Chapter 3 Aircraft accident and serious incident investigations

1 Aircraft accidents and serious incidents to be investigated

<Aircraft accidents to be investigated>

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

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

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

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

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

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

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

<Aircraft serious incidents to be investigated>

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

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

◎Article 76-2 of the Civil Aeronautics Act

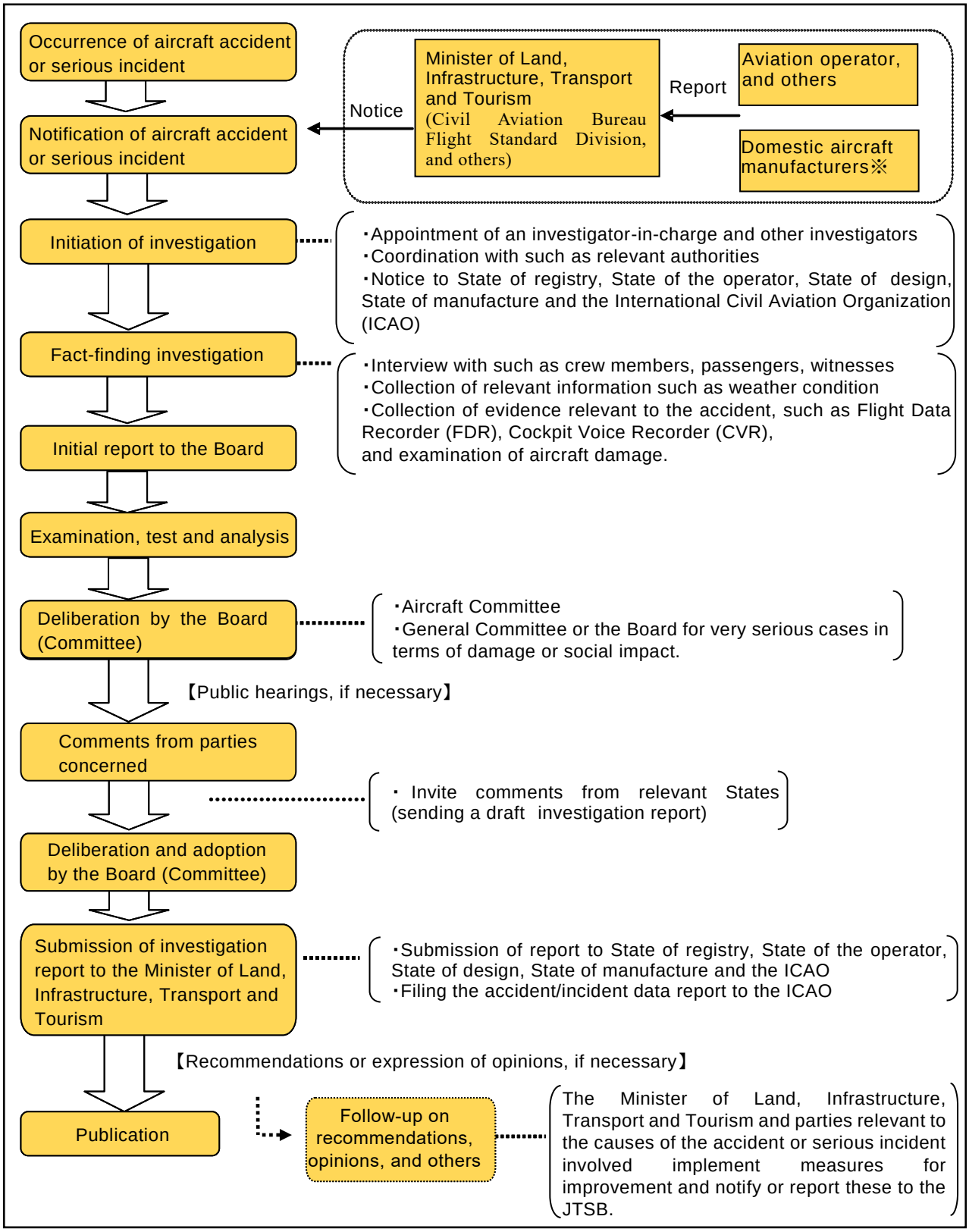
・When the pilot in command has recognized during flight that there was a danger of collision or contact with any other aircraft.

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

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

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

2 Procedure of aircraft accident/serious incident investigation



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

3 Statistics of investigations of aircraft accidents and serious incidents

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

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

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

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

Investigations of aircraft accidents and serious incidents in 2019

(Cases)

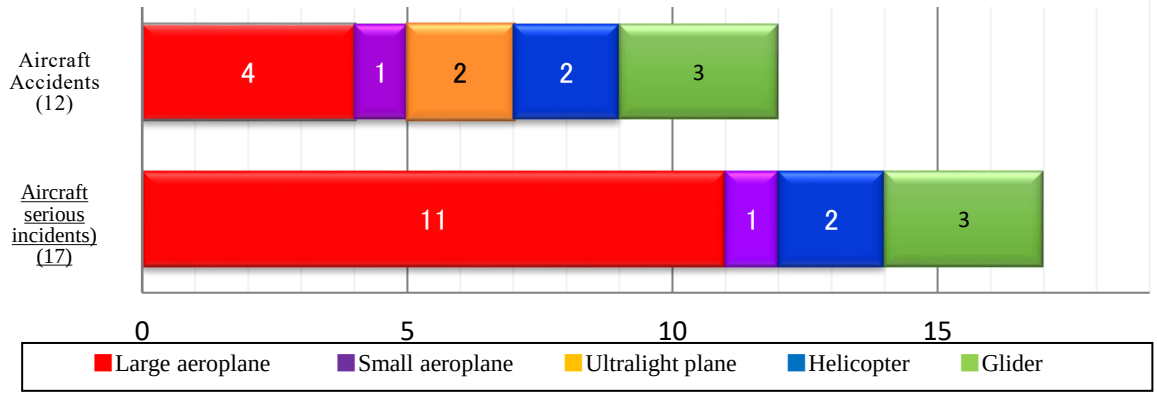
Category	Carried over from 2018	Launched in 2019	Total	Published investigation reports	(Recommendations)	(Safety recommendations)	(Opinions)	Carried over to 2020	(Interim report)
Aircraft accident	17	12	29	15	(1)	(0)	(0)	14	(0)
Aircraft serious incident	15	17	32	11	(0)	(0)	(0)	21	(0)

4 Statistics of investigations launched in 2019

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

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

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



* Large aeroplane refers to an aircraft of a maximum take-off mass of over 5,700 kg.
* Small aeroplane refers to an aircraft of a maximum take-off mass of under 5,700 kg except for ultralight plane.
* Ultralightplanes include self - made aircraft in the form of ultralightplanes.

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

Statistics of number of injuries (aircraft accident)

(Persons)

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

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

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

The aircraft accidents and serious incidents which occurred in 2019 are summarized as follows: The summaries are based on information available at the start of the investigations and therefore are subject to change depending on the course of investigations and deliberations.

(Aircraft accidents)

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

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

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

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

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

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

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

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

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

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

(Aircraft serious incidents)

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

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

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

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

6 Publication of investigation reports

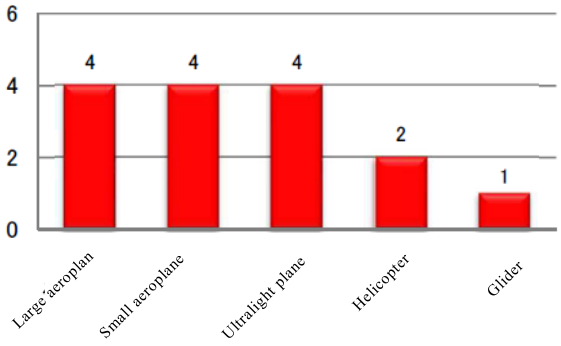
The number of investigation reports of aircraft accidents and serious incidents published in 2019 was 26, consisting of 15 aircraft accidents and 11 aircraft serious incidents.

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

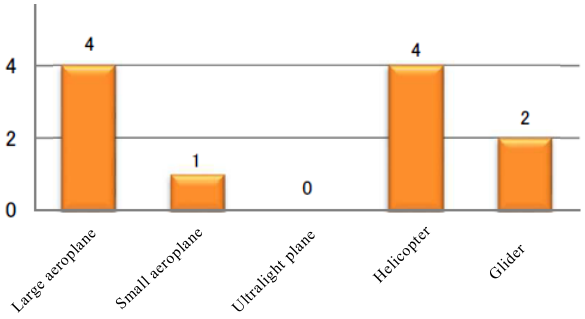
Note: In Aircraft accidents and serious incidents, two or more aircraft are sometimes involved in a single case. See page 51 to 62 for details.

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

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



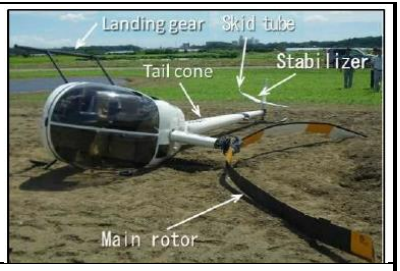
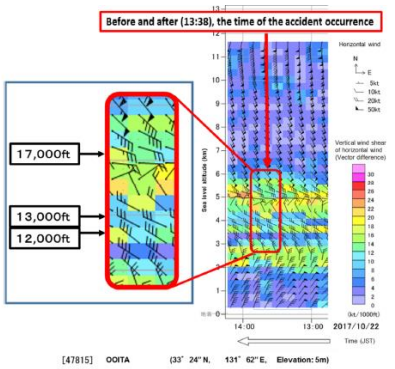
Number of published aircraft serious incident reports (11 cases) by aircraft category in 2019



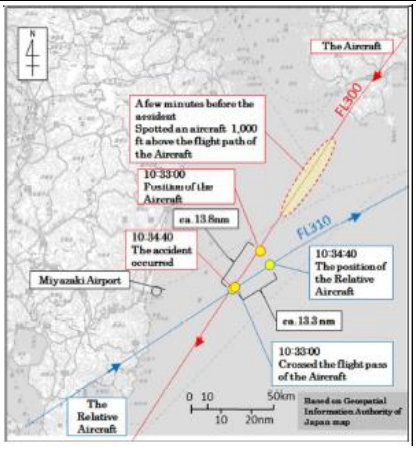
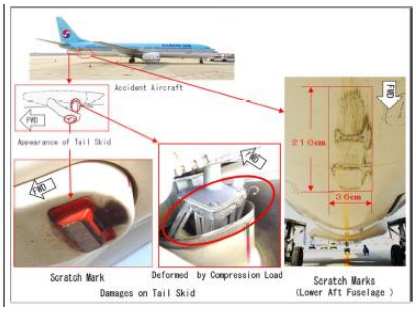
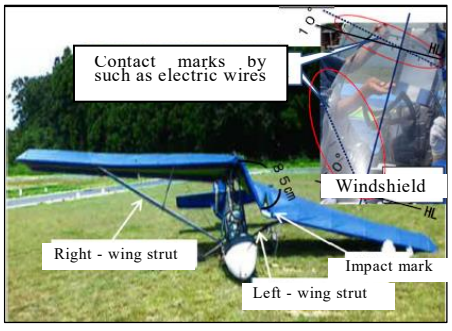
The aircraft accidents and serious incidents which occurred in 2019 are summarized as follows.

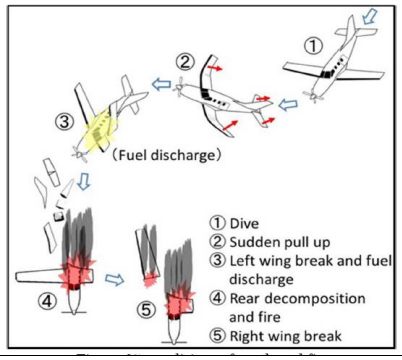
Aircraft accident investigation reports published in 2019

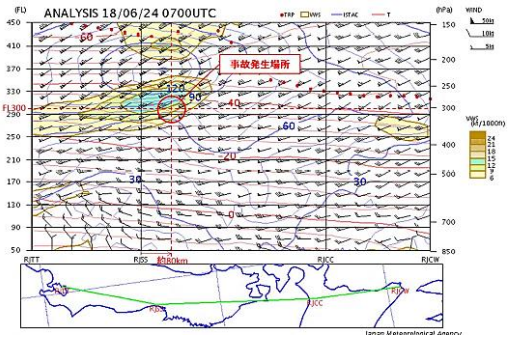
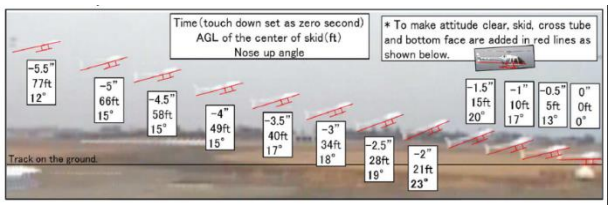
1	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	January 31, 2019	October 8, 2017 SemineTemporary Airfield in Kurihara City, Miyagi Prefecture.	Privately Owned	JA3447 BEECHCRAFT E33 (Small aeroplane)
	Summary	The aircraft overran the runway after rejecting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

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

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

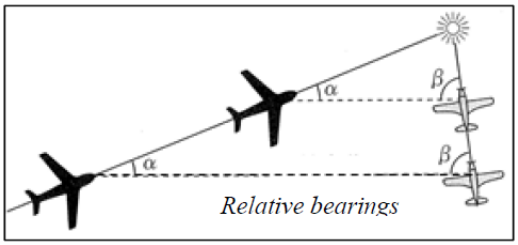
	Probable Causes	In this accident, it is probable that because the aircraft was shaken during cruising, a flight attendant fell down and got injured. It is probable that the aircraft was shaken, because wake turbulence from another aircraft still remained along the flight path of the aircraft. 		
	Report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

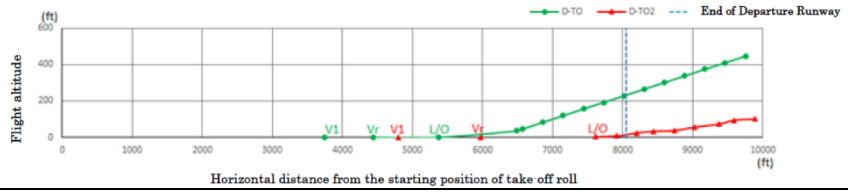
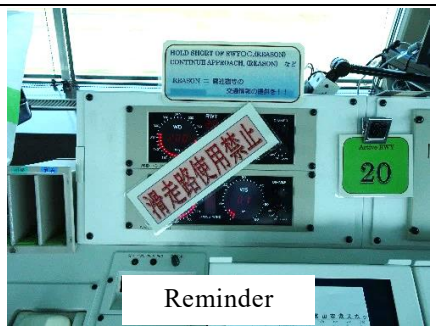
	Probable Causes	In this accident, it is highly probable that the aircraft crashed because it flew at a low altitude and touched such as electric wires. It is somewhat likely that the aircraft contacted with such as the electric wires, because the pilot could not visually recognize such as the electric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

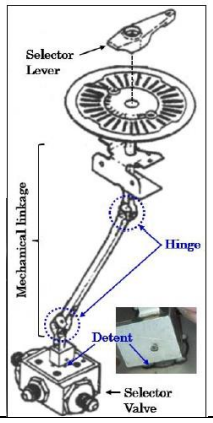
12	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	September 26, 2019	June 24, 2018, At FL300 over Kurihara City, Miyagi Prefecture	Japan Airlines Co., Ltd.,	JA8944 Boeing 777-300, (Large aeroplane)
	Summary	The aircraft as a scheduled flight 514, experienced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

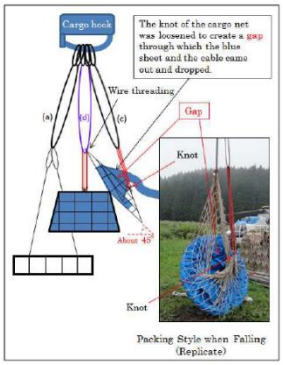
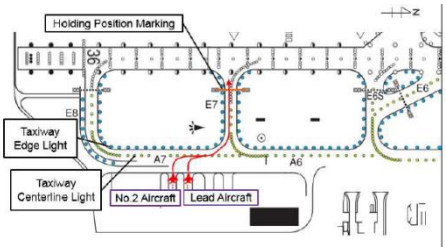
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA395A.pdf		
15	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	October 31, 2019	November 3,2018 Namegata City, Ibaraki Prefecture	Privately Owned	JR1749 KITFOX Model IV -1050 (Amateur built aircraft,Two-seater)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

Aircraft serious incident reports published in 2019

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

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

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

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

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

	Summary	The aircraft dropped the fresh concrete from the bucket that was slung external to the aircraft while flying over the mountain forest in Otoyo Town, Nagaoka County, Kochi Prefecture. There was no damage to the ground.
	Probable Causes	In the serious incident, it is highly probable that the fresh concrete dropped on the ground by unintended opening of the shutter while the aircraft was flying with loading the fresh concrete in the bucket. It is probable that the unintended opening of the shutter was caused by the increased load imposed on the shutter when the helicopter was shaken due to rough air condition and was flying in the situation that the locking by the over center mechanism of the shutter was not properly working. 
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA003W.pdf

11	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	November 28, 2019	July 7, 2019 Kitami City, Hokkaido	Non-Profit Organization Aero Sports KITAMI	JA4027(Aircraft A): Avions Pierre Robin DR400/180R, (Rotercraft) JA2288(Aircraft B): Alexander Schleicher ASK21(Rotercraft)
	Summary	When Aircraft B was flying at an altitude of about 3,000 ft after taking off from Sky-port KITAMI (temporary airfield) towed by Aircraft A, a tow rope connecting both aircraft was fractured. Immediately thereafter, the tow rope that remained in Aircraft B dropped on the ground. There were no injury and damage to the aircraft and the ground.		
	Probable Causes	In this serious incident, it is highly probable that, when the tow rope was fractured while Aircraft A was towing Aircraft B, the captain of Aircraft B, who did not recognize the rope break and judged that it was dangerous to follow Aircraft A by seeing it making descending turn to the left, operated the tow rope release lever, that caused the tow rope remaining in Aircraft B to drop. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA4027_JA2288.pdf		

7 Actions taken in response to recommendations in 2019

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

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

(Safety recommendations on August 30, 2019)

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

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

○Summary of the Accident

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

Live Camera at Murodo

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

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

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

○Probable causes

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

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

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

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

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

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

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

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

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

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

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

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

○Safety Actions taken in response to the recommendations

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

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

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

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

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

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

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

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

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

(2) Recommendations on proper installation and operation of ELTs

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

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

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

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

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

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

Column

AIR-meeting 2019

Aircraft Accident Investigator

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

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

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

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

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

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

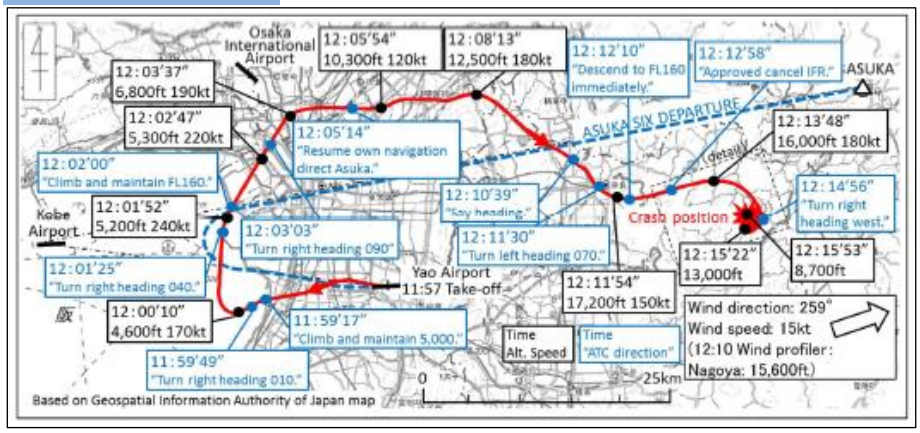
8 Summaries of major aircraft accident and serious incident investigation reports (case studies)

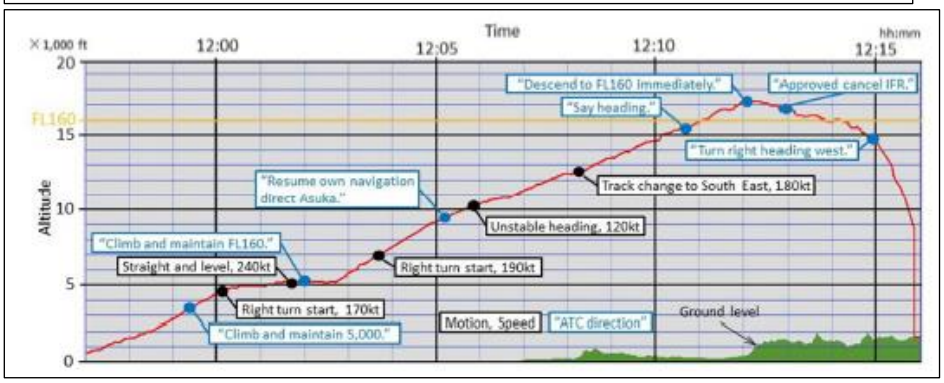
Crash due to loss of control during flight
Privately owned Socata TBM700, N702AV

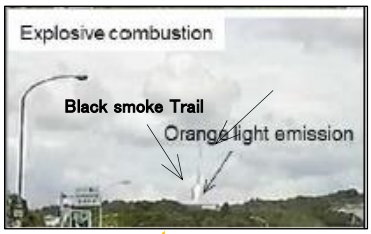
Summary of the accident：On Monday, August 14, 2017, a privately owned Socata TBM700, registered N702AV,took off from Yao Airport at 11:57 Japan Standard Time (JST: UTC + 9 hours; all times are indicated in JST on a 24-hour clock), for the purpose of leisure flight under Instrument Flight Rules (IFR),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

Findings

History of the flight







Nose-dive（Loss of control）

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

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

Further instructions due to failure to properly deal with control instructions

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

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

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

The captain was not able to control the Aircraft.

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

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

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

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

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

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

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

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

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

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

Damage to airframe due to hard landing

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

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

Findings

Situation before performing the autorotation full landing

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

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

History of the flight

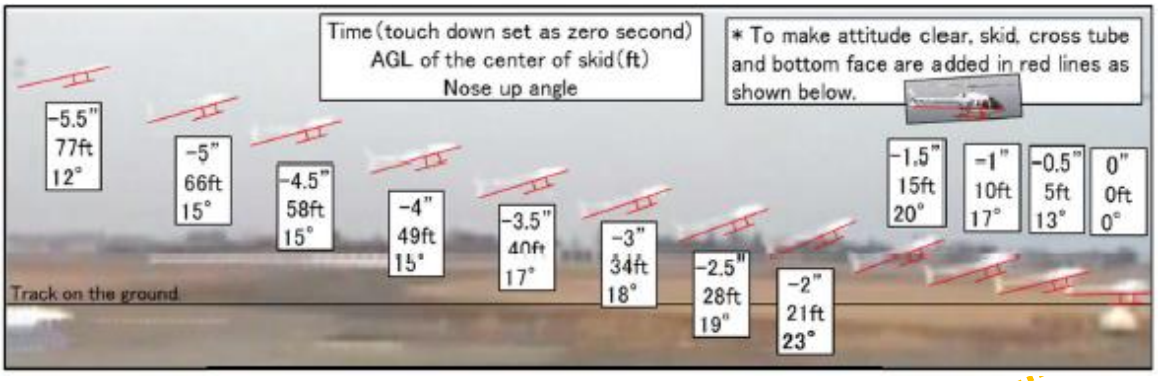
Trainee A conducted six times touch and go training. The fifth and sixth trainings were autorotation power recovery.

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

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

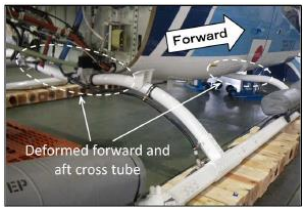
The instructor presumed that the helicopter could not touch down if nose up attitude was kept unchanged,and accordingly, set the nose to horizontal attitude.

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

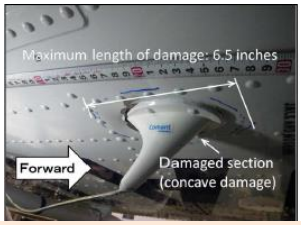


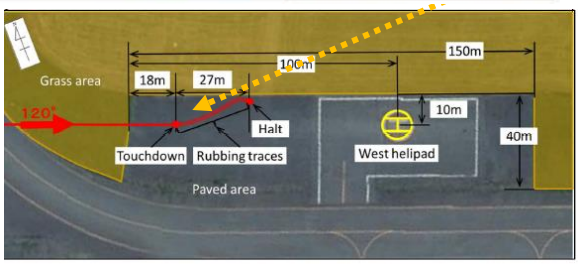
Damage to Aircraft

Deformed cross tube



Damaged antenna mounting





The situation of the accident (From three crews)

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

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

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

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

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

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

Findings

History of the Flight (JST)

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

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

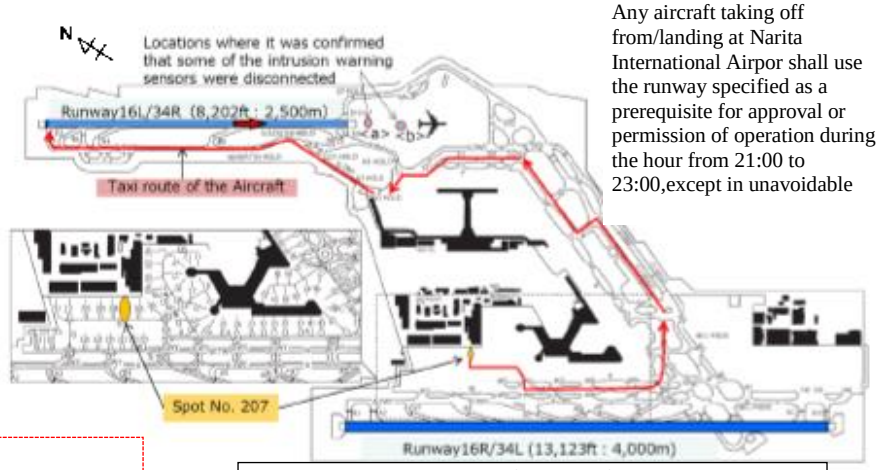
The captain assumed that the Aircraft would be able to take off from runway 16R.

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

The captain changed FMC take off data settings.

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

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



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

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

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

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

Take off data

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

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

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

Take off Thrust

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

FMC setting

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

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

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

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

QAR Records and the Estimated Values by the Manufacturer

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

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

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

Aircraft disable to continue taxiing due to fractured landing gear axle

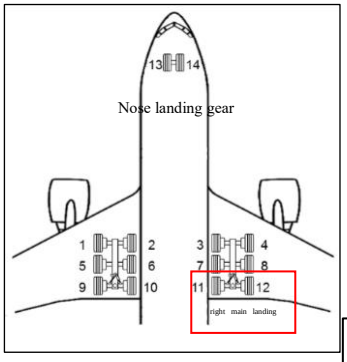
Korean Air Co., Ltd., Boeing 777-300, HL7573

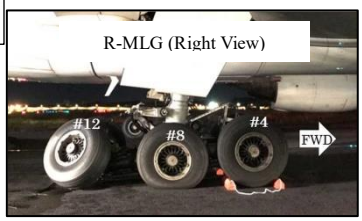
Summary of the serious incident: On Friday, June 29, 2018, a Boeing 777-300, registered HL7573, operated by Korean Airlines Co., Ltd., had the right main landing gear aft axle fractured when landing at Narita international airport. Consequently, the aircraft was forced to halt and was unable to continue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

Findings

History of the flight

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





Damage to Aircraft

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

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

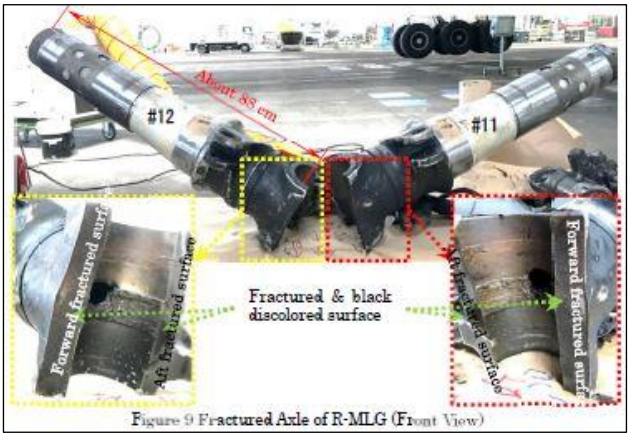
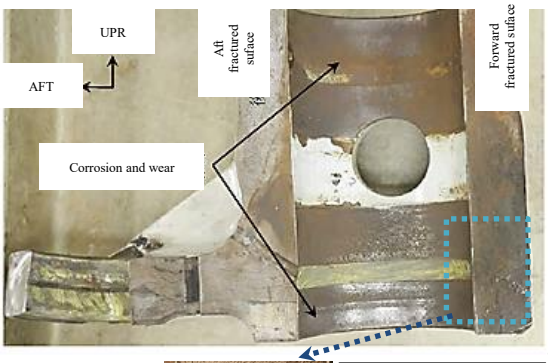


Figure 9 Fractured Axle of R-MLG (Front View)

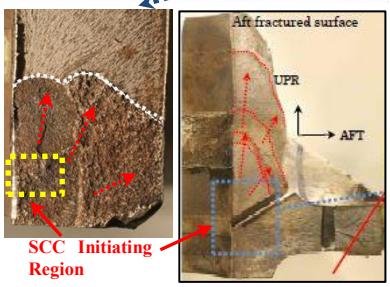
○The entire fractured surface of the front side of the pivot discolored black due to the corrosion.
○It wasconfirmed that a partially black-discolored portion due to corrosion and a grey new metal surface were confirmed on the fractured surface of the aft side of the pivot.



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

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

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



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

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

Case equivalent to damage to engine casing

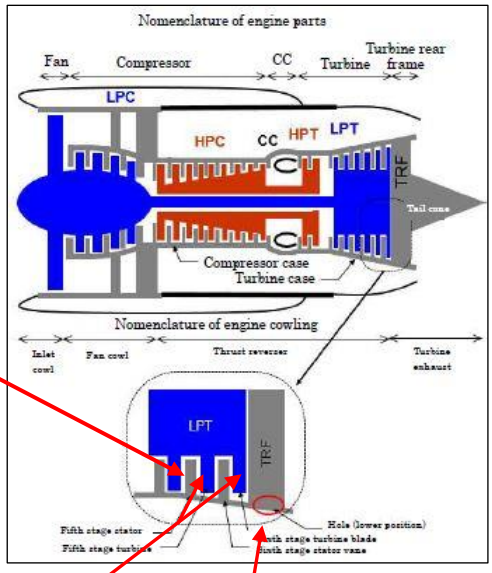
Japan Airlines Co., Ltd., Boeing777-300ER, JA743J

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

Findings

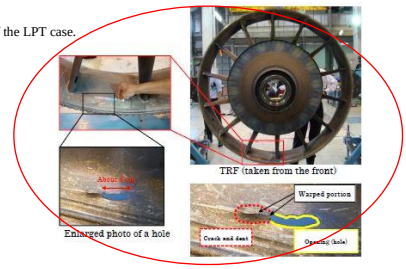
Fractured No.1 Engine

➤①One of LPT fifth stage stator vanes was fractured



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

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



Analysis of findings

The crack was generated due to the increased stress of the trailing edge of LPT fifth stage stator vanes caused by arch-binding.

※**Arch-Binding** refers to the condition of adjacent segments that are stuck tight, and the free movements of the adjacent segments are impeded.

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

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

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

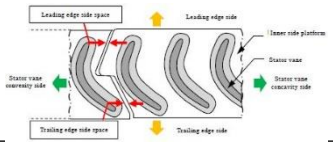
Collisions of fragments generated by the damaged LPT→the hole of TRF ・・③

Action before this serious incident occur

Engine manufacturer's action

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

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



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

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

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

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

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