Port (Ibaraki Prefecture) with the captain, one worker and 21 anglers when it collided with a breakwater north from No. 2 small-ship basin of Hokkai-hama of the port, injuring six anglers, the captain and the worker.
2	Date and location	Vessel type and name, accident type
	February 29, 2020 North off the coast of Iki City, Nagasaki Prefecture	KOKYUMARU, Fishing vessel (Vessel A) SHINEIMARU, Recreational fishing vessel (Vessel B) Collision
	Summary	Vessel A departed Katsumoto Port, Iki City, Nagasaki Prefecture with the captain and ordinary seamen on board was heading toward a fishing area north of the port. Vessel B departed Kishi Fishing Port, Itoshima City, Fukuoka Prefecture with the captain and five anglers onboard and was drifting on the sea north from Katsumoto Port for the purpose of recreational fishing with its engine stopped. The two vessels collided in an offshore area north of Katsumoto Port and Vessel B capsized.
3	Date and location	Vessel type and name, accident type
	February 29, 2020 About 6.5 nautical miles off the eastern coast of Nakayamazaki, Rokkasho-mura, Aomori Prefecture	GUO XING 1, Cargo ship (vessel A) TOMIMARU No.8, Fishing vessel (vessel B) Collision
	Summary	Vessel A bound for South Korea departed Hachinohe Port, Aomori Prefecture with the captain and 13 crew members on board. Vessel B, with the captain and 14 crew members onboard left a fishing area northwest of Shiriyazaki, Aomori Prefecture and was returning to Hachinohe Port. The two vessels collided at about 6.5 nautical miles off the eastern coast of Nakayamazaki, Rokkasho-mura, Aomori Prefecture.
4	Date and location	Vessel type and name, accident type
	June 16, 2020 Osanbashi Pier, Naka Ward, Yokohama City, Kanagawa Prefecture	ASUKA II, Passenger ship Fire
	Summary	A fire broke out on the vessel was moored at Osanbashi Pier, Naka Ward, Yokohama Prefecture
5	Date and location	Vessel type and name, accident type
	June 19, 2020 Quay A5 of Honmoku Wharf, Naka Ward, Yokohama City, Kanagawa Prefecture	TIMU, Cargo ship Casualties of workers
	Summary	While the cargo ship was moored at Quay A5 of Honmoku Wharf, a cargo transfer operation was ongoing using the ship's crane, when cargo suspended from the crane fell into the hold, resulting in the death of one worker and the injury of another.
6	Date and location	Vessel type and name, accident type
	July 25, 2020 Southeast off the coast of Mauritius	WAKASHIO, Cargo ship Grounding
	Summary	The cargo ship ran aground in an offshore area southeast of Mauritius, leaking fuel oil.
	Reference	Column (page 146)
7	Date and location	Vessel type and name, accident type
	August 7, 2020	KAIMONMARU, Oil tanker

	Near the northern end of the eastern berth of the Keiyo Sea Berth, Chiba Port	Collision (pier)
	Summary	The tanker collided with the pier during mooring.
8	Date and location	Vessel type and name, accident type
	September 6, 2020 Inawashiro Lake, Fukushima Prefecture	Pleasure boat (its name unidentified) Swimmers killed or injured after contact
	Summary	The pleasure boat was navigating off the coast of Nakatahama of Inawashiro Lake when it contacted with swimmers, killing one and injuring three.
9	Date and location	Vessel type and name, accident type
	September 12, 2020 Mitsujima located at the northern end of Tsushima City, Nagasaki Prefecture	CHANG SHUN 1, Cargo ship Grounding
	Summary	On September 12, 2020, during a scheduled pause at Nishisuido in the Tsushima Strait at Busan Port, ROK, the ship ran aground in a shallow area north of Mitsujima, Tsushima City, Nagasaki Prefecture at around 02:40.
10	Date and location	Vessel type and name, accident type
	November 19, 2020 North off the coast of Yoshima (island), Sakaide City, Kagawa Prefecture	SHRIMP of ART, Passenger ship Flooding
	Summary	The ship was inundated with seawater during navigation and sank. All of the passengers and crew were rescued and transported to Yoshima.
11	Date and location	Vessel type and name, accident type
	November 28, 2020 Near Kashima Port, Ibaraki Prefecture	HAYATO (Vessel A), Cargo ship FUDOMARU No.5, Recreational fishing vessel (Vessel B) Collision
	Summary	Vessels A and B collided near Kashima Port. Among those on board Vessel B, one passenger died and 11 passengers and crew members were injured.
12	Date and location	Vessel type and name, accident type
	December 23, 2020 Location unknown	SHINKOMARU No.8, Fish carrier Missing crew members
	Summary	The fish carrier bound for Owase Port, Owase City, Mie Prefecture departed Akamizu, Ainan-cho, Minamiuwa District, Ehime Prefecture between 10:00 and 12:00, December 22. The last phone contact was made at around 1:00 PM on the same day before the ship went missing.

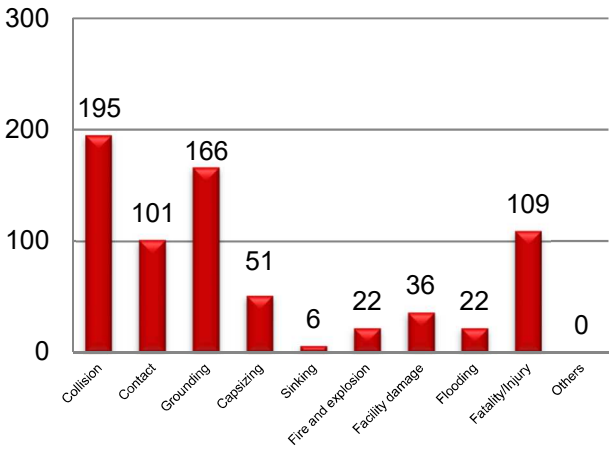
8 Publication of investigation reports

The number of investigation reports of marine accidents and incidents published in 2020 were 895, consisting of 708 marine accidents (among them, 15 were serious) and 187 marine incidents (among them, zero were serious).

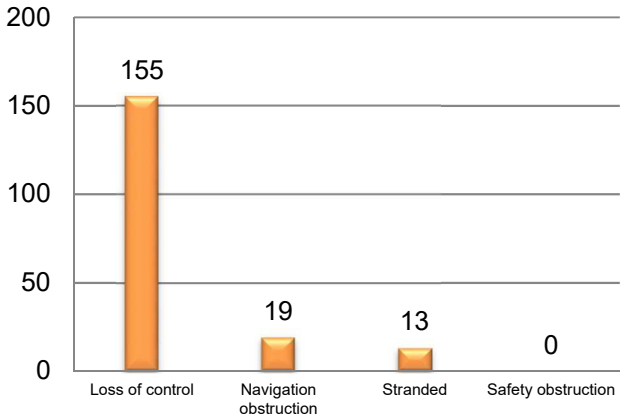
Breaking them down by type, the marine accidents included 195 cases of collision, 166 cases of grounding, 109 cases of fatality/injury, and 101 cases of contact. The marine incidents included 155 cases of losses of control, (143 cases of navigational equipment failure, 11 cases of fuel shortages, etc., one case of listing), 19 cases of navigation obstruction, and 13 cases of stranded.

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

Marine accidents (708 cases): reports publicized in 2020



Marine incidents (187 cases): reports publicized in 2020



The number of vessels involved in marine accidents and incidents was 1,164. Breaking them down by type, the marine accidents involved 258 pleasure boats, 286 fishing vessels, 146 cargo ships, 54 passenger ships and 47 tankers. The marine incidents involved 106 pleasure boats, 25 fishing vessels, 18 cargo ships, and 16 passenger ships.

Number of vessels by type involved in marine accidents and incidents for which reports were publicized in 2020

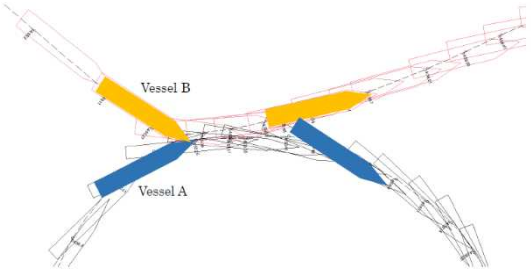
(Vessel)

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	54	146	47	286	38	39	4	27	23	6	258	36	12	976
Marine incident	16	18	5	25	1	9	0	0	1	0	106	4	3	188
Total	70	164	52	311	39	48	4	27	24	6	364	40	15	1,164
Composition Ratio %	6.0	14.1	4.5	26.7	3.4	4.1	0.3	2.3	2.1	0.5	31.3	3.4	1.3	100.0

The marine accidents and serious incidents which occurred in 2020 are summarized as follows:

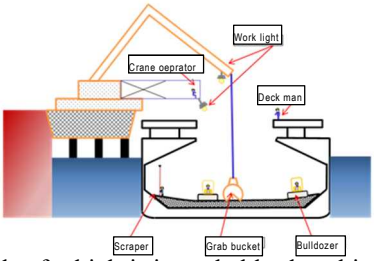
Marine serious accident reports published in 2020

1	Date of Publication	Date and location	Vessel type and name, accident type
	January 30, 2020	September 29, 2018 Wakamatsu district of Kanmon Port, Kanmon Passage	SM3, Cargo ship (Vessel A, Republic of Korea) KOUTOKU MARU, Oil tanker (Vessel B) Collision
	Summary	While Vessel A, with a master and 9 crew members on board, was proceeding north-northeast bound for Pohang Port, Republic of Korea, in Wakamatsu Passage of Kanmon Port, and while oil tanker KOUTOKU MARU, with a master, boatswain and 6 crew members on board, was proceeding southeast bound for Setonaikai in No. 2 Kanmon Passage of Kanmon Port, both vessels collided at around 14:55 on September 29, 2018, after having just entered Kanmon Passage. Vessel A suffered denting of her shell plate on her port fore side and port aft side, and KOUTOKU MARU lost her starboard anchor and suffered denting of her bulbous bow, etc.; however, there were no casualties or injuries on either vessel.	

	Probable Causes	It is probable that the accident occurred because, while SM3 was traveling eastward from Wakamatsu Passage to Kanmon Passage and KOUTOKU MARU was traveling southeastward from No. 2 Kanmon Passage to Kanmon Passage in a situation whereby the courses of both vessels would cross in Kanmon Passage, the master of SM3 intended to turn to the left and pass the bow of KOUTOKU MARU and boatswain of KOUTOKU MARU was maintaining the same course and ship speed, as a result of which both vessels collided. It is probable that the master of SM3 intended SM3 to turn to the left and pass the bow of KOUTOKU MARU because of the possibility that he wanted to move ahead of a cargo ship proceeding northwest in Kanmon Passage and because he had the experience that other vessels kept out of the way of SM3 when he called their names by VHF wireless telephone, and that, at the time of the accident, the master of SM3 similarly thought that KOUTOKU MARU would turn to the right and avoid SM3 by passing off her stern. It is probable that boatswain of KOUTOKU MARU was maintaining the same course and ship speed because, according to the navigation rules of Kanmon Port in the Ordinance for Enforcement of the Act on Port Regulations, SM3 was in a position whereby she had to keep out of the way of KOUTOKU MARU, and thus he was expecting SM3 to eventually avoid KOUTOKU MARU and diverted his attention to responding to a total three calls by VHF wireless telephone. 
	Report	https://www.mlit.go.jp/jtsb/eng-mar_report/2020/2018tk0016e.pdf
	Reference	Chapter 2 (page 32)

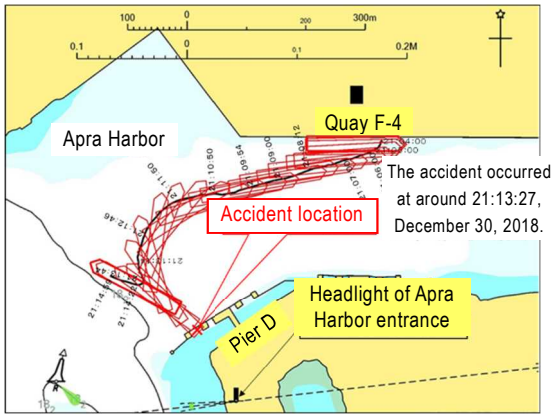
2	Date of Publication	Date and location	Vessel type and name, accident type
	January 30, 2020	July 26, 2018 Southern entrance of Ondo-no-seto (strait), Kure City, Hiroshima Prefecture	ISHITEGAWA, Passenger ferry (Vessel A) DAIEIMARU No.10, Cargo ship (carrying pebbles and stone products) (Vessel B) Collision
	Summary	Vessel A, bound for Matsuyama Port, Matsuyama City, Ehime Prefecture with the captain and eight crew members on board departed Kure port (Kure section), Kure City, Hiroshima Prefecture and was navigating southward at Ondo-no-seto (strait), Kure City. Vessel B, bound for Kure Port (Kure section) with the captain and three crew members on board were navigating westward in the Sea of Aki (Akinada). At around 07:56:30 on July 26, 2018 when they collided at the southern entrance of Ondo-no-seto.  In Vessel A, one passenger and one cabin crew member were injured and the outer hull of the portside was damaged (e.g., breached). This collision also made a hole in the bulbous bow of the Vessel B but did not cause any casualties.
	Probable Causes	It is probable that during the southward navigation of the Vessel A from the northern entrance/exit to the southern entrance/exit of Ondo-no-seto strait and the westward navigation of the Vessel B toward the southern entrance/exit of Ondo-no-seto, the captain of Vessel A judged that the vessel could clear the southern entrance/exit by means of a “port-side to ort-side” operation and continued travel, while the navigation officer of Vessel B single-handedly kept continued navigating at a full speed, deviating northward from the route designated by the Japan Coast Guard’s Public Notice No. 92. It is probable that he was late in noticing the oncoming Vessel A. Avoidance measures taken by both ships were too late to avoid a collision in the vicinity of the south entrance/exit of Ondo-no-seto. It is probable that the captain of Vessel A judged that the ship could safely pass the southern entrance/exit of Ondo-no-seto strait per usual by means of a “port-side to port-side” operation because he assumed that the Vessel B would navigate according to the navigation protocols for Ondo-no-seto sea area specified by the Japan Coast Guard’s Public Notice No. 92 and the Kure

		Maritime Safety Agency's administrative guidance. He therefore did not anticipate that the Vessel A would deviate from the route designated by Notice No. 92 enter the strait on a northward track. It is probable that the reason the navigation officer of the Vessel B steered the ship at nearly full speed while deviating northward from the route designated by Notice No. 92 was due to a failure to study his intended route by consulting a marine chart and so did not know about the method specified by the Japan Coast Guard's Public Notice No. 92 or the Kure Maritime Safety Agency's administrative guidance for this area. It is probable that the navigation officer of the Vessel B continued to steer the ship by himself because the captain had not instructed him to report when the vessel has approached Ondo-no-seto and that the captain assumed that the vessel would pass Ondo-no-seto during his scheduled shift at the helm, so he stood by in his room without attending to the navigation.
	Report	https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-1-2_2018tk0009.pdf (Japanese only)
3	Date of Publication	Date and location / Vessel type and name, accident type
	February 27, 2020	January 28, 2018 Ichimonji Breakwater of Okinoshima Fishing Port, Omihachiman City, Shiga Prefecture OKISHIMA, Passenger ship Collision (breakwater)
	Summary	The passenger ship left the floating pier of Okinoshima Fishing Port with the captain, a worker and nine passengers onboard. During navigation in the port area, the ship collided with the Ichimonji Breakwater. One passenger, the captain and the worker were severely injured in the accident while seven passengers were slightly injured. This accident caused a breach in the bow. 
	Probable Causes	It is probable that this nighttime collision occurred because after the ship navigated away from the floating pier of Okinoshima Fishing Port and passed the southern breakwater, the captain did not take the route to the south side of the Ichimonji Breakwater and continued on toward the breakwater. The reason the captain did not take the safer southern route off the Ichimonji Breakwater could not be verified because he could not remember how he had steered the ship before, during and after the accident and no one witnessed the captain's operation.
	Report	https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-2-1_2019tk0002.pdf (Japanese only)
4	Date of Publication	Date and location / Vessel type and name, accident type
	March 26, 2020	March 9, 2019 Off the eastern coast of Himesaki, Sado City, Niigata Prefecture GINGA, Passenger ship Passengers injured due to collision (floating objects in the water)
	Summary	Passenger ship GINGA with its captain, chief engineer and two crew members as well as 121 passengers onboard was navigating westward on hydrofoils at about 41.7 knots (speed relative to the seabed) at an eastern offshore area of Himesaki, Sado City, Niigata Prefecture on the way to Ryotsu Port of the same city, when the ship collided with floating objects at around 12:16, March 9, 2019. This resulted in the injuries of 108 passengers and one crew member. This accident breached the starboard quarter of the GINGA. * This accident was investigated as a "particularly serious accident."
	Probable Causes	It is probable that this accident occurred as follows: After GINGA passed the slowdown zone located east off the coast of Himesaki, it accelerated, heading westward in a foilborne state, when the captain observed floating objects in the direction of the port bow (front left side) of the ship. He attempted to avoid a collision with the objects but failed. As a result, the objects hit the rear hydrofoil wing, resulting in lumbar fractures in several passengers.

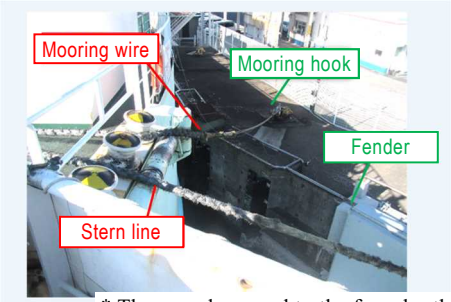
<table>
<tr><td></td><td></td><td colspan="2">It is probable that the captain could not avoid the collision despite his maneuvering because when he noticed them for the first time in the front left direction, they had already approached passed an avoidable distance.
It is probable that the reason he could not visually identify the objects until they were so close was that they were submerged.
Regarding the cause of many passengers' lumbar fractures, it is probable as follows: After the rear hydrofoil collided with the floating objects, the fuse pins fractured, causing the rear hydrofoil to pivot backward from the points where it was attached to the ship's hull. This lowered the stern and at the same time, the rear hydrofoil pulled the ship's body into the sea due to the water resistance against the rear hydrofoil. As a result, the bottom of the ship at the stern impacted the sea surface, generating significant upward and backward acceleration causing a severely impact to the passengers.
  </td></tr>
<tr><td></td><td>Report</td><td colspan="2">https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-3-1_2019tk0008.pdf (Japanese only)
https://www.mlit.go.jp/jtsb/ship/p-pdf/MA2020-3-1-p.pdf (Explanatory Material (Japanese only))</td></tr>
<tr><td></td><td>Reference</td><td colspan="2">Feature 4 (page 8), Chapter 2 (page 19), Case Studies (page 149)</td></tr>
<tr><td>5</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 25, 2020</td><td>January 17, 2019
Quay adjacent to Sumitomo Chemical Co., Ltd., Niihama Port, Niihama City, Ehime Prefecture</td><td>ISHIZUCHI, Cargo ship
Fatality of a worker</td></tr>
<tr><td></td><td>Summary</td><td colspan="2">While the vessel was unloading cargo at Niihama Port, a worker was hit by a bulldozer in the hold and died at around 03:39 on January 17, 2019</td></tr>
<tr><td></td><td>Probable Causes</td><td colspan="2">It is probable that this accident occurred as follows: The Worker of Company A was unloading coal behind Bulldozer A in No. 5 hold in Niihama Port where the Vessel moored during nighttime, Operator A thought there was nobody behind the Bulldozer A and thus moved it backward, causing the Worker to be run over by Bulldozer A.
 
It is probable that Operator A thought that there was nobody behind and moved Bulldozer A backward because there had been no signal given by either the Worker or Deck Man A.
Deck Man A, who was paying attention to the contact between Bulldozer A and the grab bucket, did not notice the positional relationship between the Worker and Bulldozer A, and there was no system established for the cargo-hold-work that enables the bulldozer to stop immediately in response to the position and actions of the Scraper, as a result of which it is probable that this accident occurred.
 
</td></tr>
<tr><td></td><td>Report</td><td colspan="2">https://www.mlit.go.jp/jtsb/eng-mar_report/2020/2019tk0004e.pdf</td></tr>
<tr><td>6</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 30, 2020</td><td>September 2, 2019
Akashi Kaikyo Traffic Route</td><td>GLOVIS COMPANION, Car carrier (Vessel A, Republic of the Marshall Islands)
HIGASHIDA MARU, Fishing vessel (Vessel B)
Collision</td></tr>
<tr><td></td><td>Summary</td><td colspan="2">Vessel A was proceeding west in the Akashi-Kaikyo Traffic Route and the fishing vessel HIGASHIDA MARU was proceeding southeast and attempting to cross the Akashi-Kaikyo Traffic Route when both vessels collided in the Akashi-Kaikyo Traffic Route.
The master of HIGASHIDA MARU was injured, and her bow sustained crushing and other damage, while GLOVIS COMPANION sustained abrasions on her starboard- side shell plating.</td></tr>
</table>

	Probable Causes	It is probable that the accident occurred when, as Vessel A was proceeding west under Pilot A's pilotage and Vessel B was proceeding southeast in the Traffic Route at night, both vessels collided because Pilot A continued navigating with his attention directed to maintaining Vessel A's path within the Traffic Route and Vessel B continued proceeding south-southwest and crossing the Traffic Route after entering the route with his attention on vessels that were proceeding east in the Traffic Route. It is likely that Master B proceeded south-southwest and continued crossing the Traffic Route after entering the route for the reason that, at the time of the accident, there were several vessels proceeding east to Vessel B's west and Master B was directing his attention to the vessels proceeding east and did not notice Vessel A proceeding west because he was considering which of the vessels to pass by their sterns. It is probable that Pilot A continued navigating with his attention directed to maintaining Vessel B's path within the route because he did not personally notice Vessel A's approach and there was no report of Vessel B's approach from Master A or Navigation Officer A. It is probable that the situation whereby Pilot A did not make any specific requests for lookout giving attention to the situation outside of the Traffic Route to Master A despite knowing that, at the time of the accident, it was a time of day when fishing vessels leave port contributed to the accident's occurrence. 
	Report	https://www.mlit.go.jp/jtsb/eng-mar_report/2020/2019tk0019e.pdf

7	Date of Publication	Date and location	Vessel type and name, accident type
	August 27, 2020	August 17, 2018 No. 26 berth of Kasumigaura-Minami Wharf, Yokkaichi Port, Yokkaichi City, Mie Prefecture	OOCL NAGOYA, Container vessel Collision (gantry crane)
	Summary	The vessel which was manned by the Master and 23 crewmembers, was navigated under escort by the pilot's pilotage, while the vessel was proceeding toward west and was approaching for berthing port side head-in to No. 26 berth of Kasumigaura-Minami Wharf, No. 3 district of Yokkaichi Port on Yokkaichi City, Mie Prefecture. At around 07:39 on August 17, her port fore collided with a gantry crane on the berth. The vessel caused damage of cutting and bending at the bulwark of the port fore part, etc. No. 26 berth of Kasumigaura-Minami Wharf caused damage of delamination at the concrete construction, derailing and deformation at the gantry cranes, etc. but there were no casualties in OOCL NAGOYA or the port facility.	
	Probable Causes	It is probable that this accident occurred, at Yokkaichi port, under conditions a of northwesterly wind blowing at wind force 5 to No. 26 berth of Kasumigaura-Minami Wharf, No. 3 district of Yokkaichi Port on Yokkaichi City, Mie Prefecture, while the Container vessel, OOCL NAGOYA was approaching No. 26 berth for mooring port side head-in by the Pilot's pilotage instruction, and then the Master intervened immediately and conducted maneuvering the vessel himself, and forward movement of the vessel was lost due to using by full astern, because the vessel was swept away toward a car carrier which was moored for starboard side head-out with her port side to No. 25 berth closely, and then taking full ahead was conducted to avoid collision with the car carrier and the vessel was proceeding forward; however, the vessel was not able to control her attitude, with the result that the port fore part of the vessel collided with the gantry crane (S2 Unit) on No. 26 berth. It is probable that the Master intervened immediately and conducted maneuvering the vessel himself, and forward movement of the vessel was lost due to using by full astern, because the Master was not able to make sufficient trusting relationship with the Pilot and felt that the approaching ship speed toward No. 26 berth was fast near the car carrier moored at No.25, and thereby the Maser thought he would abort the vessel movement completely. It is probable that the Master was not able to make sufficient trusting relationship with the Pilot, because the Master felt that the Pilot's explanation was not sufficient for him. It is probable that the accident occurred due to inadequate Bridge Resource Management (BRM)*1 including effective communication, etc. in the navigation bridge between the bridge team including the Master and the Pilot, while the vessel was in a situation of being imminently swept away toward the port side where No. 25 berth and the car carrier moored at No.25 were	

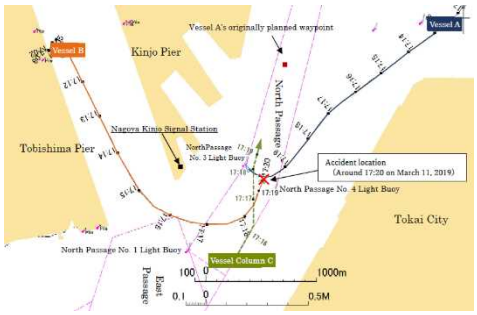
<table>
<tr><td></td><td></td><td colspan="2">located by the leeway exceeding 10°.</td></tr>
<tr><td></td><td>Report</td><td colspan="2">https://www.mlit.go.jp/jtsb/eng-mar_report/2020/2018tk0012e.pdf</td></tr>
<tr><td>8</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
<tr><td></td><td>August 27, 2020</td><td>December 30, 2018
Apra Harbor, Guam, unincorporated and organized U.S. territory</td><td>NIPPONMARU, Passenger ship
Collision (mooring equipment (a pile dolphin))</td></tr>
<tr><td></td><td>Summary</td><td colspan="2">The ship bound for Saipan with the captain, 204 crew members and 419 passengers on board left Apra Harbor quay F-4 in Saipan, US at around 21:04 (local time in Guam), December 30, 2018. After a left turn in an area west of the quay on the way to the port entrance, the ship went astern to approach pier D (a US Navy facility) on the opposite shore and collided with a pile dolphin (mooring equipment) of the pier D at around 21:13:27.
This accident resulted in holes in the outer plates of the starboard and port quarters but caused no casualties.
The accident also damaged the pile dolphin of the pier D.
After the accident, the ship cancelled its cruising schedule. Two passengers became sick and stayed in Guam to receive care until January 7, 2019. Other passengers flew back to Japan by January 3 the same year.
  </td></tr>
<tr><td></td><td>Probable Causes</td><td colspan="2">It is probable that this accident occurred as follows: When the captain steered the NIPPONMARU leftward in the sea area from quay F-4 of Apra Harbor, Guam, he tilted the joystick fully sternward in his attempt to facilitate the left turn although he should have tilted it fully in the starboard direction. Since he continued his full tilt of the sternward and was unaware of his mistake, the ship went astern while its bow was turning leftward causing the stern to collide with the pile dolphin of pier D located opposite to quay F-4.
In fact, the captain intended to tilt the joystick fully in the starboard direction but tilted it fully sternward. It is probable that although he was aware that tilting the joystick fully in the starboard direction requires tilting it fully toward the left side of his body while orienting his body toward the stern, he was in a standing position with his body positioned in a different direction from what he was used to. This resulted in him tilting the joystick fully toward the left side of his body while facing aport, and not sternward.
It is probable that the captain was unaware of his misdirection because he performed the operation without watching the way his hands controlled the joystick or the outboard display. He did not think that what was reported to him by the navigation officer in charge of the stern indicated an approach toward pier D, and he understood neither the proposals nor advice by a navigation officer supporting ship's handling nor those of the pilot.
It is probable that the captain was unaware of his misdirection because he performed the operation without watching the way his hands controlled the joystick or the outboard display. He did not think that what was reported to him by the navigation officer in charge of the stern indicated an approach toward pier D because the ship was turning leftward by means of a side thruster and a tugboat and because he interpreted what the navigation officer in charge of the stern reported to him as evidence of the ship continuing a left turn. In this way, he selectively collected information corroborating what he was thinking was right and therefore was convinced that his handling of the ship was correct.
It is probable that the reason the captain could understand neither the proposals nor advice by the support navigation officer or the pilot was that he ignored any information that might disprove what he was thinking to be right.
It is likely that the captain believed that he should always be in charge of the handling, undocking and turning around of the ship and recognized that the navigation officer in charge of steering the ship was a newcomer in training. All these factors led to his prioritizing his own judgements rather than heeding the suggestions and advice of the pilot and the support navigation officer, which likely caused his continued tilting the joystick fully sternward.</td></tr>
</table>

	Report	https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-7-2_2019tk0001.pdf (Japanese only) https://www.mlit.go.jp/jtsb/ship/p-pdf/MA2020-7-2-p.pdf (Explanatory Material (Japanese only))	
	Reference	Case Studies (page 148)	
9	Date of Publication	Date and location	Vessel type and name, accident type
	August 27, 2020	September 17, 2019 Eastern offshore from Cape Nosappu, Nemuro City, Hokkaido	KEIEIMARU No.65, Fishing vessel Capsizing
	Summary	During the port call of the fishing vessel navigating toward Hanasaki Port, Nemuro City, Hokkaido with the captain and seven crew members on board, the ship capsized of the eastern shore of Cape Nosappu in the same city at around 7:20, September 17, 2019. Among the eight crew members, one died and seven went missing. 	
	Probable Causes	It is probable that this accident occurred under circumstances in which a high wind maritime alert was issued and a low-pressure system was approaching, the fishing vessel bound for Hanasaki Port was navigating westward in an east of Cape Nosappu in the face of winds and ocean waves. Lateral waves hitting the port-side oscillated the vessel (causing a maximum expected value of 1/1000), a strong wind blast blew when its port-side (windward side) horizontally oscillated maximally, its tilt moment rapidly increased and the tilted in the starboard direction in excess of the bulwark submersion angle, causing the starboard bulwark to submerge, thereby capsizing the vessel. It is probable that as the ship oscillated horizontally due to lateral waves hitting its port-side, a strong blast of wind blew when its port-side (windward side) horizontally oscillated maximally and tilted the vessel to starboard past the bulwark submersion angle due to the choice of route and rate of speed that made it vulnerable to wind and ocean wave effects striking port-side.	
	Report	https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-7-3_2019tk0022.pdf (Japanese only) https://www.mlit.go.jp/jtsb/ship/p-pdf/MA2020-7-3-p.pdf (Explanatory Material (Japanese only))	
	Reference	Case Studies (page 151)	
10	Date of Publication	Date and location	Vessel type and name, accident type
	October 1, 2020	December 2, 2019 Ferry berth in Tokushima-Komatsushima Port, No.1 section	TSURUGI, Passenger ship Injury of a crew member
	Summary	During the undocking of the ferry with the captain and eight crew members on board at the berth at the No. 1 section of Tokushima-Komatsushima Port, Tokushima Prefecture, at around 08:02 on December 2, a mooring wire detached from a mooring hook by a remote control stroke and injured the head of a second officer in charge of the stern. The second officer suffered brain contusion, traumatic subarachnoid hemorrhage and left orbital floor fracture. A stern handrail of the vessel was also damaged.	

<table>
<tr><td></td><td>Probable Causes</td><td colspan="2">It is probable that this accident occurred under circumstances in which an onshore worker was not informed in advance of an undocking method test of a newly installed fender on the stern-side ferry berth. During the undocking procedure at the ferry berth, the onshore worker heard the pilot's transceiver conversation, "Release the stern painter." so he mistakenly thought that was an instruction directed at him to release the mooring wire and so he pushed the mooring hook release switch. This action released the taut stern-side spring line, which sprang back and struck second officer who was standing in the snapback zone of the spring line.
It is probable that the reason the onshore worker was not informed in advance was that the captain believed that "the worker was listening to cross-talk conversations through a ship's transceiver and therefore he should understand the situation even without being informed directly of the undocking method test using the fender."
It is probable that the reason the onshore worker mistook the captain's conversation "Release the stern painter." for an order to him to detach the mooring wire was that he was unfamiliar with the procedure and was only paying attention to transceiver communication so as to prevent a late execution of an order to detach the mooring line.
The procedure for undocking work at the ferry birth had been verbally informed to Nankai Ferry Co., Ltd.'s employees through safety guidance but a concrete procedure had not been specified in its safety management manual, and a manual for handling a mooring hook was not available. It is probable that these factors have contributed to this accident.
 
* The vessel moored to the ferry berth</td></tr>
<tr><td></td><td>Report</td><td colspan="2">https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-8-1_2020tk0006.pdf (Japanese only)</td></tr>
<tr><td>11</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 29, 2020</td><td>November 2, 2019
Southern sea area off the coast of Tanoshima (island), Matsuyama City, Ehime Prefecture</td><td>KAZUMARU No.3, Recreational fishing vessel
Grounding</td></tr>
<tr><td></td><td>Summary</td><td colspan="2">The recreational fishing vessel with the captain, a crew member and 10 anglers on board was navigating north in a southern sea area off the coast of Tanoshima. At around 21:31, November 2, 2019, the vessel ran aground a shallow area.
All persons on board were injured, and a hole was made in the lower bow.</td></tr>
<tr><td></td><td>Probable Causes</td><td colspan="2">It is probable that, during the night-time navigation under a slightly cloudy weather without moonlight in a southern sea area off the coast of Tanoshima (island) on the way to a fishing spot north from the same island, the captain was navigating the ship while depending solely on visual route checks, so he was late in noticing that the ship was approaching Tanoshima and although he immediately shifted to the neutral operation of the engine, the ship ran aground the shallow south of Tanoshima.</td></tr>
<tr><td></td><td>Report</td><td colspan="2">https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-9-1_2019tk0025.pdf (Japanese only)
https://www.mlit.go.jp/jtsb/ship/p-pdf/MA2019-4-2-p.pdf (Explanatory Material (Japanese only))</td></tr>
<tr><td>12</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
<tr><td></td><td>November 26, 2020</td><td>March 11, 2019
North Passage, Nagoya Port, Aichi Prefecture</td><td>EOS, Oil tanker and chemical tanker (Vessel A, Republic of Korea)
AISHO No. 8, Cargo ship (Vessel B)
Collision</td></tr>
<tr><td></td><td>Summary</td><td colspan="2">As the oil tanker and chemical tanker EOS was proceeding southwest and the cargo ship AISHO No. 8 was proceeding north, both vessels collided in the Nagoya Port North Passage.
EOS sustained a breach and other damage to her port bow plating shell and AISHO No. 8 sustained dents and other damage to her bow bulwark.</td></tr>
<tr><td></td><td>Probable Causes</td><td colspan="2">It is probable that both vessels collided in Nagoya Port because, as Vessel A was proceeding southwest toward the North Passage, Master A, when he observed Vessel B off of the bow,</td></tr>
</table>

assumed that Vessel A and Vessel B were in a meeting relationship and would pass port-to-port and, further, that Vessel B would cross the North Passage on an easterly course and head in the direction that Vessel A had come, and therefore he continued navigating at the same course and speed, and because Master B assumed that Vessel B, which was navigating within the North Passage, was in a position of maintaining her course and Vessel A, which was about to enter the North Passage, would give way to Vessel B, and therefore he turned to port and proceeded north.

It is probable that each master respectively attempted to avoid an accident, as Master A set the rudder hard to starboard, stopped the main engine with the intention of avoiding a collision by passing port-to-port because Vessel B had come too close for Vessel A to navigate to Vessel B's stern, and Master B saw Vessel A's bow approaching off the bow and make a sudden turn to starboard, sensed the danger of collision, and set the main engine to full astern.



It is probable that the fact that course signals made using international signal flags were not checked and communication by VHF or other means was not made between Vessel A and Vessel B contributed to the accident.

	Report	https://www.mlit.go.jp/jtsb/eng-mar_report/2020/2019tk0009e.pdf

13	Date of Publication	Date and location	Vessel type and name, accident type
	November 26, 2020	December 2, 2019 Outside Nejime Port, Minamiosumi-cho, Kagoshima Prefecture	NANKYU No. 10, Passenger ship Injuries

Summary

On December 2, 2019, passenger ship NANKYU No. 10 bound for Ibusuki Port, Ibusuki City, Kagoshima Prefecture with the captain, ordinary seamen and 55 passengers on board departed Nejime Port, Minamiosumi-cho, Kagoshima Prefecture, taking a north-northwest course. At around 16:24, the ship was significantly shaken horizontally by incoming tidal waves. The sudden uplift, caused seated passengers to become airborne and slam back down onto their seats. Fourteen passengers were injured.

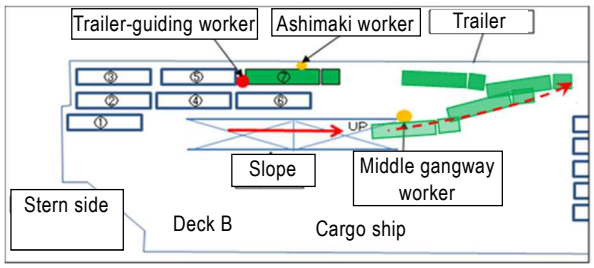
Probable Causes

It is probable that this accident occurred because the passenger ship departed Nejime Port even though the weather and hydrographic conditions had reached the standards for departure and navigation cancellation conditions specified by the safety management manual of Nankyu-Dock Co., Ltd. The vessel continued navigating outside the port at about 12 knots while taking a north-northwest course, which deviated northward from the standard navigation route. The bow of the ship was hit and violently lifted by oncoming tidal waves, causing seated passengers to become airborne and subsequently slammed back down into their seats, resulting in injuries.

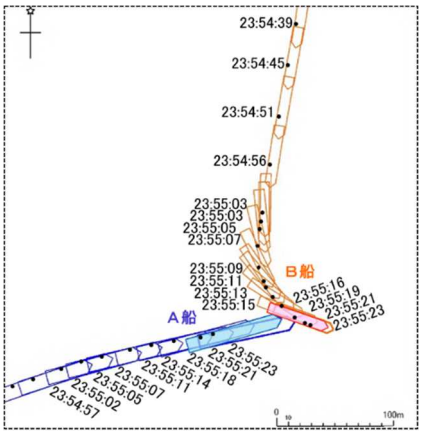
It is probable that the reasons that the ship continued navigating at about 12 knots in the direction of north-northwest, deviating northward from the standard route, were twofold: Firstly, the captain believed that, despite the up-and-down motions, the ship could safely avoid the oncoming waves by making a series of left turns and navigating at a speed slower than that specified by the navigation standard table. Secondly, he believed that even though taking the north-northwest course would subject the ship to oncoming wind and waves, the course would prevent the ship from drifting toward the aquaculture facilities located to the west from the breakwater and lighthouse of Nejime Port.

It is probable that the captain never imagined that the passengers would be thrust violently upward, slammed back into their seats and subsequently suffering injuries, including spinal fractures.

It is probable that the reasons why the ship departed Nejime Port despite the bad weather and hydrographic conditions having reached the standards for departure cancellation conditions specified by the safety management manual of Nankyu-Dock Co., Ltd. were that the captain mistakenly believed that he could cancel a departure only when wind speeds and wave heights exceeded the standards for departure cancellation condition and also the operation management

<table>
<tr><td></td><td></td><td colspan="2">director left navigation the final decision on him. It is likely that these factors have contributed to the accident.</td></tr>
<tr><td></td><td>Report</td><td colspan="2">https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-10-2_2019tk0027.pdf (Japanese only)</td></tr>
<tr><td></td><td>Reference</td><td colspan="2">Chapter 2 (page 22), Case Studies (page 152)</td></tr>
<tr><td>14</td><td>Date of Publication</td><td colspan="2">Date and location</td></tr>
<tr><td></td><td>December 17, 2020</td><td>January 20, 2019
Kashii Park Port, Hakata Port, Fukuoka pref.</td><td>CHURASHIMA, Roll-on/roll-off cargo ship
Fatality of a worker</td></tr>
<tr><td></td><td>Summary</td><td colspan="2">During the loading of container chassis onto the ship with the captain and 13 crew members on board at quay No. 8 of Kashii Park Port, Hakata Port, Fukuoka Pref., a worker in charge of trailer-guiding was crushed to death between a container chassis loaded on the deck and a reversing trailer at around 01:55, January 20, 2019.</td></tr>
<tr><td></td><td>Probable Causes</td><td colspan="2">Regarding this night-time accident during a container chassis loading operation at deck B, it is highly probable that the worker who was guiding a trailer and cargo stowage positions (hereinafter referred to as a “trailer-guiding worker”) was crushed to death between the chassis-towing trailer and a pre-loaded container chassis.
 

It is probable that the reason the trailer-guiding worker was sandwiched between the trailer and the pre-loaded container chassis is because the trailer driver lost sight of the worker but continued reversing by the whistled warning signals of the worker, and because the worker attempted to crossover to the left side of the trailer by slipping behind it after whistling.
It is probable that even though the trailer driver had lost sight of the trailer-guiding worker, he most likely continued reversing, because he felt the whistled signal was noted usual.
It is probable that another worker (ashimaki worker) said that he felt at the time of the accident that trailer moved backward even after hearing the trailer-guiding worker’s whistle sign. Since the worker also heard the trailer-guide worker’s successive whistles thereafter, it is likely that the driver did not come to a complete stop upon the first whistle sign.
The reason the trailer-guiding worker moved behind the trailer to the left side after he whistled was probably due to his intention to set a tire stopper to the tire left rear section of the container chassis, however, since nobody witnessed his actions, the reasons could not be confirmed.
Regarding alcohol intake by the trailer driver before the cargo handling operation: How his alcohol intake may have affected his driving ability could not be confirmed. However, given that even low blood-alcohol concentrations can affect driving ability and that these effects increase at higher concentrations, it is likely that his pre-accident drinking affected his situational judgment and response time.</td></tr>
<tr><td></td><td>Report</td><td colspan="2">https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-11-1_2019tk0028.pdf (Japanese only)</td></tr>
<tr><td>15</td><td>Date of Publication</td><td colspan="2">Date and location</td></tr>
<tr><td></td><td>December 17, 2020</td><td>June 26, 2019
Offshore area west from Sagishima (island), Mihara City, Hiroshima Prefecture</td><td>JK III, Cargo ship (Vessel A)
NOTOJIMA, Marine sweeper (Vessel B)
Collision</td></tr>
<tr><td></td><td>Summary</td><td colspan="2">On June 26, 2019, Vessel A bound for Fukuyama Port, Fukuyama City, Hiroshima Prefecture with the captain and four crew members on board was navigating north east, while Vessel B bound for Kure Port, Kure City, Hiroshima Prefecture with the skipper and 40 crew members on board was navigating south-south west. At around 23:55, the two ships collided at an offshore area west of Sagishima, Mihara City, Hiroshima Prefecture.
The bulbous bow of the Vessel A was dented, and a hole was made in the outer plate of the starboard quarter of the Vessel B, but there were no casualties.</td></tr>
</table>

	Probable Causes	It is probable that this accident occurred as follows: At night at an offshore area west from Sagishima, Mihara City, Hiroshima Pref between northeast-bound Vessel A and south-southwest-bound Vessel B. The navigation officer of Vessel A decided to sail past Vessel B "port-side to port-side" and continued on near the center of Aoki-seto. Meanwhile, the duty officer of Vessel B felt unsafe about navigating past Vessel A "port-side to port-side," so he decided to pass Vessel A "starboard to starboard." He asked his skipper's permission for to make a left turn and mistakenly thought that permission was granted and continued on from Kosagijima (island) through at nearly the center of the sea area west from the Toramarusho light beacon. As a result, the two ships collided.  It is probable that the reason the navigation officer of Vessel A decided to navigate past the Vessel B "port-side to port-side" and continued navigating near the center of Aoki-seto is because he usually navigated along the scheduled course line near the center of Aoki-seto displayed on the radar and avoided other ship by a portside to portside navigation, so he was mistakenly convinced that the Vessel B would soon make a right turn and navigate south east along Aokibana. It is probable that the reason the duty officer of Vessel B felt unsafe about navigating past the Vessel A "port-side to port-side" was that he thought that Vessel A was navigating near Aokibana and was concerned about the close distance to the 10-meter depth contour near Aokibana. It is probable that the reason the duty officer of the Vessel B continued navigation from Kosagijima (island) through nearly the center of the sea area west from Toramarusho light beacon is that he mistakenly thought that the Vessel A would turn left toward Aokibana and proceed north. It is probable that the reason the duty officer of the Vessel B asked the skipper's permission for a left turn but mistakenly thought that he was granted the permission is because he was confident of the skipper's trust in his steering ability and received no instructions from the skipper regarding his operation, he mistakenly thought he has obtained his approval. It is likely the fact that neither the Vessel A nor Vessel B used VHF to mutually exchange navigation information contributed to the occurrence of this accident. It is likely that the fact the Vessel B skipper fell asleep due and neglected to properly instruct the duty officer contributed to its occurrence.
	Report	https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-11-2_2019tk0015.pdf (Japanese only) https://www.mlit.go.jp/jtsb/ship/p-pdf/MA2020-11-2-p.pdf (Explanatory Material (Japanese only))
	Reference	Case Studies (page 150)

9 Actions taken in response to recommendations and opinions in 2020

Measures taken in response to recommendations in 2020 are summarized as follows:

① Passenger ship SORA contact with an approach light beacon

(Recommendations on December 20, 2018)

After its investigation of the collision of passenger ship Sora with an approach light beacon that occurred at Hanshin Port Kobe District 6 on July 26, 2017, the JTSB published its investigation report and made recommendations to OM Kobe Co., Ltd. on December 20, 2018, and received the company's completion report on its measures taken based on the JTSB's recommendations as described below.

● Summary of accident

The passenger ship SORA, with the master, the chief engineer, and 29 passengers on board, departed from the Kaijo Access Terminal of Senshu Port, heading north for a pier at the Kobe Airport Kaijo Access Terminal in Hanshin Port Kobe District 5 on July 26, 2017 around 21:29. Then the vessel collided with the Kobe Airport east approach light beacon in Hanshin Port Kobe District 6.

On SORA, four passengers were severely injured, and 21 passengers and two crew members suffered minor injuries. The hull suffered collapses and other damage to the portside bow area. The Kobe Airport east approach light beacon suffered abrasions to the support legs.

● Probable Causes

It is probable that this accident occurred in the following situation. At night, the beacon of the Kobe Airport east approach light beacon E2 was difficult to see due to the illuminating lights at Port Island's container terminal in the background. The passenger ship SORA was heading north in Hanshin Port Kobe District for a pier at Kobe Airport Kaijo Access Terminal in Hanshin Port Kobe District 5. The master was watching only visually without monitoring the radar installed on the port side of the steering stand and the GPS plotter with overlaid radar images. The master did not notice that the vessel was heading for the Kobe Airport east approach light beacon, then the ship collided with the beacon.

It is probable that the reasons why the master was watching only visually without monitoring the radar installed on the port side of the steering stand and the GPS plotter with overlaid radar images were as follows: (1) The master was chatting with the chief engineer. (2) He had been able to see in the past the light of the Kobe Airport east approach light beacon E2 when approaching the lighthouse.

By leaving ship steering to the chief engineer, the master was handling his smartphone. The master kept chatting with the chief engineer, and he was watching only visually without monitoring the radar installed on the port side of the steering stand and the GPS plotter with overlaid radar images. Paying less attention to return the vessel into the reference route, the master navigated the ship on the west side of the reference route without displaying it on the GPS plotter with overlaid radar images. Furthermore, the chief engineer transferred ship steering to the master without sharing information about the light beacon E2, and he was checking records in the engine logbook without watching the bow direction. It is probable that such behavior shows a lack of discipline in SORA's wheelhouse, which was attributable to the occurrence of this accident.

One of the reasons why the discipline in the wheelhouse was not maintained was that OM Kobe Co., Ltd. had not defined and disseminated the specific details of the standard arrangement of mariners on watch duty that the Safety Management Rule requires to be stipulated. At the same time, there was not enough safety education and training to learn the importance of ship navigation. Those include watching with the help of the radar installed on the port side of the steering stand and the GPS plotter with overlaid radar images, sharing the same information among crew members, and navigating along reference routes as much as possible. Based on this information, it is probable that the safety management of OM Kobe Co., Ltd. was not working effectively, which was attributable to the occurrence of this accident.

There were many injuries, including those who suffered severe injuries. It is probable that many passengers did not wear seat belts.

The collision caused the passengers to be thrown in the bow direction, hitting themselves against the front chairs. It is likely that the chairs that came off the floor contributed to this magnitude of human damage.

○ Recommendations to the OM Kobe Co., Ltd.

It is probable that the accident occurred when, as the passenger ship SORA was proceeding north in the Kobe section of Hanshin Port toward the pier of Kobe Airport Kaijo Access Terminal, which is in Kobe Section 5 of Hanshin Port, at night, SORA collided with the Kobe Airport East Approach Light Beacon when her master did not notice that she was navigating toward the light beacon because he was engaged in visual lookout only, without using the radar installed on the port side of the steering stand or the GPS plotter that overlaid the radar's images.

It is probable that OM Kobe Co., Ltd.'s safety management was not functioning effectively because it did not clearly indicate and make known specific information concerning ordinary navigational watch stations that are required by stipulations in safety management regulations, and because sufficient safety education and training on the importance of keeping appropriate lookout using the radar and GPS plotter and sharing information among crew members had not been provided.

Although OM Kobe Co., Ltd. implemented various measures to prevent recurrence after the accident, given that, when navigation routes were investigated following the accident, it was found that vessels are navigating near the Kobe Airport East Approach Light Beacon, it is probable that safety education and training on the importance of navigating on the standard route whenever possible were not sufficiently provided.

In view of the result of this accident investigation, the Japan Transport Safety Board recommends that OM Kobe Co., Ltd. implement the following measures pursuant to paragraph (1) of Article 27 of the Act for Establishment of the Japan Transport Safety Board in order to stably ensure the safety of passenger transport.

Owing to the importance of having preventative measures continuously and reliably implemented, continuously provide education and training to crew members of operating contractors with emphasis on the following points:

(1) The importance of lookout that includes appropriate use of navigation equipment

(2) The importance of sharing information on navigational safety among crew members

(3) The importance of safe operation that includes use of equipment that aids for preventing grounding (collision)

(4) The importance of conducting appropriate ship maneuvering, including recognizing the safety of navigating on standard routes and navigating on standard routes whenever possible

○ Measures taken by OM Kobe Co., Ltd. based on the recommendations (completion report)

Recommendation (1) The importance of lookouts that includes appropriate use of navigation equipment

Completion report

○ A Constant lookout and marine accident prevention during a navigation
Date: April 17 (Wednesday), 2019
Outside advisor: Mr. Suzuki Kunihiro, Vice President and Maritime Counselor,
Trainees: 14 trustee company crew members

○ A constant lookout and marine accident prevention during a navigation
Date: April 25 (Thursday), 2019
Navigation manager of the company: OM Kobe Co., Ltd.
Trainees: Nine trustee company crew members

○ Importance of safe operation (including constant lookout) by utilizing grounding/collision prevention devices
Date: September 28 (Saturday), 2019
Outside adviser: Mr. Suzuki Kunihiro, Vice President and Maritime Counselor, Safe Sailing Service Co.
Trainees: 15 trustee company crew members

○ Importance of safe operation (including constant lookout) by utilizing grounding/collision prevention devices
Date: October 17 (Thursday), 2019
Navigation manager of the company: OM Kobe Co., Ltd.
Trainees: 15 trustee company crew members

○ OJT by professionals
① During departure from port
Appropriate use of navigation equipment
Lookout (surveillance) by sight and navigation equipment
② During navigation
Look out (surveillance) by sight and navigation equipment
Appropriate use of navigation equipment
③ During entry into port
Appropriate use of navigation equipment

Recommendation (2) The importance of sharing information on navigational safety among crew members

Completion report

○ Safety-related educational seminar for crew members
Date: June 7 (Friday), 2019
Outside adviser: Prof. Furusho Masao, Kobe University
Trainees: 13 trustee company crew members

○ Safety-related educational seminar for crew members
Date: June 24 (Monday), 2019
Navigation manager of the company: OM Kobe Co., Ltd.
Trainees: Six trustee company crew members

○ OJT by professionals
① During navigation and departure from port
Importance of sharing navigation safety information among crew members

Recommendation (3) The importance of safe operation that includes use of equipment that aids for preventing grounding (collision)

Completion report

○ Importance of safe operation by utilizing grounding/collision prevention devices
Date: September 28 (Saturday), 2019
Outside advisor: Mr. Suzuki Kunihiro, Vice President and Maritime Counselor, Safe Sailing Service Co.
Trainees: 15 trustee company crew members

○ Importance of safe operation by utilizing grounding/collision prevention devices
Date: October 17 (Thursday), 2019
Navigation manager of the company: OM Kobe Co., Ltd.
Trainees: 15 trustee company crew members

○ OJT by professionals
① During navigation
Utilization of grounding/collision prevention devices

Recommendation (4) The importance of conducting appropriate ship maneuvering, including recognizing the safety of navigating on standard routes and navigating on standard routes whenever possible

Completion report

○ Obligation of navigating on the standard routes and importance of appropriate navigation
Date: September 28 (Saturday), 2019
Outside adviser: Mr. Suzuki Kunihiro, Vice President and Maritime Counselor, Safe Sailing Service Co.
Trainees: 15 trustee company crew members

○ Obligation of navigating on the standard routes and importance of appropriate navigation
Date: October 17 (Thursday) 2019
Navigation manager of the company: OM Kobe Co., Ltd.
Trainees: 15 trustee company crew members

○ OJT by professionals

① Ensuring safety and appropriate ship maneuvering by navigating on the standard routes during navigation and entry into port

* Notification contents including attachments are shown in the JTSB's website:

https://www.mlit.go.jp/jtsb/shiphoukoku/ship-kankoku18re_20200326.pdf (Japanese only)

② Oil tanker HOUNMARU Collision (Bridge)

(Recommendations on April 25, 2019)

After investigating the collision of oil tanker HOUNMARU with the Kansai International Airport Access Bridge that occurred on September 4, 2018, the JTSB published its investigation report and issued recommendations to Tsurumi Sunmarine Co., Ltd. on April 25, 2019, and was reported by the company (completion report) regarding the measures it took based on the recommendations as described below:

○ Summary of accident

When Typhoon No. 21 was approaching the Seto Inland Sea, including Osaka Bay, and a maritime typhoon warning was issued, the oil tanker HOUNMARU, 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, on September 4, 2018 around 13:40 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 HOUNMARU continued single anchoring at the east side of the Oil Tanker Berth ("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' ("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 result, it is probable that the HOUNMARU 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 HOUNMARU 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 HOUNMARU 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 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 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 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 the Tsurumi Sunmarine Co., Ltd.

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, it is probable that 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 likely that Tsurumi Sunmarine Co., Ltd. was 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.

Additionally, the Japan Transport Safety Board requests that Tsurumi Sunmarine Co., Ltd. report measures taken based on these recommendations pursuant to paragraph (2) of the same Article.

(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.

○Measures taken by Tsurumi Sunmarine Co., Ltd. based on the recommendations (completion report)

A completion report in response to the recommendations in (1).

According to the implementation plan and safety management manual, the company made it known

to the captains (masters) of the ships it manages that they shall comply with [1] to [4] of recommendation (1) regarding key points during anchoring (selection of anchorage, anchoring method, engine standby, main anchor supervision, etc.: hereinafter referred to as "points to note during anchoring").

(1) Distribution of a safety notice

The company obtained the JTSB's summary of accident prevention measures "Measures for Preventing an Anchor Dragging Accident during an Extremely Strong Typhoon" from the Japan Coastal Tanker Association and distributed it as a safety notice to its captains and shipowners (Attachment 1).

(2) Issuance of an alert in case of an extremely strong typhoon

The company instructed its safety manager and navigation manager to issue an alert including typhoon information and an anchor dragging accident prevention alert to the captains of operating ships, in cases of an extremely strong typhoon (Attachment 2).

(3) Other measures

The company took the following measures for the captains and owners of the ships operated by it and instructed them with regard to points of note during the anchoring of a ship.

● Instructions as wake-up calls by the Tsurumi Sunmarine Ship Safety Board

The Tsurumi Sunmarine Ship Safety Board held a general and regular branch meetings to inform owners and captains of the ships whose operations are managed by the company regarding the anchor dragging accident in question and points of note during anchoring. It also distributed a poster and a leaflet to each shipowner and ship (Attachment 3).

[Date of meetings]
General meeting: April 15
Keihin Branch meeting: October 21
Nagoya Branch meeting: May 21 and November 12
Osaka Branch meeting: May 22 and October 2
Shikoku Branch meeting: June 4 and November 6
Fukuoka Branch meeting: May 17 and October 25

● Monthly safety priorities

The general meeting of the Tsurumi Sunmarine Ship Safety Board has decided to designate the "appropriate selection of anchorage (anchoring location) and anchor dragging countermeasures" as "monthly safety priorities" to distribute it through each regular branch meeting to the owners and the captains of the ships operated by the company. Each shipowner and ship set their concrete goals in the monthly safety priorities and carried them out. (Attachment 4).

● Repetitive calls for attention to the anchor dragging accident in preparation for the typhoon season

The company regularly brought to the attention to the navigation manager, the captains and the

owners of the ships operated by the company the anchor dragging accident and provided them with information on the behaviors of typhoons, or storms with a cold wave and high waves toward the prevention of recurrences of the incident.

Date of the above: June 5 (before the typhoon season) and January 7 (before the wild winter weather season)

Instructed by: Navigation manager

Instructed to: Captains and owners of the 130 ships operated by the company

Distribution method: Attention to anchor dragging accident prevention was brought up and information on the behaviors of typhoons was distributed through faxes and e-mails (Attachment 5).

Completion report in response to recommendation (2)

In order to clarify the company's safety support system in anticipation of risks due to abnormal weather and hydrographic conditions, the company modified its safety management manual, and at the same time, in order to prevent the recurrence of the anchor dragging accident even in the face of an extremely strong typhoon, it additionally stipulated points to take note of during anchoring (selection of anchorage, anchoring method, engine standby, main anchor supervision, etc.) in their navigation standard and submitted the revised standard to the Kanto District Transport Bureau, which accepted it (Attachments 6 to 8).

The contents of the revision are as follows:

Revised safety management manual

① Safety management manual

[Term definitions]

Article 2 (23) previously defined "onshore facilities as a quay (including fender facilities) and facilities used for loading or unloading cargo (i.e., a movable bridge.)." However, due to the impracticality of this definition at during actual situation, the definition of onshore facilities was revised as "a quay, facilities used for loading or unloading cargo (including a movable bridge [including a fender facility and an adjunct materials-handling facility]) and other onshore facilities such as a breakwater and a bridge."

[Support by the navigation manager]

Article 25 previously specified events/incidents upon which navigation cancellation should be forwarded to a captain, but the company modified the title of this provision to "Support by the Navigation Manger" and clearly specified that support be provided by the navigation manager (provision of information, safety review and, when necessary, operation schedule modification) and additionally stipulated that, upon a navigation cancellation notification from the captain, the captain must be provided with information for selecting a harbor shelter (including a harbor of refuge and anchoring point) for discussion.

[Instructions by the top management or the safety manager]

Article 26 previously specified only the "issuance of a dense fog advisory" as information based

on which the top management or the safety manager should urge the navigation manager to judge whether the navigation is possible or not, but the wording of the article was modified to "in case a storm is anticipated due to a large typhoon or the like, or an issuance of a dense fog advisory" thereby reinforcing crisis management against storms.

② Navigation standard

[Selection of a harbor shelter]

The company modified the title of Article 5 to the "Selection of a Harbor Shelter" and clearly specified how a captain, in case a storm is anticipated due to a large typhoon or the like, should select a safe harbor shelter and that the captain must strengthen surveillance and make the main engine ready for immediate use.

The article was added with a provision to the effect that a captain, upon his/her decision on harborage or anchoring, must inform the navigation manager of his/her decision plus the harbor shelter and harborage means.

[Discussion of harborage]

The title of Article 6 was modified to the "Discussion of Harborage" and added with a provision stating, "Especially when a large typhoon is anticipated and the selection of a harbor shelter or the harborage means may significantly affect the safety of the cargo, the captain must discuss with the navigation manager to decide the best harbor shelter and harborage means on his/her own judgment."

* Notification contents including attachments are posted on the JTSB's website:
https://www.mlit.go.jp/jtsb/shiphoukoku/ship-kankoku19re_20200625.pdf (Japanese only)

③ **Passengers injured after the collision of passenger ship GINGA with floating objects**

(Recommendations on March 26, 2020)

See "Chapter 2. Summary of recommendations and opinions issued in 2020 – 1. Recommendations" (page 19 (1)).

10 Provision of factual information in 2020 (marine accidents and incidents)

The JTSB provided factual information on one case (marine accidents) to relevant administrative organs in 2020. The details are as follows.

① Information provided by the JTSB regarding the accident injury of passengers of passenger ship NANKYU No. 10 on December 2, 2019

Information provided on March 6, 2020

Provision of information on the accident involving passenger ship NANKYU No. 10, which resulted in passenger injuries

Regarding the accident that injured passengers of passenger ship NANKYU No. 10 on December 2019, the Kyushu District Transport Bureau issued an "order regarding transport safety" to Nankyu-Dock Co., Ltd. on February 19, 2020. In addition to the facts found by that point, the JTSB, in its investigation process thus far, found the below-mentioned facts, so it reported them to the Ministry of Land, Infrastructure, Transport and Tourism as follows:

1. Summary of the accident

(1) Date: December 2, 2019

(2) Location: An offshore area north west from Nejime Port, Minamiosumi-cho, Kagoshima Prefecture

(3) Description of the accident

At around 16:20 on December 2, 2019, passenger ship NANKYU No. 10 bound for Ibusuki Port, Ibusuki City, Kagoshima Prefecture with the captain, a crew member and 55 passengers on board departed Nejime Port, Minamiosumi-cho, Kagoshima Prefecture and was navigating in an offshore area northwest of Nejime Port. When the ship was struck by oncoming tidal waves, and was violently thrust upward, that resulted in injuries such as lumbar compression fractures on passengers seated in the anterior passenger compartment.

2. Factual information

The facts revealed through investigation thus far are as follows:

(1) Information on the passenger ship

Gross tonnage: 19 tons

Maximum capacity: 66 persons (64 passengers and 2 crew members)

Navigation speed: 20 knots

Route: from Nejime Port to Ibusuki Port

(2) Situation of the seats of the passengers

The ship was not required to be equipped with seatbelts. Anterior and posterior passenger compartments behind the control compartment had 46 and 7 seats respectively, among which only 3 seats in the posterior compartment were equipped with seatbelts.

(3) Injuries of passengers

Passengers who later suffered injuries were seated in the bow-side anterior passenger compartment. When the ship was shaken vertically and the uplifted bow slammed back hard onto the sea surface, nine passengers suffered lumbar compression fractures and other injuries.

(4) Weather and hydrographic conditions

・ Weather: cloudy

Wind direction: North-northwest, wind speed: 5.4 m/s on average, maximum instantaneous wind speed: 9.2 m/s (Values observed at Ibusuki Regional Meteorological Observing Station located 12 km west-northwest from where the accident occurred)

・ According to the Kagoshima Local Meteorological Observatory, a high wind, high-seas and frost warning was issued in Minamiosumi-cho at 15:35, December 2, 2019.

3. Past similar accidents

Among accidents investigated and published by the JTSB between October 2008 and December 2019, the number of casualties on passenger ships excluding hydrofoil craft was 45, among which 15 injury accidents occurred due to ships contacts with tidal waves (similar to the passenger ship in question) and did not take appropriate measures (e.g. course changes or deceleration) for mitigating ship motion or did not require passenger movement to posterior seats despite anticipated tidal waves. Each accident is summarized in the attachment below.

4. Similar accidents under investigations

Currently, in addition to the accident in question, the JTSB is investigating three accidents similar to it.

① January 26, 2019, passenger ship REPID 2 (gross tonnage: 19 tons) with the captain, chief engineer and 14 passengers on board was navigating north-northeast off the western coast of Matsuyamazaki, Saikai City, Nagasaki Prefecture when the ship crested a wave and its bow dropped steeply. The ship oscillated vertically and one passenger seated at the bow side suffered a lumbar compression fracture and other injuries.

② On August 14, 2019, a recreational fishing and sightseeing vessel, PROPOW III (gross tonnage: 2.6 tons) with the captain and 8 passengers on board was navigating off the coast of Akaiwa, Otaru City bound for Otaru Port. When the ship crested tidal waves and two passengers seated at the bow side suffered lumbar vertebral fractures.

③ On September 19, 2019, during a sightseeing navigation, a pleasure boat GURILAND 900 (gross tonnage: 3 tons) with the captain and 12 passengers on board, was hit by large waves and the boat and bounced vertically. One passenger seated at the bow side suffered lumbar spine burst fracture.

Attachment

List of passenger injuries due to the oscillations of ships climbing over tidal waves

Date	Ship	Human damage	Situation during accident	Summary	Measures in case of recurrence or other	Date of report publication
May 3, 2008	Pleasure boat KEIMARU, weighing 2.9 tons	Thoracic compression fracture and lumbar compression fracture on one passenger	Navigation speed: 10 knots Wave height: 0.5 m	While navigating with the captain and nine passengers onboard, the captain found high waves ahead but neglected to mitigate ship motion by changing the course or decelerating when the ship was violently shaken vertically. As a result, one passenger seated at the left front underwent a severe jolt and suffered a thoracic compression fracture and lumbar compression fracture.	・Attachment of handrails to passenger seats (due to passengers who felt an impact thrusting them up from below) ・A course change or deceleration for mitigating ship motion upon finding tidal waves	June 2009
Jan. 11, 2009	Pleasure boat SAKAMOTO, weighing 311 tons	Lumbar compression fractures on two passengers	Navigation speed: 15 knots Wave height: 1.0 m or more	The boat with the captain, one crew member and 28 passengers on board was struck by waves from the right front. Due to the captain's decision to maintain course and speed, the bow crested the waves and dropped with a violent vertical impact. The inertial force sent two passengers seated right front section of the anterior compartment airborne and the impact of the free-fall into their seats caused lumbar compression fractures.	・N/A	April 2010
Apr.30, 2009	Pleasure boat ANEI No. 98, weighing 19 tons	Lumbar compression fracture and head banging of one passenger and lumbar compression fracture of another passenger	Navigation speed: 25-26 knots Wave height: 2.5 m	The boat with the captain, one crew member and 28 passengers on board was struck by waves from the left front. Due to the captain's failure to notice the oncoming tidal waves until immediately before they hit, the bow crested the waves and slammed into the sea. This caused two passengers seated in the anterior compartment to go airborne and the impact of the fall back into their seats resulted in lumbar compression fractures and head injuries.	Recommendations to the boat owner: ・The boat owner shall continue appropriate safety education for crew members including measures for safe navigation through wild weather and make them comply with the contents of the safety education. ・In order to implement the safety management manual, the boat owner shall review safety measures under wild weather conditions according to each passenger boat size and compartment situation – measures such as route selection, deceleration, seatbelt requirements and guiding passengers to seats less prone to motion impacts, and compiling these into a for safe	March 2011

					navigation under a wild weather manual, mandate the manual to crew members and make them comply with required compliance.	
Mar. 8, 2010	Diver ship LA MER, weighing 15 tons	Lumber compression fracture of one passenger	Navigation speed: 15 knots Wave height: 0.5-1.0 m	During its navigation with the captain, two crew members and three passengers on board, the crew noticed wakes generated from another vessel. Since the ship maintained the same course and speed, the bow climbed and dropped between the crests of the wakes, sending a passenger seated on a bench at the anterior passenger compartment to go airborne, the impact upon landing fractured his lumbar vertebra.	▪N/A	May 2011

Date	Ship	Human damage	Situation during accident	Summary	Measures for preventing recurrence and others	Date of report publication
June 16, 2012	Passenger ship REPID 2, weighing 19 tons	Thoracic compression fracture and lumbar compression fracture of one passenger	Navigation speed: 23 knots Wave height: 2.0 m	The ship was navigating with the captain, one crew member and eight passengers on board while facing ocean swells from the left front side. Because the captain failed to follow the safety navigation manual for wild weather, when the ship climbed over the swell, it was rocked vertically, which sent one passenger seated in the anterior compartment airborne, and slamming his head against the ceiling and subsequently dropped him back into his seat, resulting in thoracic compression and lumbar compression fractures.	・The shipowner should ensure the compliance with the safety navigation manual for wild weathers by crew members through instructions and consider equipping each seat with a seat belt.	January 2013
June 24, 2012	Passenger ship ANEI No. 3, weighing 19 tons	Lumbar compression fracture of one passenger	Navigation speed: 15-22 knots Wave height: 2.0-2.5 m	The ship with the captain, one crew member and 56 passengers on board was struck by successive waves from the left bow side. Since the crew did not guide the passengers to the posterior seats where ship motion was relatively small and neglected to instruct them to fasten their seat belts properly, the vertical oscillations of the ship sent one passenger seated in the anterior passenger compartment without his seatbelt fastened airborne then slammed him back into his seat. The impact resulted in the lumbar compression fracture.	・The shipowner should ensure the following: guiding of passengers to posterior seats, restriction on the number of passengers, provision of information on the proper fastening of seatbelts to passengers (and ensuring their proper use), navigation speed adjustment according to ocean waves, sharing of marine information, proper installation of seatbelts, attachment of shock absorbers such as cushions to seats, safety education such as compliance with the safety navigation manual for wild weather, improvement of communications and the setting of navigation schedules with less burden on crew. Business operator of small high-speed vessels should comply with the company's safety navigation manual	March 2013

					for wild weather, ensure in particular the guiding of passengers to posterior seats and fasten seatbelts, and in the case of a ship whose passenger seats are located at the anterior part of it, equip each seat with a shock absorber such as a cushion. With regard to a newly built small high-speed vessel, the business operator must ensure that passenger compartments are located in placed with minimal vertical acceleration and that each seat is equipped with a shock absorber.	
June 26, 2012	Passenger ship ANEI No. 38, weighing 19 tons	Lumber compression fracture of a passenger	Navigation speed: 15-20 knots Wave height: 2.0 m	The ship with the captain, one crew member and 66 passengers on board was struck by successive waves from the left bow side. Since the crew did not guide passengers to the posterior seats where ship motion was relatively small or instruct them to fasten their seatbelts properly, the vertical motion of the ship sent one passenger seated without a fastened seatbelt in the anterior compartment airborne and slammed him down into his seat, resulting in a lumbar compression fracture.	・The same as those for passenger ship No. 3 ANEI described above	March 2013

Date	Vessel	Human damage	Situation during accident	Summary	Measures against recurrence	Date of report publication
July 8, 2012	Marine taxi MERMAID V, weighing 3.6 tons	Lumbar compression fracture of two passengers	Navigation speed: 20 knots Wave height: 2.5 m	During the vessel's navigation with the captain, one crew member and nine passengers on board, the crew was late in noticing swelling waves and decelerating the vessel, so it was tossed vertically by the waves, which sent two passengers seated on a bench of the bow deck airborne and slammed them down onto the floor, causing lumbar compression fractures.	・When navigating in choppy conditions, a navigation speed capable of mitigating the oscillations of vessel must be ensured. ・Compliance with the navigation standard	September 2013
Sept. 25, 2012	Diver ship LUCKY, weighing 19 tons	Lumbar spine burst fracture of one passenger	Navigation speed: 8 knots Wave height: 2.0-3.0 m	The ship with the captain and 41 passengers on board, the captain neglected to guide the passengers to posterior seats with less rocking motion. When the ship encountered large waves, it decelerated but the waves shook it vertically, causing a passenger sitting on a seat without handrails or seatbelt, located at the starboard side of the cabin to go airborne, and to slam him back into his seat. The passenger suffered lumbar burst fracture.	・Necessity of guiding passengers to posterior seats less affected by rocking motions before departure	November 2013
Nov. 11, 2012	Passenger ship PHOENIX, weighing 68 tons	Thoracic compression fracture of one passenger	Navigation speed: 10 knots Wave height: 4.0 m	The ship with the captain, two crew members and 77 passengers on board was rocked by large waves from the right front side. The crew had not selected the standard course, and therefore when ship crested a large swell, it was shaken vertically. The impact caused a passenger who was seated on the deck in the left center passenger compartment (and without anything to hold onto) to go airborne and then slam back down onto the deck, resulting in a thoracic compression fracture.	・When a captain decides to depart even in the face of stormy weather, the shipowner should take appropriate measures to ensure the captain's compliance with the navigation standard, such as instructing the captain to select the standard route. ・When a captain has decided to depart in the face of stormy weather, the shipowner should instruct the crew to ask passengers sitting on seats in the posterior passenger compartment to offer their seats to elderly persons including tourists.	July 2013
June 5, 2014	Passenger ship HAMAKAZE, weighing 19 tons	One passenger: right rib fracture, thoracic compression fracture,	Navigation speed: 19 knots Wave height: 1.0-1.5 m	Despite a strong wind warning, high-seas warning and maritime strong wind warning, the ship with the captain, one crew member and nine passengers on board was navigating in a	・The shipowner should instruct captains to avoid the questionable areas, that are prone to high waves. If a ship	June 2016

		lumbar compression fracture, traumatic hemothorax and cervical contusion Two passengers: thoracic compression fractures		sea area wilder than the surrounding sea. The ship climbed successive high waves without decelerating, then dropped steeply between the waves. Three passengers seated anterior to the right center section of the passenger compartment went airborne and then fell heavily their seats, which resulted in lumbar compression fractures and other injuries.	should navigate through such an area, appropriate measures such as deceleration according to wave height must be taken. ・When navigating under stormy weather conditions and ship motion instability is anticipated, the captain should guide the passengers to posterior seats. ・When strong ship motion is expected due to stormy weather conditions or wind-borne waves, the safety manager should, before departure, instruct the crew to make all passengers appropriately fasten their seatbelts and to concretely explain to them how to mitigate impacts of ship motion such as recommended postures to prevent impacts to their buttocks after going airborne.	

Date	Vessel	Human damage	Situation during accident	Summary	Measures for preventing recurrence and others	Date of report publication
Aug. 29, 2014	Pleasure boat RAVEN 3, weighing less than 5 tons	Lumbar spine burst fracture and right radial head fracture of one passenger	Navigation speed: 15-20 knots Wave height: 0.3 m	The pleasure boat with the captain and three passengers on board, was almost directly struck by the wakes generated by another ship, the impact of which vertically shook the bow, causing a passenger seated on an anterior seat to go airborne and subsequently slammed back down into his seat. This resulted in a lumbar spine burst fracture and right radial head fracture.	・When navigating through ocean waves, it is necessary to decelerate and choose a route with a less vertical impact on the ship. When vertical motion of the bow is anticipated, passengers should be guided to the posterior section of the ship with less vertical motion.	October 2015
Dec. 16, 2014	Passenger ship SOUTHERN KING, weighing 19 tons	Lumber compression fracture of a passenger	Navigation speed: no data Wave height: 2.5 m	While navigating with the captain, one crew member and 56 passengers on board, the crew neglected to instruct the passengers to fasten their seatbelts, so when the ship climbed over successive high waves and dropped between them, it was vertically shaken. The ship's motion sent a passenger seated without his seatbelt fastened at the left front side of the anterior passenger compartment to airborne and slammed back onto his seat, resulting in a lumber compression fracture.	・Ensuring compliance with the manual for safe navigation under a stormy weather, that requires the fastening of seat belts	May 2016
Apr. 17, 2016	Diver ship HONOKA, weighing 3.5 tons	Chance fracture of lumbar spine of a passenger and damage to the intervertebral disc of lumbar vertebra of another passenger	Navigation speed: 6 knots or less Wave height: 1.5 m	The ship was navigating with the captain, eight crew members and 26 passengers on board. The crew neglected to ask the passengers to take seats at the center section of the anterior deck or posterior section where ship motion impact would be small, so when the ship climbed over oncoming waves, the ship was violently shaken vertically, causing two passengers at the right front side of the anterior deck to go airborne and then slamming them to the deck, resulting in chance fractures of the lumbar spine.	・In case there is a possibility of an impact due to waves, the crew should organize passengers' luggage and guide the passengers to the center section of the deck or the stern section. ・When a stormy weather is anticipated, departure from the port should be cancelled.	August 2017
Aug. 10, 2017	Traffic boat SKIPJACK II, weighing 0.9 tons	Thoracic spine burst fracture of a passenger	Navigation speed: 9-10 knots Wave height: 0.5-1.0 m	During navigation of the boat with the captain and seven passengers on board against oncoming rough waves, the crew neglected to adequately decelerate the boat, so when the ship climbed over the waves, it was vertically shaken at the bow and sending a passenger seated at the right front section of the ship	・Regarding cases in which a risk of ship being shaken by rough waves is present, captains shall endeavor to guide passengers to the posterior section of ship where ship motion is relatively small and minimize the	October 2019

				airborne and then slamming them back down onto their seat. The passenger suffered a thoracic spine burst fracture.	wave-induced ship motion, for example, by adequate deceleration.	

* The relevant information is posted on the JTSB website.
https://www.mlit.go.jp/jtsb/iken-teikyo/s-teikyo18_20200306.pdf (Japanese only)

Column

Serious accidents that occurred in other country's territorial water

Marine Accident Investigator

On July 25, 2020, a Panamanian-registered cargo ship operated by a Japanese shipping company ran aground southeast of the coast of the island Republic of Mauritius. On August 6, a fuel oil was released and reached the seashore of the southeast coast causing widespread oil pollution.

The accident amounted to a serious marine incident to be investigated by the country where the cargo ship is registered and is also related to Japan's merchant fleet and therefore based on international treaty, the country of the registration country Panama, and coastal nation Mauritius agreed that Japan would take charge of the accident investigation (also see Chapter 7, on page 171). According to the framework of the treaty, Japan for the first time dispatched five investigation team members to conduct the site investigation of the accident of a foreign-flag ship in foreign territorial waters. In this way, Japan has promoted the establishment of a cooperative international investigation system between affected countries.

Although the period of the investigation overlapped the COVID-19 pandemic and the investigation team encountered various difficulties, we were able to carry out hearings with concerned parties and an airborne investigation over the accident site in cooperation with local authorities.

Looking back on the dispatch of the team for accident investigation in Mauritius

Since the COVID-19 pandemic, the investigation team for the first time from Japan encountered various difficulties. Since the COVID-19 made it impossible for the team to obtain a flight to Mauritius, we first departed Japan on September 20, arrived to the Reunion Island, which is a French territory located about 230 km southwest of Mauritius, chartered a small propeller-driven aircraft and then traveled to Mauritius. Immediately after arriving, the team members took PCR tests and then quarantined in a hotel to the west of Mauritius. The quarantine lasted for two weeks, during which we were allowed to visit other team members' rooms, but our movement on the hotel premises was impossible under the control of special mobile police.

At the same time, government authorities of Mauritius were cooperative with Japan's accident investigation and allowed the team to hold hearings with concerned parties even during its quarantine. However, all team members had to wear a mask and PPE(Personal Protective

Equipment). Ministry of Foreign Affairs, Regional Integration and International Trade officials escorted us by car during our commutes between our hotel and the hearing sites. Hearings were attended by Ministry of Health and Wellness officials with contact between us and other than concerned parties strictly prohibited.

After the quarantine, we moved to a hotel in the capital Port Louis. Restrictions on their movements were lifted, making it easier for us to investigate the accident.

After successfully completing the first investigation in Mauritius, we returned to Japan on October 22. We were able to complete the investigation without any major problems. In addition to the cooperation of the Mauritius government, Japan's authorities, such as the Ministry of Foreign Affairs of Japan did their best to coordinate the smooth investigation by the team. On the basis of the factual information obtained from the accident investigation, the maritime accident investigators will proceed with analyses aimed at the clarification of the accident.

Investigation team members being encouraged by the minister

Minister of Land, Infrastructure, Transport and Tourism, Akaba encouraging the investigation team

An investigation team member receiving a PCR test

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

Collision after leaving the quay and while turning

Collision of passenger ship Nipponmaru with mooring equipment (a pile dolphin)

Summary: Passenger ship NIPPONMARU (gross tonnage: 22,472 tons) with the captain, 204 crew members and 419 passengers on board left Apra Harbor quay F-4 of Guam, an unincorporated and organized US territory. While reversing toward pier D on the opposite shore, the ship turned left south of the quay toward the port entrance and collided with the pile dolphin of pier D at around 21:13, December 30, 2018.
This accident caused breaches in the outer plates of the starboard and port quarters, damaged the pile dolphin of pier D but resulted in no casualties.

At around 21:04, the ship that was being docked to quay F-4 (hereinafter referred to as the "quay") to its portside with the bow directed toward the east when it started to leave the quay.

After leaving the quay, the ship reversed toward a sea area west from the quay.

After reaching an area west of the quay, it started a left turn at around 21:10.

The ship reversed toward the pier while turning leftward.

Collision (at around 21:13:27)

(Analysis of the accident)

(Difference between the captain's recognition of how he was handling the ship and how he was actually handling the ship)

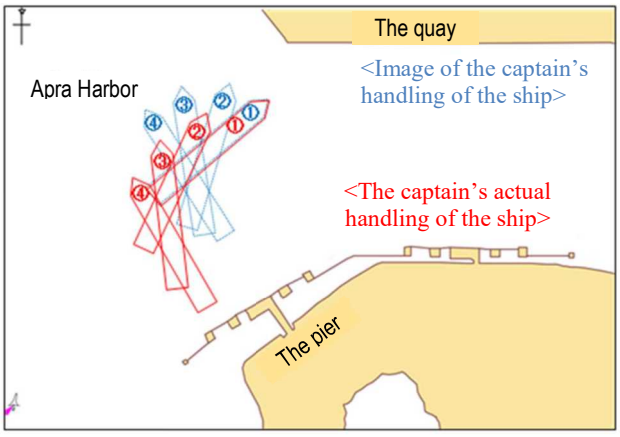
It is probable that the captain intended to tilt the joystick fully in the starboard direction but tilted it fully sternward. Although he was aware that tilting the joystick fully in the starboard direction requires tilting it fully toward the left side of his body while orienting his body toward the stern, he was in a standing position with his body positioned in a different direction from what he was used to. This resulted in him tilting the joystick fully toward the left side of his body while facing aport, and not sternward.

It is probable that the captain was unaware of his misdirection because he performed the operation without watching the way his hands controlled the joystick or watching outboard display. He probably did not think that what was reported to him by navigation officer B indicated the approach of the ship toward the pier, and he understand neither the proposals or advice by navigation officer C who was supporting ship's handling nor those by a pilot.

It is probable that the captain kept on steering the ship without watching his hands controlling the joystick and without thinking that what was reported by navigation officer B meant that the ship was on a collision course with the pier because he selectively collected information corroborating that what he was thinking was correct and was therefore convinced that his handling of the ship was right.

The reason the captain did not understand neither the proposals nor advice by the navigation officer C nor those by the pilot was probably because he ignored all information disproving his preconceived belief.

It is likely that the captain wanted to hold a leading position in the undocking and turning of the ship and recognized that navigation officer C was a newcomer in training. All these factors likely led to his prioritizing his own judgements over the suggestions advice by the pilot and navigation officer C, which likely caused his continuation of tilting the joystick fully sternward.



Difference between the captain's image of his handling and the actual movement of the ship

Probable cause: It is probable that, during the ship's left turn in an area west of the quay, the captain in an attempt to facilitate the turn tilted the joystick fully sternward although intending to tilt it fully in the starboard direction. He continued tilting the joystick fully sternward unaware of his mistake causing the ship to reverse with its bow rotating leftward when the stern collided with the pile dolphin of the pier.

For details, please refer to the accident investigation report. (Published August 27, 2020)
https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-7-2_2019tk0001.pdf

Many passengers injured due to the collision with floating objects during navigation

Passengers injured due to the collision of passenger ship GINGA with floating objects

Summary: Passenger ship GINGA (gross tonnage: 277.32 tons) with its captain, chief engineer and other two crew members as well as 121 passengers onboard was navigating westward on hydrofoils at a speed of about 41.7 knots (speed relative to the seabed) in an offshore area east from Himesaki, Sado City, Niigata Prefecture on the way to Ryotsu Port of the same city, when the ship collided with floating objects at around 12:16, March 9, 2019. This resulted in the injuries of 108 passengers and one crew member.
This accident breached the starboard quarter of the GINGA.

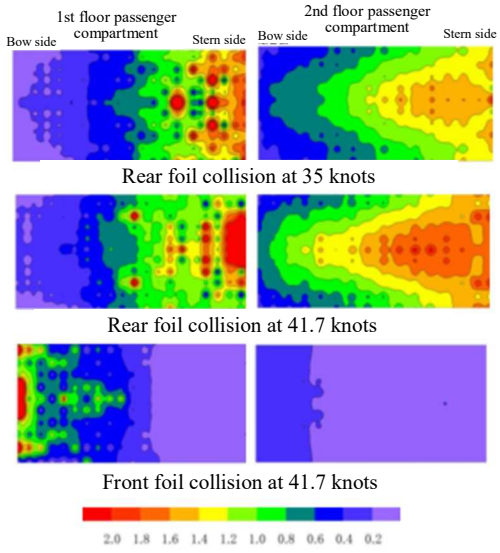
The ship departed Niigata Port in hull borne state at around 11:30 and started foilborne navigation at around 11:35.

At around 11:39, the ship was navigating west-northwest on autopilot, taking a course of 288° at a speed of about 40 knots.

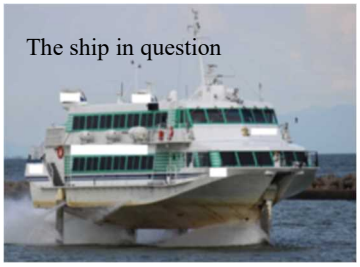
At around 11:48, the ship reduced its speed to about 37 kn and continued to navigate.

At around 12:15, when the ship was navigating westward while increasing its speed, the captain observed white floating objects in the water near the port bow, so he took immediate action to drop the ship's hull to surface and steered full starboard, while the chief engineer began throttling down toward full stop.

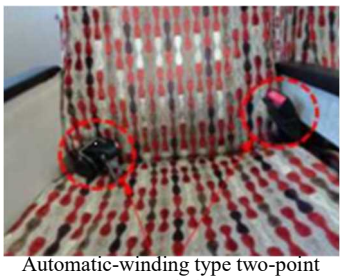
Impact on the ship at around 12:16



Speeds and upward acceleration for each collision point



Seat table



Automatic-winding type two-point seat belt

Seats of the ship (at the time of the accident)

(Analysis of upward acceleration and passenger injuries)

Due to the many lumbar fracture injuries that occurred in sections where upward acceleration was greatest, use of seats and seat cushions with adequate shock-absorbing functions was found to be an effective measure in reducing the number and degree of injuries in case of an accident.

(Analysis of backward acceleration and passenger injuries)

In this accident, the generation of backward acceleration due to the collision with the floating objects threw the passengers forward, which caused injuries such as upper jaw fractures and traumatic dental root fractures of 35 passengers. Therefore, installing shock absorbers to each seat head rest and seat back was found to be an effective measure in reducing the number and degree of injuries in case of an accident.

Probable causes: After the ship passed the slowdown zone located east off the coast of Himesaki, it accelerated and headed westward in a foilborne state. It is probable that the captain first observed the floating objects in the direction of the port bow (front left side) but they had already approached beyond avoidable distance, so he could not avoid them despite his collision avoidance maneuvering and the floating objects struck the rear hydrofoil wing, resulting in lumbar fractures among several passengers.

For details, please refer to the accident investigation report. (Published March 26, 2020)
https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-3-1_2019tk0008.pdf (Japanese only)

The Japan Transport Safety Board has stated recommendations to the Ministry of Land, Infrastructure, Transport and Tourism. For details, please refer to "Chapter 2: Summary of recommendations and opinions issued in 2020 (page 18).

Collision after passing an oncoming Vessel By "starboard to starboard" navigation instead of "port-side to port-side"

Collision between cargo ship JK III and marine sweeper NOTOJIMA

Summary: Cargo ship JK III (Vessel A, gross tonnage: 699 tons) bound for Fukuyama Port, Fukuyama City, Hiroshima Prefecture with the captain and four crew members on board was navigating north east, while marine sweeper NOTOJIMA (Vessel B, gross tonnage: 498 tons) bound for Kure Port, Kure City, Hiroshima Prefecture with the skipper and 40 crew members on board was navigating south-south west. At around 23:55, June 26, 2019, the two ships collided. The bow of the Vessel A was dented, and there was a breach in the outer plate of the starboard quarter of the Vessel B. There were no casualties in either ship.

At around 23:25, navigation officer A (of Vessel A) took over shift duty from captain A and was navigating in a northeast direction in Mihara-seto toward Aoki-seto at a speed of about 12 knots along the scheduled route by autopilot.

During the navigation in Aoki-seto, as navigtion officer A was monitoring the radar screen, he recognized AIS information indicating Vessel B navigating southward at about 3 M in toward the port bow.

Soon after passing the Koneshima (island) lighthouse, navigation officer A visually confirmed the starboard and mast lights of Vessel B behind Aokibana, Mihara City, Hiroshima Prefecture. in the port bow direction.

Navigation officer A, in an attempt to pass Vessel B by "port-side to port-side" navigation and to secure a safe passing distance from Vessel B near Aokibana, took two right turns at about 2° to 3° each.

Duty officer B in charge of navigation of Vessel B that was navigating along Bisan-seto sea area north route took over shift duty at around 20:45. On the other hand, skipper B of the Vessel B was in command of the ship and was instructing officer B from his chair but fell asleep before long.

Duty officer B recognized the mast light and starboard light of the Vessel A at about 20° off the starboard bow and at a distance of about 2,500 yd (about 2,286 m) but did not report it to skipper B.

Duty officer B wanted to steer right and pass Vessel A "port-side to port-side" but observed that the mast and starboard lights of Vessel A were fast approaching and that the ship was turning leftward and navigating near Aokibana.

Duty officer B felt that the sea area near Aoki-seto was narrower than expected and proposed a left turn to skipper B, but the skipper B barely replied, so officer B took a course of 194°but thought that the direction change of the Vessel A was small and steered left 190°.

Location of the accident
(The accident occurred at around 23:55:21, June 26, 2019)

Vessel B still did not change course. Navigation officer A felt that was unusual but that the Vessel B would maneuver right sooner or later.

Since Vessel B still did not change course and was now on a collision course with Vessel A, navigation officer A, recognizing the danger, activated the ship's searchlight (about 15 seconds from collision), switched to manual steering and turned the ship rightward by 30°to 40°.

Duty officer B felt that Vessel A was so near that he ordered reduced RPMs on both engines to navigate at a very low speed. He received an instruction from commander B, to stop both engines then ordered the immediate reversal of both engine to move slowly astern.

Collision (at around 23:55)

Probable cause: This accident occurred at night at an offshore area west from Sagishima, Mihara City, Hiroshima Prefecture on Vessel A's northeast route and Vessel B's the south-southwest route. It is probable that navigation officer A decided to pass Vessel B "port-side to port-side" and continued on near the center of Aoki-seto. Meanwhile, duty officer B felt unsafe about passing Vessel A "port-side to port-side," so he decided on a "starboard to starboard" maneuver and asked his skipper's permission for a left turn. He mistakenly thought that permission was granted and continued navigating near the center of the channel. As a result, the two ships collided.

For details, please refer to the accident investigation report. (Published December 17, 2020)
https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-11-2_2019tk0015.pdf (Japanese only)

Capsizing during navigation on a course and speed vulnerable to portside wind and waves

Capsizing of fishing vessel KEIEIMARU No. 65

Summary: Fishing vessel KEIEIMARU No.65 (gross tonnage: 29 tons) with the captain and seven crew members on board was returning to Hanasaki Port, Nemuro City, Hokkaido. At around 07:20, September 17, 2019, the ship capsized east of Cape Nosappu in the same city.
Among the eight crew members, one died and seven went missing.

On September 12, the ship departed Hanasaki Port dip net fishing for saury.

At around 17:16 on September 14, the crew began fishing east of Cape Nosappu, Nemuro City.

At around 04:08 on September 16, the ship started returning to the port.

On the way back to the port, the captain had a phone conversation with consort ship captain A, and in response to a question from captain A, explained that he was navigating with slightly reduced the engine rotation.

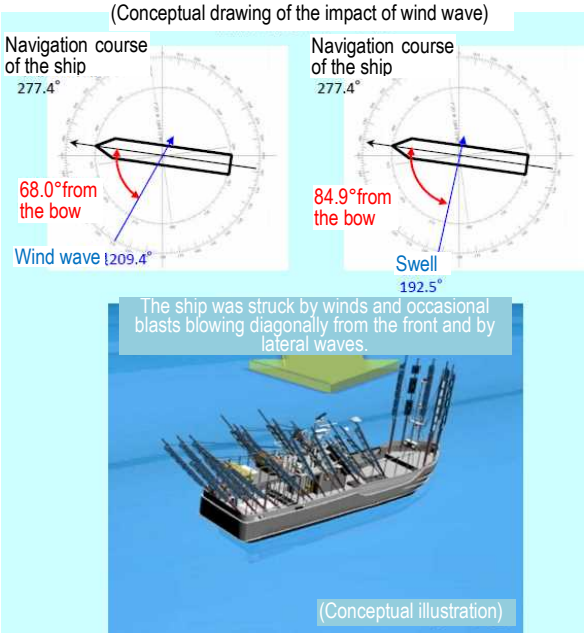
Under bad weather conditions with windblasts and high waves, consort ship captain B judged the navigation to no longer be possible. At 07:00, when consort ship captain B called the captain in question (KEIEIMARU No. 65), he was told that the captain was bailing* the seawater out of his ship which was struck by lateral waves.

* "Bail" means steering a ship to either a portside direction or a starboard direction to discharge seawater on the deck.

Consort ship captain B thought that the captain was busy steering the ship while bailing the seawater out of it, so he ended the call. Subsequently, at around 07:30, consort ship captain B called again but heard the recorded message "The mobile phone you have called is switched off."

Capsizing (at around 7:20)

(Conceptual drawing of the impact of wind wave)



(Situation of judgment on returning to the port)

- It is likely that this accident could have been avoided, had the captain decided to return to the port sooner, passing the sea area where the accident occurred before the growing atmospheric depression approached, this accident could have been avoided.
- Therefore, captains should appropriately judge meteorological and hydrographic conditions, and if necessary, decide to return to port early to avoid risk.

(Mechanism resulting in the capsizing)

In this case, it is highly probable that strong ocean waves caused a horizontal oscillation (269°) equivalent to a maximum expected value of 1/1000, a windblast struck the ship simultaneously with the maximal horizontal oscillation of the portside (windward) and the tilt moment rapidly increased (1.5 times higher than that in the case of a steady wind), which resulted in the rapid capsizing of the ship.

Probable cause: Under circumstances in which a high wind maritime alert was issued and a low-pressure system was approaching, the Vessel bound for Hanasaki Port was navigating westward east of Cape Nosappu in the face of winds and ocean waves. It is likely that the lateral waves hitting the port-side oscillated the vessel (causing a maximum expected value of 1/1000), a strong wind blast blew when its port-side (windward side) horizontally oscillated maximally, its tilt moment due to the winds rapidly increased and tilted in the starboard direction in excess of the bulwark submersion angle, causing the starboard bulwark to submerge, thereby capsizing the vessel.

For details, please refer to the accident investigation report. (Published August 27,2020)
https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-7-3_2019tk0022.pdf (Japanese only)

Passengers injured on ship due to a vertical thrusting them upward and slamming them back into their seats

Passengers injured on passenger ship NANKYU No. 10

Summary: Passenger ship NANKYU No. 10 (gross tonnage: 19 tons) with the captain, ordinary seamen and 55 passengers on board departed port taking a north-northwest course at about 12 knots. At around 16:24, on December 2, 2019, the ship was struck hard by incoming tidal waves, that lifted the bow caused seated passengers to become airborne then slammed down onto their seats. The impact injured 14 passengers.

The captain had checked the meteorological and hydrographic conditions at the waiting area of the Nejime Port ferry landing, and although the average wind speed was 10 m/s, he judged that navigation would be possible given the wave height.

All seats on the ship were occupied by passengers. The captain verbally called to their attention the risk of wild weather and ship motion before the ship departed Nejime Port toward Ibusuki Port.

The ship passed the breakwater and lighthouse located at the north of Nejime Port at a speed of about 12 knots. It was navigating north-northwest while being struck tossed upward by tidal waves (1.5 to 2.0 m in height) outside the port. When the ship climbed over an oncoming high wave, the bow lifted, tossing passengers seated in the anterior passenger compartment into the air. When the ship subsequently dropped between the waves, passengers were slammed violently down into their seats.

Impact (at around 16:24)

(Analysis of the accident)

- Although the wind speed at the port exceeded their departure cancellation standard, the wave height to port did not reach theirs, so the captain judged that departure would be possible.
- At the accident site outside the port, the captain steered the Vessel A as follows:
(1) To avoid collision with an aquaculture facility, the captain took a north-northwest course further north from the standard course.
(2) Although the ship was struck by oncoming winds and waves (1.5 to 2.0 m in height), it kept on at a speed of about 12 knots.

Situation of passenger injuries

Among 14 injured passengers, 9 suffered spinal fractures and 5 suffered minor injuries.

Those who suffered spinal fractures had been seated in the 1st to 3rd row seats of the passenger compartment.

The situation involving the passenger compartment and seats of Vessel A are as follows:

Situation of the passenger compartment

Situation of the chair seats

Probable cause: It is probable that the ship departed despite the bad weather and hydrographic (walrus) conditions exceeding the standards for departure and navigation cancellation conditions and continued navigating outside the port at about 12 knots while taking a north-northwest course, which deviated northward from the standard navigation route. Probably the ship crested a high wave, which lifted the bow and thrust the passengers seated in the passenger compartment up in the air and slammed them onto their seats, resulting in injuries.

For details, please refer to the accident investigation report. (Published November 26, 2020)
https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-10-2_2019tk0027.pdf (Japanese only)

The Japan Transport Safety Board has provided recommendations to the Ministry of Land, Infrastructure, Transport and Tourism. For details, please refer to “Chapter 2: Summary of recommendations and opinions issued in 2020 (page 22).

Column

Approaches toward investigations and accident prevention

Sendai Office, Secretariat

In response to a marine accident or incident, investigators are required to approach main investigation targets (e.g., persons and ship(s)) as soon as possible according to accident/incident type. A hearing of the accident parameters is conducted, written inquiries are sent to concerned parties and an on-site investigation is begun. The vessels involved in accidents are counted as physical evidence, subject to disposal. This necessitates on-site investigations as early as possible.

The following are the contents of our investigations, focusing on the examples of a fire accident and an engine failure.

Fire accident

Many accidents investigated by the Sendai Office involve fires on fishing vessels, which can be roughly classified into electrical fires (due to short circuits, degradation of wire insulation, etc.) and contact with combustible substances (such as fuel or lubricants) by a heat source (such as an exhaust pipe).

Fiber-reinforced plastic (FRP) is used for the bodies and structures of fishing vessels. FRPs, excluding flame-retardant plastics, pose a significant fire risk to vessels if they are overheated, catch fire and the subsequent fire spreads by chain reaction.

Among fire accidents, there are many cases in which a vessel is burned beyond recognition. They are often impossible to retrieve after sinking, and thus investigations are sometimes difficult.

Engine failure

Main engine failure is caused for example by long-term lack of maintenance of pistons or crank shafts and subsequent corrosion. While there are shipowners who keep their ships in perfect condition, there are cases in which engine manufacturer maintenance standards are not met.

While investigating various accidents, I sometimes feel that many engine troubles could have been avoided through pre-departure inspections, engine inspections and maintenance—all of which are important regular requirements.

JTSB investigations are intended to identify the causes of accidents and prevent their recurrence. During hearings with those related to navigation or maintenance, it is important not to make accusations, get angry or mentally back them into corners. Our basic stance is “80% listening and 20% talking.” Even though I am always trying to put this into practice I often fail to do so, which often causes regret later.

Chapter 6 Efforts toward accident prevention

1 Information dissemination for accident prevention

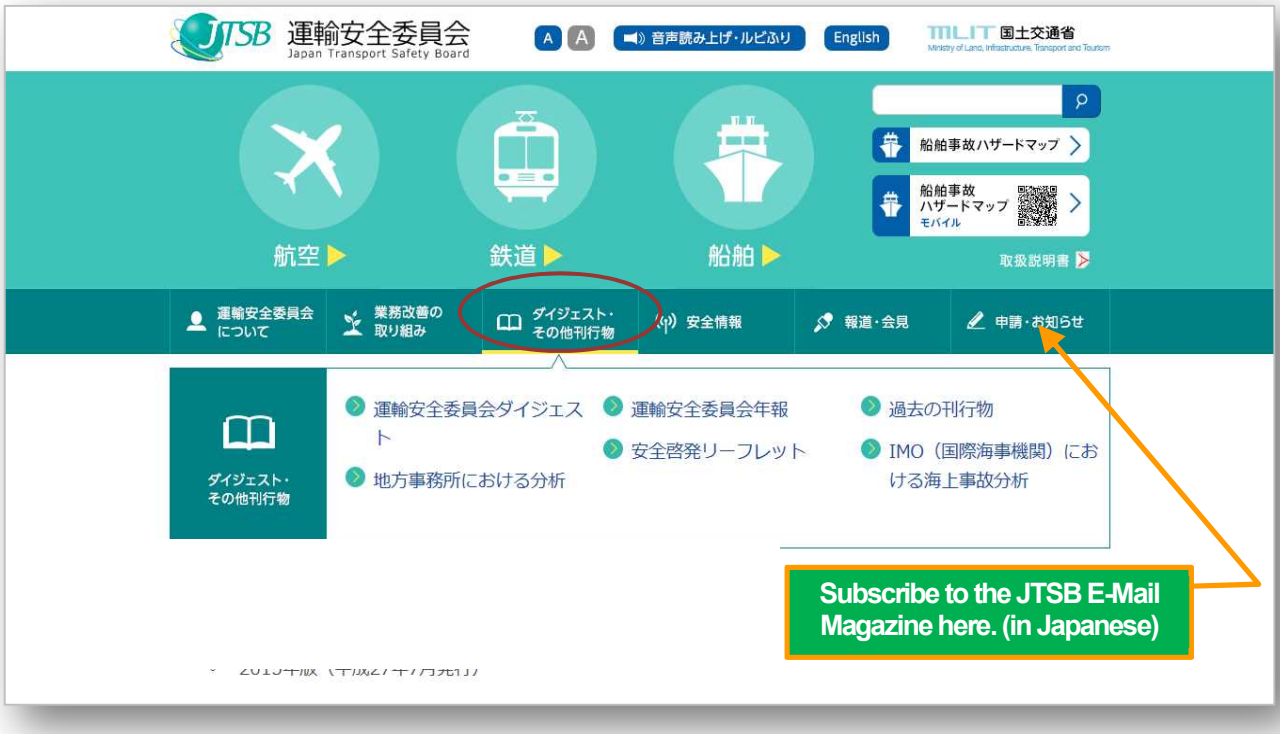
The Japan Transport Safety Board prepares and issues various publications as well as individual reports, regarding specific cases so that it can better understand the efforts being made to prevent recurrence and contribute to accident prevention.

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.

Moreover, we are exchanging opinions with business operators and other parties regarding how the JTSB should disseminate its information and an effective and appropriate dissemination method. Also in the future, we will make improvements based on opinions 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 2020, we released three issues of “JTSB Digests” (November, December: Issues No. 34-36).

The contents of each issue are as follows.

① JTSB Digest No. 34 [Aircraft accident analysis digest] “Accidents relating to the in-cloud flights of VFR aircraft” (Published November 24, 2020)

This issue covers accidents relating to in-cloud flights and others of VFR aircraft with representative cases, accident circumstances and backgrounds and summarizes points of note for preventing recurrences.

- Occurrence of in-cloud flights accidents and serious incidents
- Background of in-cloud flights accidents and serious incidents
- Psychological background of pilots
- Accident investigation case: “A crash into the mountain slope”
- Accident investigation case: “A crash into the vicinity of the mountain top”
- Accident investigation case: “A crash into the face of mountain slope”
- Accident investigation case: “A crash into the mountain slope”

② JTSB Digest No. 35 [Marine accident analysis digest] “For the safe navigation of small passenger ships – Bang! Backache! For the prevention of a spine fracture accident on a small passenger ship” (Published December 16, 2020)

This issue covers accidents involving passenger spinal fractures resulting from sudden vertical motions of ships, explains and analyzes how they occurred and the resultant injuries, as well as summarizes points of note for the safe navigation of small passenger ships (also see the Feature on page 10).

- Occurrence of accidents involving passenger spinal fractures
- Accidents examples involving passenger spinal fractures
- Accidents analyses involving passenger spinal fractures
- Measures for preventing recurrences of passenger spinal fracture and other accidents

③ JTSB Digest No. 36 [Marine accident analysis digest] “Analyses of accidents and incidents relating to engine trouble on recreational fishing vessels and fishing vessels” (Published December 24, 2020)

This issue analyzes accidents and incidents relating to engine trouble on recreational fishing vessels and fishing vessels (small vessels weighing less than 20 tons in total tonnage), includes accident and incident situations and examples, summarizes measures for preventing recurrences, as well as the importance of daily inspections and points of note for maintenance.

- Occurrence of accidents relating to engine trouble
- Accident investigation case: “Loss of control (engine failure – main engine)”
- Accident investigation case: “Loss of control (engine failure – seawater pump)”
- Accident investigation case: “Loss of control (engine failure – main engine)”

・Accident investigation case: “Loss of control (engine failure – reverse & reduction gear),” etc.

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 2020)

Sendai	**Small fishing vessel needs a rope ladder!** (Main contents) ・Accident investigation case ・Analyses ・Results of investigations of vessels needing rope ladders ・Conclusions ・A rope ladder is easy to make by yourself ! 
Nagasaki	**Many capsizing accidents of small boats are happening along the west coast of Kyushu.** **– What you can do to enjoy your leisure activities – Points of note for preventing a capsizing accident** (Main contents) ・Accident examples ・Example 1: “I left port knowing that waves were high.” ・Example 2: “I did not immediately return to the port despite the increasingly high waves.” ・Example 3: “I continued navigating the ship despite the waves hitting the sides.” ・Summary of key points to prevent capsizing small boats 
Naha	**Before setting sail…** **Knowledge leads to a sense of security, and compliance leads to safety – For pleasure boat accident prevention and damage mitigation –** (Main contents) ・Analyses ・Accident investigation case (6) ・Safe navigation checklist ・To the users of marina and fisharina ・Key points for accident prevention and damage mitigation 

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

Preparation of publicly available reports and analysis digests

Hiroshima Office, Secretariat

To make as many people as possible knowledgeable regarding the objectives and efforts of the JTSB, the Hiroshima Office is preparing accident investigation reports and analysis digests of past accident investigation case that are easy to understand not only for those engaged in ship operations but also for the general public.

So, what does an “easy-to-understand report” mean? Although the office uses as many photos and figures as possible for reports, their number of readers has not increased. The JTSB has decided to include detailed illustrations in reports for the purpose of increasing readership, allowing readers to better image accident situations and, hopefully, achieve better response.

Fortunately, the Hiroshima Office has a staff member who is very skilled with illustrations. Her skill and artistry should shed the staid images in their reports. In time, favorable reports that “the illustrator working for the JTSB on the recent accident investigation reports is very skilled” spread through SNS, resulting in 1,521 retweets, 18 quote tweets and 2,685 likes.

At first, the office staff had concerns about using illustrations – such as “the use of illustrations may result in colorful reports,” “what is the best placement for illustrations be used in a report?” and “the use of illustrations may be regarded as inappropriate for accident investigations.” However, when the office took on the challenge of preparing a report from a new point of view and tentatively published it, the report was also highly appreciated inside the JTSB. Now illustrations are also being utilized in analysis digests in headquarters (Tokyo) and other local offices.

JTSB Annual Report

4 Issuance of the JTSB Annual Report

In order to publicize the JTSB's general activities in 2019 and prevent the occurrence of accidents based on what was learned in past accidents, the JTSB issued the "JTSB Annual Report 2020" in July 2020.

As part of our efforts to provide information overseas, we issued the English version of the report "Japan Transport Safety Board Annual Report 2020" on December 2020. 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.

For preventing "capsizing accident" of saury fishing vessel

For the safe navigation of recreational fishing vessels and fishing vessels – Prevention of accidents and incidents involving an engine trouble

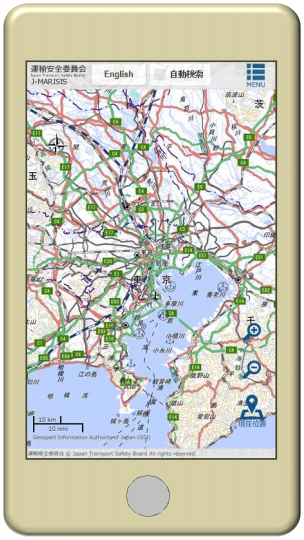
6 J–MARISIS – Now even easier to use

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.

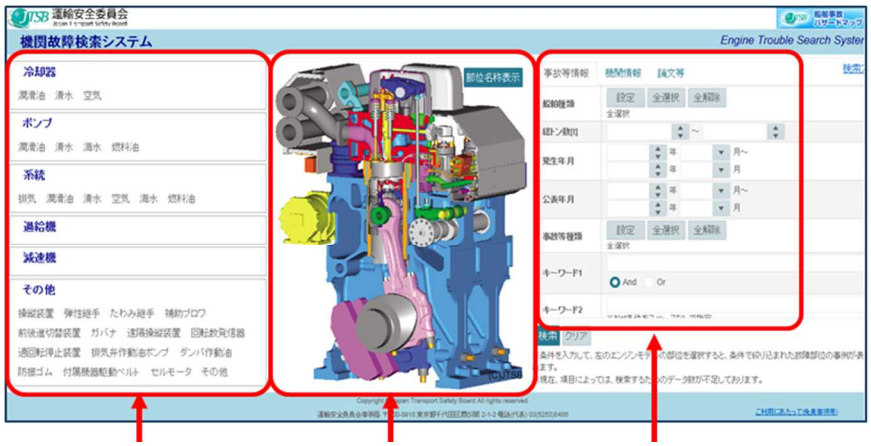
Contact us https://www.mlit.go.jp/jtsb/toi.html

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.

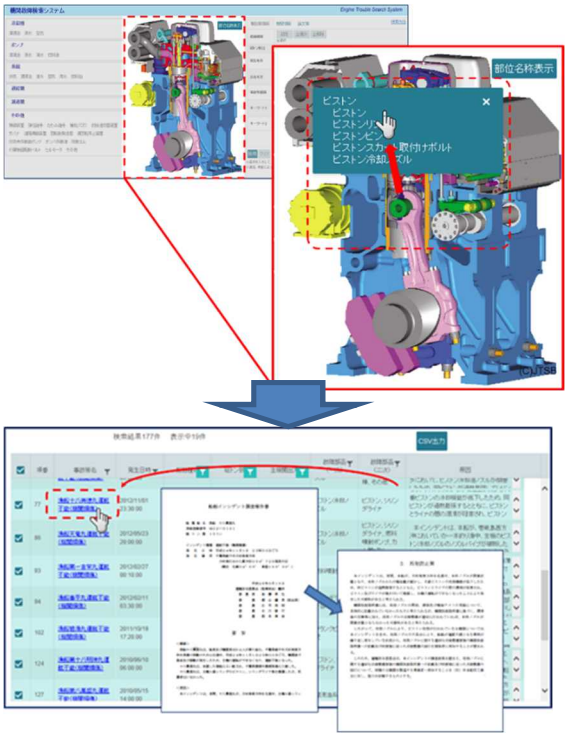
Engine Trouble Search System https://jtsb.mlit.go.jp/hazardmap/etss/



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 research, 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.)

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)

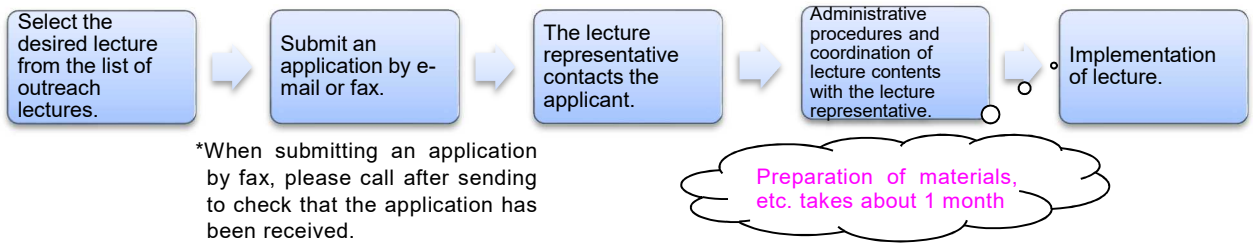
Scene of an outreach lecture

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 2020, information on accident investigation and other matters was provided to 253 persons, including the 28 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.

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)

Column

Relocations of the office building of the JTSB

General Affairs Division

On March 30, 2020, the secretariat headquarters of the JTSB was relocated to the 15th floor of Yotsuya Tower in front of Yotsuya Station, Tokyo. In this column, I will introduce a few incidences relating to the relocation.

Since its establishment on October 1, 2008 until June 3, 2018, the JTSB had been located at the Central Government Building No. 2 in Kasumigaseki. Following the relocation of related departments and agencies, the JTSB temporarily moved to the Otemachi Joint Government Building No. 3 on June 4, 2018, but returned to the Central Government Building No. 2 on March 4, 2019. There after the office moved again to the current location. In total, there were three relocations in about two years.

I feel that each relocation streamlined the JTSB through reductions in the superfluous documents that burdened each division and department, however the relocation to Yotsuya Tower involved various hardships. These included sorting out matters to be reviewed, floor layouts, adjustments of work-related infrastructure, reductions and allocations of bookshelves, advancing relocation schedules, complication involved in relocating to private building, signboard installation and adjustment, attendance to relocation work and too many other issues, about which I cannot explain in the limited space of this column.

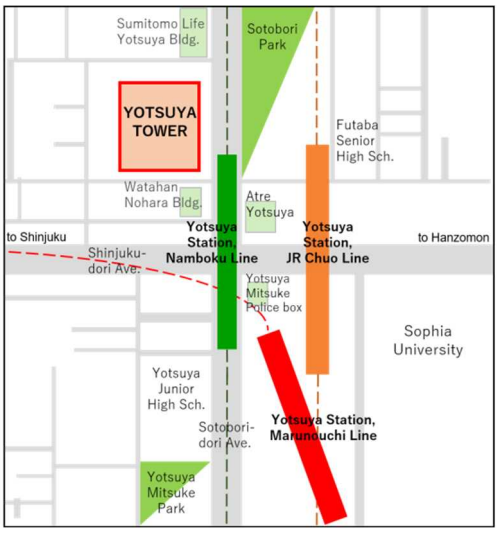
Initially, after the last relocation, COVID-19 restricted employees attendance to the office and so, many cardboard boxes were left unpacked for a time. We were gradually able to go back to normal operations.

Although Yotsuya Tower is a private building, the 13th to 15th floors are designated as the “Yotsuya Regional Joint Government Building” by national organs including the Tokyo Legal Affairs Bureau, the Tokyo Labor Bureau, the Ministry of Foreign Affairs, the Ministry of Economy, Trade and Industry, the Immigration Services Agency of Japan and the Ministry of Land, Infrastructure, Transport and Tourism (the Policy Research Institute for Land Infrastructure and Transport and the JTSB).

Streets in the vicinity of Yotsuya Tower, make Sotobori Park and restaurants accessible. There are restaurants, a post office and a supermarket also inside the tower building. The offices command a great view of Tokyo Skytree, Tokyo Tower, State Guest House and buildings in Shinjuku.

With our tower building blessed with this favorable location and new offices, we will endeavor to work-style reforms for better job performance, add a new twist to our way of working and improve the operating effectiveness of the staff.

Yotsuya Tower



Area map

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 2020.

2 Overseas-accident investigations and international conferences under the COVID-19 pandemic (activities in 2020)

Since March 2020, worldwide restrictions on overseas travels also affected the JTSB's accident investigation activities as a result of the COVID-19 pandemic. Of particular note is the grounding of

cargo ship WAKASHIO in Mauritius to which the JTSB dispatched an investigation team. The team had to enter the country under COVID-19 entry restrictions while coordinating with various parties ahead of time. Even after the entry into Mauritius, the team's activities were restricted by PCR testing and a two-week quarantine and had to conduct their investigation under circumstances other than usual, such as wearing protective clothing (also see the Column on page 120).

Moreover, most international conferences were cancelled while some were held virtually (on the Web). Although the JTSB was scheduled for participation in 11 international conferences in 2020, seven were cancelled or postponed and four were held virtually. Regarding the Web conferences, their agendas were altered and time allotments shortened but information was shared among the participating countries, regarding impact and restrictions on investigation activities and how they were handling under the COVID-19 pandemic. Web conferences were sometimes held during daytime in Europe, so other countries had to participate at night due to international time differences. Sometimes the participants from the JTSB also attended at night from Japan.

3 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 January 2021, 193 states are members of ICAO.

The objectives of ICAO are 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. Although the 6th Accident Investigation Panel Meeting (AIGP/6) was scheduled for April 2020, it was postponed due to the COVID-19 pandemic.

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.

The 8th Meeting of the Asia Pacific Accident Investigation Group (APAC-AIG/8) scheduled for October 2020 in India was held on the Web due to the COVID-19 pandemic. Two JTSB aircraft accident investigators participated in the meeting, and discussed tasks in accident/incident investigations while taking into account the characteristics of the Asia-Pacific region. They also discussed measures for improving the investigative ability and promoting cooperation 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 January 2021, IMO has 174 member states/territories and three regions as associate members.

IMO engages in various activities, such as the facilitation of intergovernmental cooperation, effective safety measures and drafting of conventions that relate to technical and legal problems with maritime life safety and safe marine navigations.

The Sub-Committee on Implementation of IMO Instruments (III) is a subordinate group of MSC and MEPC. It discusses how to ensure the responsibility of the flag state, including the investigation of marine accidents and incidents. III analyzes the accident or incident investigation reports submitted from states based on SOLAS and the International Convention for the Prevention of Pollution from Ships (MARPOL) to draw lessons from, which III subsequently makes public on the IMO website. By doing so, III promotes activities for the prevention of the repeated occurrence of marine accidents.

The Correspondence Group (which undertakes analysis during periods outside of the sessions) and the Working Group (which verifies the analysis results during the session period) comprises volunteer investigators from some member states. They discuss these analysis results, which the III plenary 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. Although the analyses of accident and incident investigation reports submitted by each country were scheduled for the 7th session of the Sub-Committee on Implementation of IMO Instruments (III 7) in July 2020, it was postponed due to the COVID-19 pandemic. The provisional translation of the past analysis results is shown in the JTSB website:

(URL: https://www.mlit.go.jp/jtsb/casualty_analysis/casualty_analysis_top.html)

4 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 January 2021, 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.

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.

Due to the COVID-19 pandemic, a meeting scheduled for May 2020 in Sydney, Australia was held on the Web. In the meeting to which the JTSB's Chairperson Takeda participated, information was exchanged regarding infection prevention measures of the investigative agency of each country, impact on their accident and incident investigations and how they were handling under the COVID-19 pandemic. The second Web meeting was held in October, in which information was shared among countries regarding the impact of COVID-19 on accident and incident investigations and the situations of investigation progress. Each country reported their major activities, and Chairperson Takeda reported on the grounding accident of cargo ship WAKASHIO that occurred in an offshore area east of the island nation Mauritius (also see the "Column" on page 146).

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 aim 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 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.

The 2020 annual seminar was postponed and rescheduled to 2021 as a webinar due to the COVID-19 pandemic.

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 AIR meeting scheduled for 2020 in Hampshire, UK was postponed due to the COVID-19 pandemic.

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.

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

The 29th forum scheduled for October 2020 in London, UK was postponed due to the COVID-19 pandemic. In November, a Web conference for reporting inter-forum progress was held and two JTSB marine accident investigators participated.

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.

The 23rd forum scheduled for September 2020 in Shanghai, China was postponed due to the COVID-19 pandemic.

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

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

Regarding the incident in December 2020 in which an abnormal noise and vibration were generated from the No.1 (left) engine of a Japan Airlines Co., Ltd. Boeing 777-200 during its ascent about 100 km north of Naha Airport and at an altitude of about 5,000 meters. The crew stopped the engine, declared an emergency and returned to the airport. The JTSB is investigating in cooperation with the accident investigation agency of the United States where the aircraft was designed and manufactured.

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 that were targeted by the JTSB in 2020, JTSB notified the accident investigation agencies in the related flag states of occurrences of four serious marine accidents involving ships engaged in international voyages.

As for the grounding of cargo ship WAKASHIO that occurred in an offshore area southeast of Mauritius in July 2020, the JTSB is investigating the accident with the cooperation of the accident investigation agencies of flag state Panama and coastal state Mauritius (also see the "Column" on page 146).

Among the marine accident and incident investigation reports that were published in 2020, JTSB sent five draft reports to the flag states and other interested states upon request in order to invite their comments.

5 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).

In January 2020, a meeting was held in Delhi in which a JTSB member and railway accident investigators participated. The JTSB was informed of the activities in India based on the "action plan" developed by trainees who had participated in training in Japan in July 2019 – for allowing railway accident investigation knowhow to take root in India – and providing advice for proceeding with the "action plan."

In October, a plenary Web session was held, to which the JTSB members and railway accident investigators participated. During the session, the extension of the period of the Project for Capacity Development on Railway Safety and how to proceed with the project in the future given the impact of COVID-19 were discussed. As a result, the project period that had been initially scheduled until October 2020 was extended to December 2021.

The JTSB will continue its support for the project's progress so that railway accident investigation know-how will steadfastly take root in India, actively supporting improvements in Indian railway safety.

6 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.

Every year, the JTSB dispatches aircraft and marine accident investigators to Cranfield University (UK) for accident/incident investigation training (see the Column on page 55). JTSB decided to cancel participation in the course in FY2020 due to the difficulty of sending accident investigators under the COVID-19 pandemic.

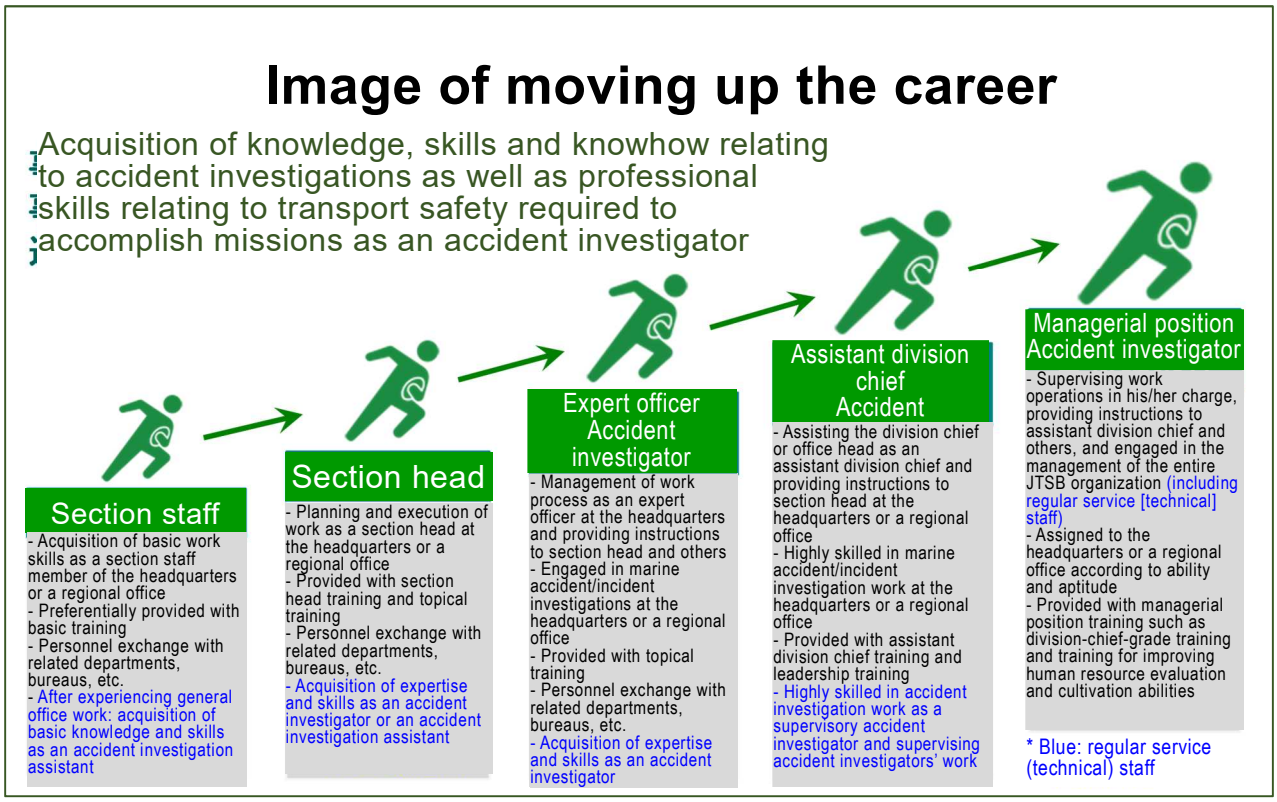
Column

"Foundation Project" – New efforts for securing human resources

General Affairs Division

Due to the vital importance of highly technical and professional staff members, the JTSB is strategically securing and cultivating human resources from a long-term perspective. Since the FY2020 examination for the national public service (regular service positions for university graduates), the JTSB began recruiting technical personnel also from the examination categories of "electricity, electronics and information," "mechanics," "civil engineering," "physics" and "chemistry" (in addition to administrative staff) and launched full-scale cultivation of future accident investigators.

The JTSB shifted from the administrative staff recruitment of its regional offices, which had been carried out at of a few years intervals, to annual recruitments centering on Tokyo by the Secretariat (Tokyo headquarters) to further enhance publicity and secure excellent human resources.



During the recruitment activities in FY2020, the JTSB developed an annual activity schedule, prepared pamphlets showing the career ladder and introducing the voices of JTSB staff. The JTSB distributed these to universities and preparatory schools as well as individually invited job seekers who had participated in the orientation meetings on the web or who had visited a local office to the Tokyo headquarters' explanatory meetings using a video teleconference system. In this way, the JTSB carried out nationwide publicity activities.

As a result of the JTSB's continuous dissemination of career benefits, it was able to hire four new recruits, including technical staff members, who have already started learning basic accident investigative techniques.

JTSB Secretariat's track record of recruiting employees through national public service examinations (for regular service positions) in the last 5 years

(Unit: person)

	2017	2018	2019	2020	2021
Administrative posts (male)	5	2	1	1	1
Administrative posts (female)	0	1	4	0	1
Technical posts (male)	0	0	0	0	1
Technical posts (female)	0	0	0	0	1
Total	5	3	5	1	4

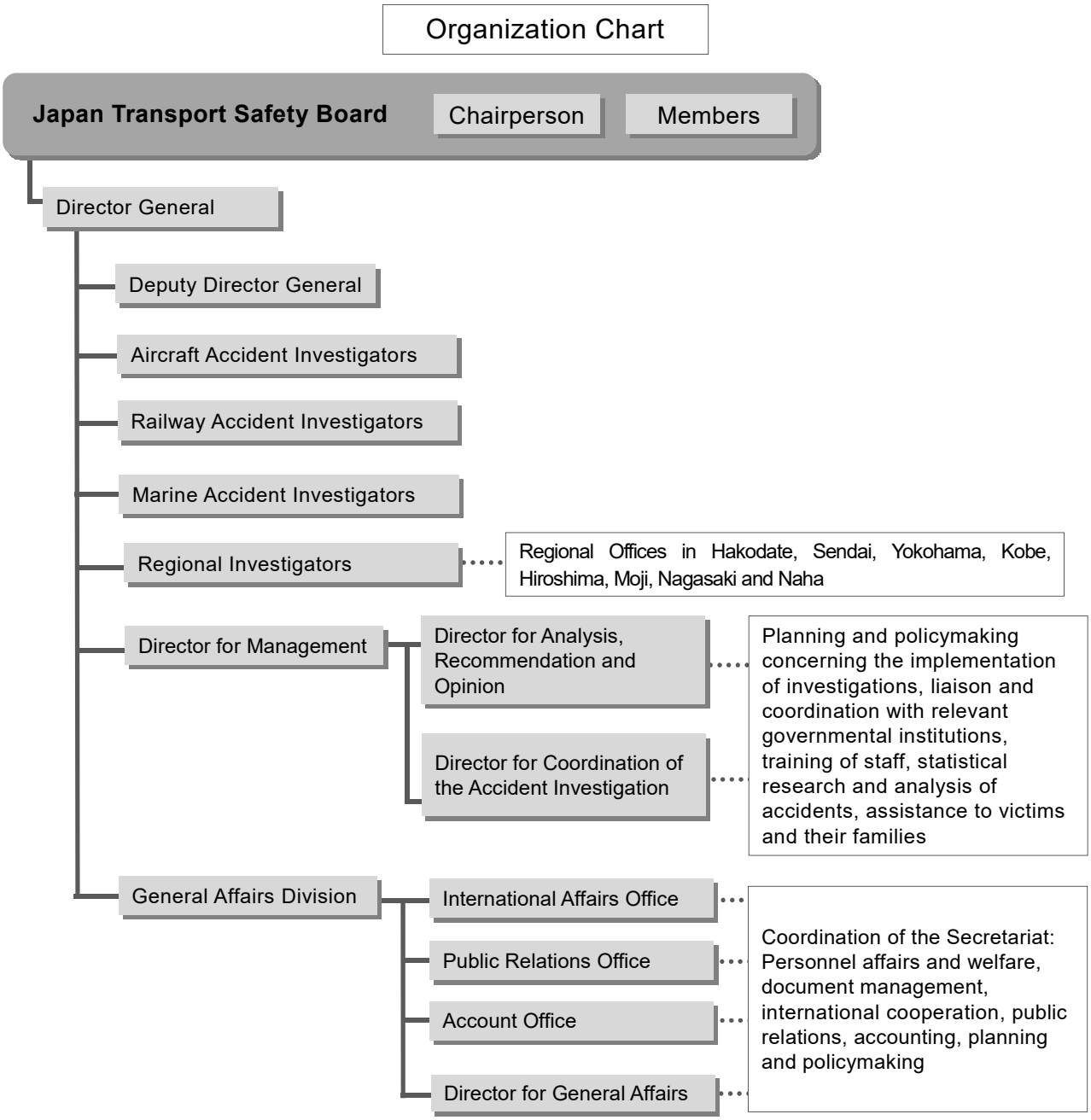
Appendices

Appendices
Contents

1 Outline of the organization 1
2 Deliberation items of Board and each Committee 2
3 Board Members 3
4 Number of occurrences by aircraft category (aircraft accidents) 5
5 Number of fatalities in accidents (aircraft accidents) 7
6 Number of occurrences by aircraft category (aircraft serious incidents) 9
7 Number of occurrences by type (railway accidents) 11
8 Number of fatalities in accidents (railway accidents) 12
9 Number of occurrences by type (railway serious incidents) 13
10 Number of occurrences by area (marine accidents and incidents) 14
11 Number of occurrences by type (marine accidents and incidents) 15
12 Number of vessels involved in accidents and incidents by type of vessel (marine accidents and incidents) 16
13 Number of vessels involved in accidents and incidents by gross tonnage (marine accidents and incidents) 17
14 Number of vessels involved in accidents and incidents in 2020 by type of accident/incident and type of vessel (marine accidents and incidents) 18
15 Number of fatalities in accidents (marine accidents) 19
16 Numbers of issued recommendations, opinions and safety recommendations 21

1 Outline of the organization

The Japan Transport Safety Board consists of the Chairperson, 12 members, and 180 secretariat staff (as of the end of March FY2020). 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 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, 2021

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 Graduate School of Engineering, the University of Tokyo (doctor of engineering)
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

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)

TSUDA Hiroka, Member (Part-time)

TSUDA Hiroka was appointed as a member on October 1, 2020; belongs to the Aircraft Committee, with special expertise in flight dynamics and control of aircraft, flight simulation and flight test.

Career summary: Senior R&D Fellow, Flight Technology Research Unit, Aeronautical Technology Directorate, Japan Aerospace Exploration Agency (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

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)

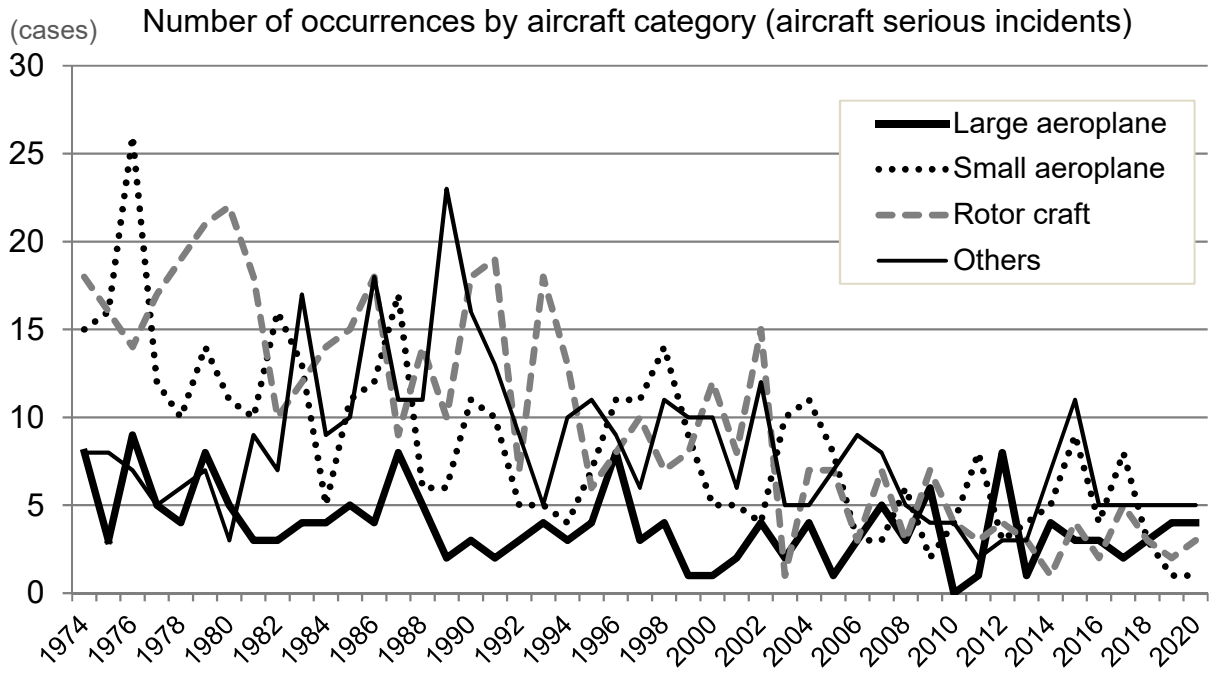
(Cases)

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

(Cases)

Category / Year of occurrence	Aircraft			Rotor craft		Glider	Airship	Total
	Large aeroplane	Small aeroplane	Ultralight plane	Helicopter	Gyroplane			
2006	3	3	4	2	1	5	0	18
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
2020	4	1	5	3	0	0	0	13
Total	179	394	176	441	25	207	2	1,424

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accidents Investigation Commission in 2008
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		Aircraft			Rotor craft		Glider	Total	
		Large aeroplane	Small aeroplane	Ultralight plane	Helicopter	Gyroplane			
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	

(Persons)

Year of occurrence \ Category		Aircraft			Rotor craft		Glider	Total	
		Large aeroplane	Small aeroplane	Ultralight plane	Helicopter	Gyroplane			
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	
2020	Crew	0	0	1	1	0	0	2	2
	Passengers and others	0	0	0	0	0	0	0	
	Crew	2	13	9	28	1	7	60	96
	Passengers and others	0	11	1	22	0	2	36	
	Total	2	24	10	50	1	9		

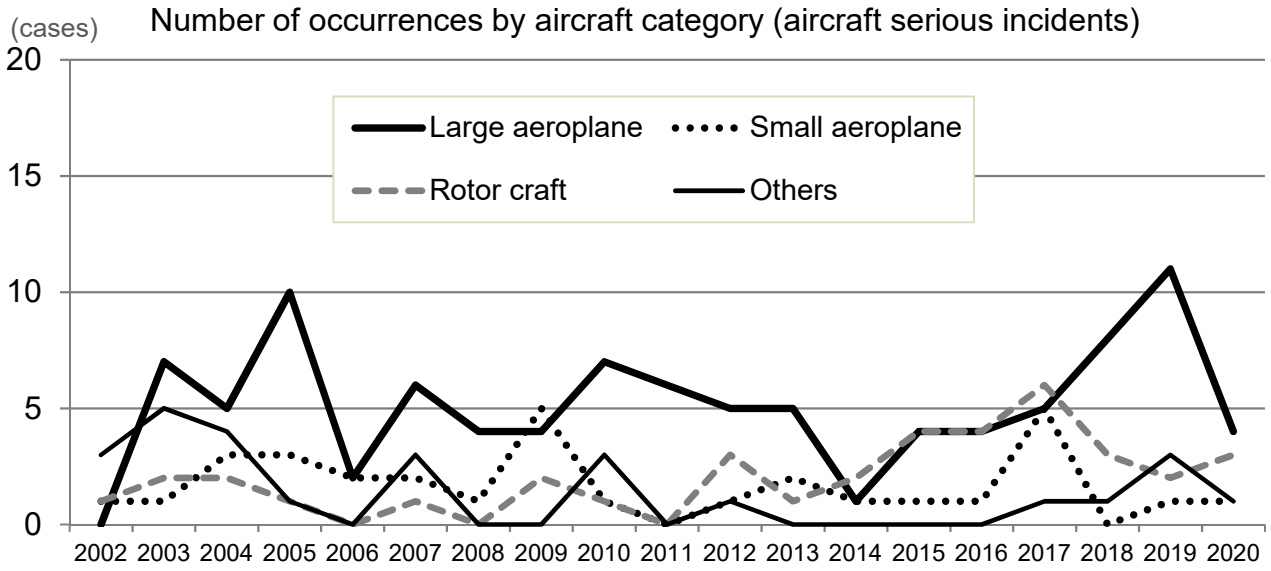
(Note) 1. The figures include the cases handled by the Aircraft and Railway Accidents Investigation Commission in 2008
2. Death tolls represent data for the respective years of occurrence relisted from the annual reports published for those years.
3. Large aeroplanes are aircraft with a maximum take-off 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
2020	4	1	1	3	0	0	0	9
Total	99	33	17	39	0	9	0	197

(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.


(cases)
Number of occurrences by aircraft category (aircraft serious incidents)
20
15
10
5
0
Large aeroplane
Small aeroplane
Rotor craft
Others
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

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
2020	0	7	0	6	0	0	0	0	0	0	0		0	0	13
Total	7	203	13	65	0	15	3	1	9	0	0	3	0	0	319

(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
2020	0	0	1	1
Total	0	2	63	65

(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.

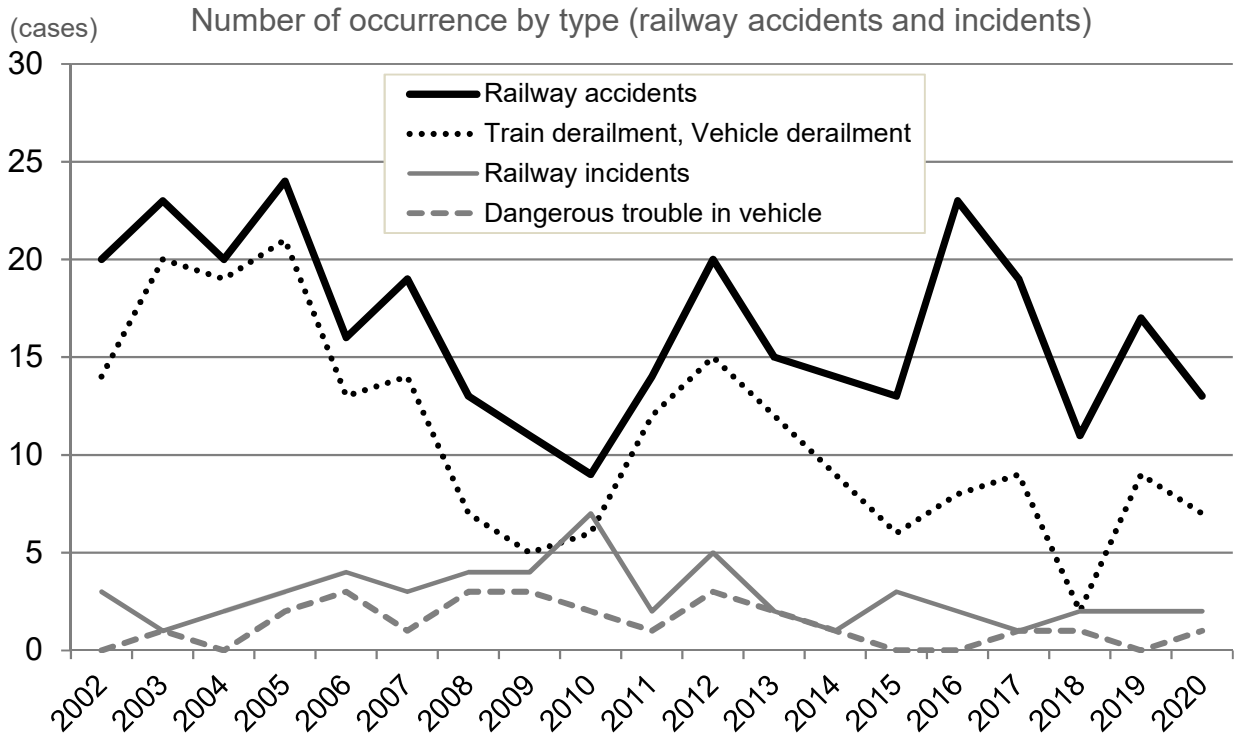
9 Number of occurrences by type (railway serious incidents)

(Cases)

Year of occurrence \ Type	Railway										Tramway							Total
	Incorrect management of safety block	Incorrect indication of signal	Violating red signal	Main track overrun	Violating closure section for construction	Vehicle derailment	Dangerous damage in facilities	Dangerous trouble in vehicle	Heavy leakage of dangerous object	Others	Incorrect management of safety block	Violating red signal	Main track overrun	Dangerous damage in facilities	Dangerous trouble in vehicle	Heavy leakage of dangerous object	Others	
2001	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2002	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2003	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
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
2020	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2
Total	1	7	0	1	7	2	3	26	0	3	3	1	0	0	0	0	0	54

(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	154	671	35	47	907
2018	194	731	38	47	1,010
2019	217	757	52	35	1,061
2020	186	629	37	16	868
Total	2,802	9,756	461	671	13,690

(Note) The above table shows the number of accidents and incidents into which the JTSB launched an investigation as of the end of February 2021 (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	101	200	11	25	65	31	1	42	146	0	181	22	0	21	1,061
2020	192	94	159	12	14	52	29	2	14	135	0	142	12	1	10	868
Total	3,240	1,572	3,096	146	234	688	412	28	374	1,907	9	1,383	178	30	393	13,690

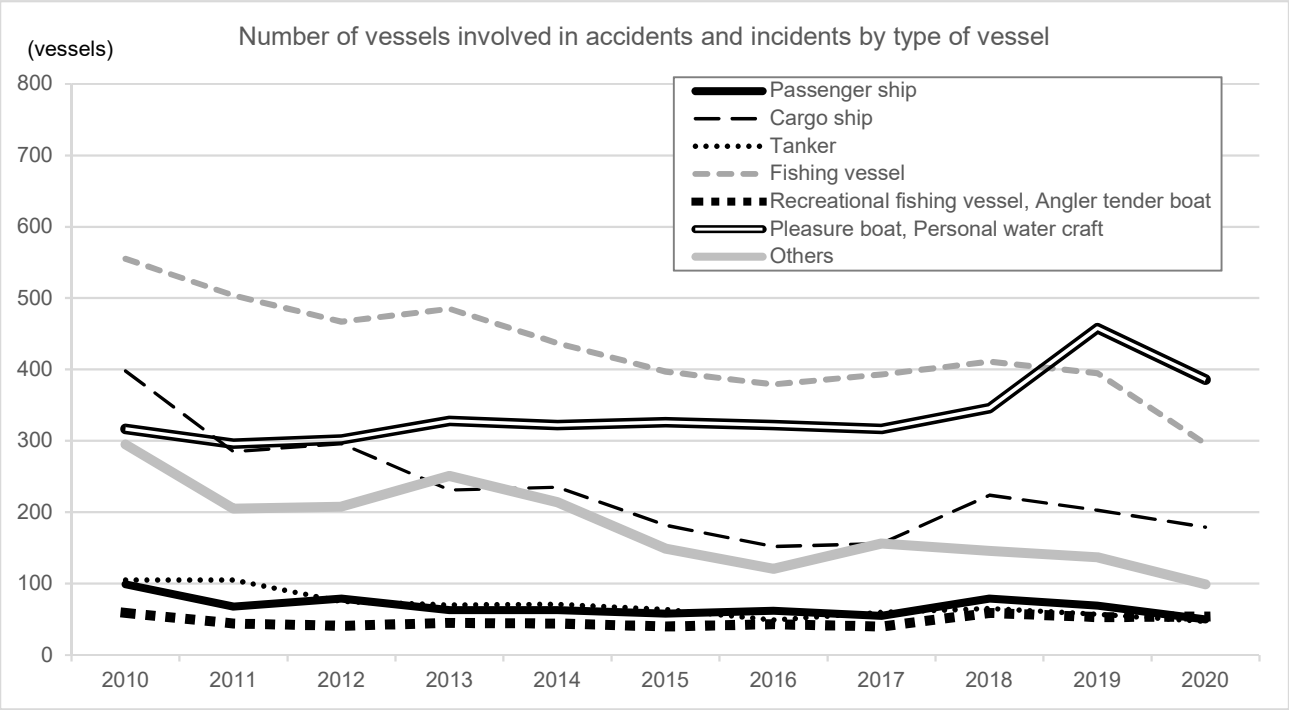
(Note) 1. The above table shows the number of accidents and incidents into which the JTSB launched an investigation as of the end of February 2021 (including those carried over from the former Marine Accident Inquiry Agency).

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
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	69	203	57	395	50	47	6	29	33	10	412	46	15	1,372
2020	50	179	47	296	33	52	2	12	22	9	329	57	23	1,111
Total	905	3,340	906	5,631	1,051	527	73	394	700	216	3,473	717	188	18,121



(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 2021 (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)

Gross tonnage / Year	less than 20 tons	20 to less than 100 tons	100 to less than 200 tons	200 to less than 500 tons	500 to less than 1,600 tons	1,600 to less than 3,000 tons	3,000 to less than 5,000 tons	5,000 to less than 10,000 tons	10,000 to less than 30,000 tons	More than 30,000 tons	Unknown	Total
2007	1	0	0	1	0	0	0	0	0	0	1	3
2008	485	52	138	216	77	24	16	17	10	15	78	1,128
2009	903	89	230	288	116	42	34	49	30	14	199	1,994
2010	900	86	175	260	128	36	37	39	25	24	118	1,828
2011	823	59	142	194	101	39	18	32	21	17	61	1,507
2012	790	53	133	199	78	33	25	38	25	20	74	1,468
2013	881	44	113	142	93	47	27	36	19	17	54	1,473
2014	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	928	31	46	130	68	28	20	34	11	14	62	1,372
2020	714	19	45	117	49	21	9	28	13	15	81	1,111
Total	10,368	627	1,401	2,151	1,075	435	292	390	245	200	937	18,121

(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 2021 (including those carried over from the former Marine Accident Inquiry Agency).

14 Number of vessels involved in accidents and incidents in 2020 by type of accident/incident and type of vessel (marine accidents and incidents)

(Vessels)

Type of accident/incident / Type of vessel	Marine accident											Marine incident				Total
	Collision	Contact	Grounding	Sinking	Flooding	Capsizing	Fire	Explosion	Facility damage	Fatality/ Injury	Others	Loss of control	Stranded	Safety obstruction	Navigation obstruction	
Passenger ship	6	17	6	0	2	1	4	0	0	4	0	2	2	0	6	50
Cargo ship	87	29	19	0	1	1	4	0	4	13	0	15	3	1	2	179
Tanker	20	10	11	1	0	0	0	0	0	2	0	2	1	0	0	47
Fishing vessel	99	14	47	3	3	21	16	2	0	63	0	27	0	0	1	296
Tug boat, push boat	14	5	4	3	0	0	0	0	3	2	0	1	0	0	1	33
Recreational fishing vessel	30	4	5	0	1	2	3	0	1	2	0	4	0	0	0	52
Angler tender boat	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
Work vessel	2	4	2	1	0	1	0	0	0	2	0	0	0	0	0	12
Barge, Lighter	10	2	3	1	0	0	0	0	3	2	0	1	0	0	0	22
Public-service ship	4	0	4	0	0	0	0	0	0	0	0	1	0	0	0	9
Pleasure boat	100	15	52	5	6	28	1	0	7	25	0	84	6	0	0	329
Personal water craft	20	1	4	0	1	0	0	0	0	26	0	5	0	0	0	57
Others	8	1	8	1	0	0	1	0	0	3	0	1	0	0	0	23
Total	400	102	165	15	14	54	29	2	18	146	0	143	12	1	10	1,111

(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 2021.
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	1	51	1	5	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	
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	

(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	
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	24	
2019	Crew	0	16	0	57	1	11	1	86	102
	Passengers	0	0	0	0	1	0	0	1	
	Others	0	3	0	1	0	10	1	15	
2020	Crew	1	2	1	46	1	12	2	65	83
	Passengers	0	0	0	0	2	0	0	2	
	Others	0	2	0	0	0	10	4	16	
Total	Crew	16	84	28	840	8	180	61	1,217	1,488
	Passengers	7	0	0	0	21	0	0	28	
	Others	3	21	1	13	2	179	24	243	
	Total	26	105	29	853	31	359	85		

(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 2021 (including those carried over from the former Marine Accident Inquiry Agency).

16 Numbers of issued recommendations, opinions and safety recommendations

Type and mode / Year	Recommendation			Opinion			Safety recommendation	
	Aircraft	Railway	Vessel	Aircraft	Railway	Vessel	Aircraft	Vessel
2008	—	—	—	2	—	—	—	—
2009	—	—	—	1	1	1	3	—
2010	—	—	—	—	—	1	1	—
2011	—	1	2	1	—	5	—	9
2012	1	1	6	1	—	4	1	2
2013	4	3	4	—	—	2	3	—
2014	4	—	—	—	—	1	2	6
2015	2	—	—	—	1	—	—	—
2016	1	—	—	—	—	—	1	3
2017	1	—	1	—	—	—	—	2
2018	1	—	1	1	2	2	—	1
2019	1	—	1	—	1	1	—	5
2020	3	—	2	—	—	—	—	1
Total	18	5	17	6	5	17	11	29

(Note) These were issued after the establishment of the JTSB in August 2008.

Japan Transport Safety Board Annual Report 2021

Issue in July, 2021

Japan Transport Safety Board
15th Floor YOTSUYA TOWER, 1-6-1 Yotsuya, Shinjuku-ku, Tokyo, 161-0004 Japan

Tel: +81-3-5367-5025 Fax: +81-3-3354-5215
URL: http://www.mlit.go.jp/jtsb/english.html
E-mail: hqt-jtsb_bunseki@gxb.mlit.go.jp

Japan Transport Safety Board

ANNUAL REPORT

2021