

Chapter 3 Aircraft accident and serious incident investigations

1 Aircraft accidents and serious incidents to be investigated

<Aircraft accidents to be investigated>

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

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

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

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

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

(Accidents related to aircraft prescribed in the Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism under Article 76, paragraph (1), item (v) of the Act)

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

< Serious aircraft incidents to be investigated >

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

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

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

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

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

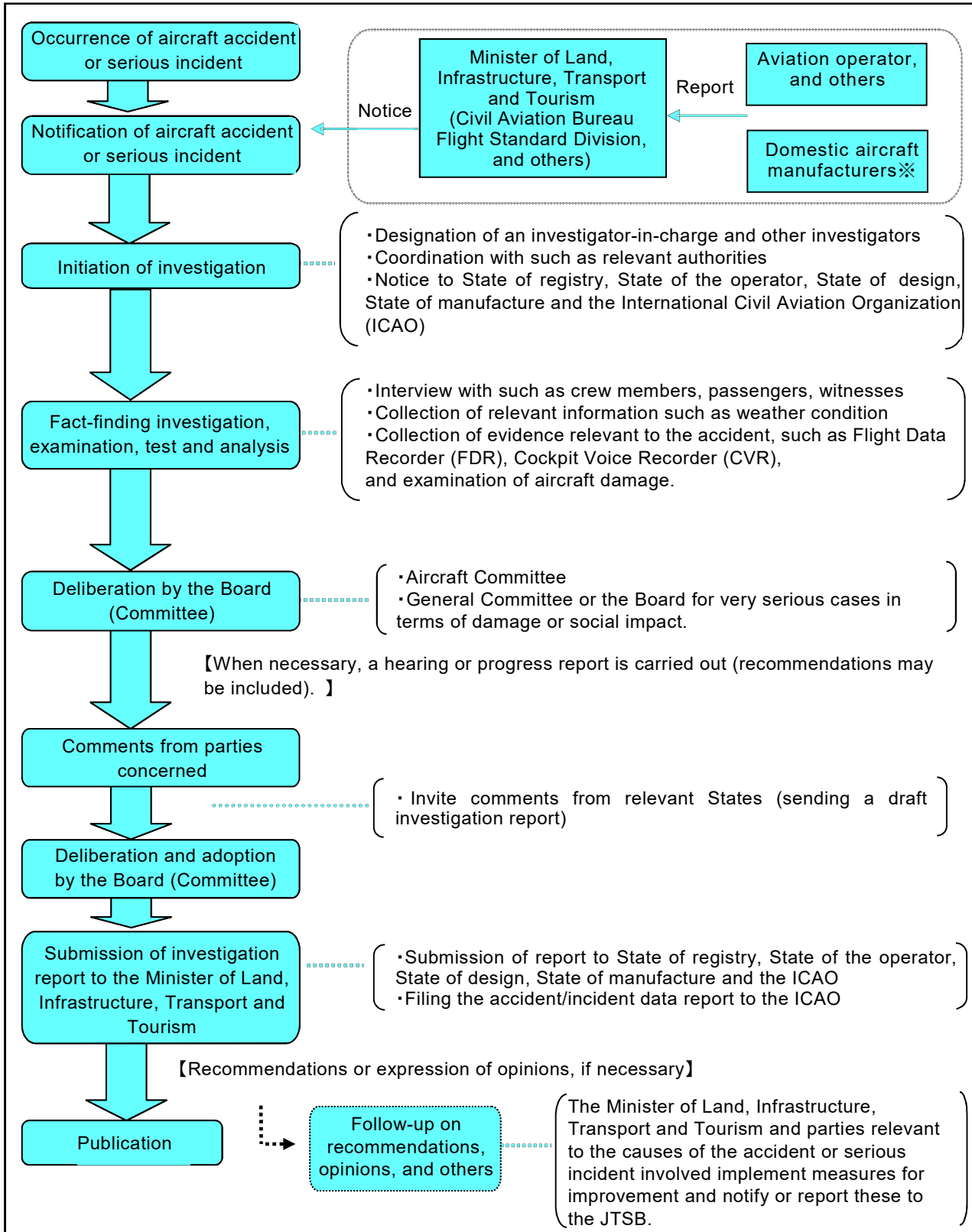
1 The following situations (Situations (8), (11) and (12) relate only to an in-flight aircraft.)

- (1) Case recognized by the captain that it may have resulted in contact between the in-flight aircraft and another object
- (2) Takeoff from a closed runway, from a runway being used by other aircraft, from a runway different from the designated one or from a taxiway, or aborted takeoff
- (3) Landing or the landing attempt on a closed runway, on a runway being used by other aircraft, on a runway different from the one designated, or on a location where aircraft are not normally supposed to land such as a taxiway or road
- (4) Contact of engine cowling, wingtip or component other than landing gear with ground surface during landing
- (5) Overrun, undershoot and deviation from a runway (limited to when an aircraft is disabled to perform taxiing)
- (6) Case where emergency evacuation was conducted with the use for emergency evacuation slide
- (7) Case where aircraft crew executed an emergency operation during navigation in order to avoid crash into water or contact on the ground
- (8) Damage of engine (limited to such a case where fragments penetrated the casing of subject engine)
- (9) Continued halt or loss of power or thrust (except when the engine(s) are stopped with an attempt of assuming the engine(s) of a motor glider) of engines (in the case of multiple engines, 2 or more engines) in flight
- (10) Case where any of aircraft propeller, rotary wing, landing gear, rudder, elevator, aileron or flap is damaged and thus flight of the subject aircraft could be continued
- (11) Multiple malfunctions in one or more systems equipped on aircraft impeding the safe flight of aircraft
- (12) Occurrence of fire or smoke inside an aircraft and occurrence of fire within an engine fire-prevention area
- (13) Abnormal decompression inside an aircraft
- (14) Shortage of fuel requiring urgent measures
- (15) Case where aircraft operation is impeded by an encounter with air disturbance or other abnormal weather conditions, failure in aircraft equipment, or a flight at a speed exceeding the airspeed limit, limited payload factor limit operating altitude limit
- (16) Case where aircraft crew became unable to perform services normally due to injury or disease
- (17) Case where a slung load, any other load carried external to an aircraft or an object being towed by an aircraft was released unintentionally or intentionally as an emergency measure
- (18) Case where parts dropped from aircraft collided with one or more persons
- (19) Case equivalent to any of (2) to (18) above.

2 The following situations are considered extraordinary:

- (1) Situations described in (8), (11) and (12) of 1 above occurring with aircraft not in flight
- (2) Damage to an aircraft not in flight (except the sole damage of engine, engine cowling, engine accessory, propeller, wingtip, antenna, tire, brake or fairing) (excluding cases where the repair of the aircraft does not correspond to major repair work)
- (3) Case where the propeller, rotary wing, landing gear, rudder, elevator, aileron, or flap is damaged, hindering the start of its flight
- (4) Case equivalent to those described in (1) to (3)

2 Procedure of aircraft accident/serious incident investigation



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

3 Statistics of investigations of aircraft accidents and serious incidents

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

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

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

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

Investigations of aircraft accidents and serious incidents in 2020

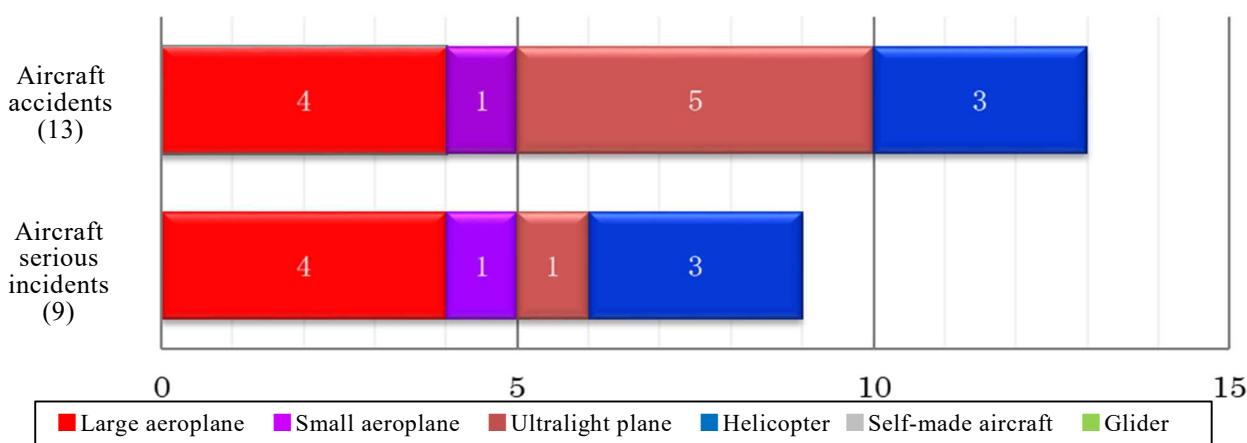
Category	Carried over from 2019	Launched in 2020	Total	(Cases)					
				Published investigation reports	(Recommendations)	(Safety recommendations)	(Opinions)	Carried over to 2021	(Interim report)
Aircraft accident	15	13	28	10	(3)	(0)	(0)	18	(0)
Aircraft serious incident	21	9	30	8	(0)	(0)	(0)	22	(0)

4 Statistics of investigated aircraft accidents and serious incidents in 2020

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

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

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



* Large aeroplane refers to an aircraft of a maximum take-off mass of over 5,700 kg.

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

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

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

The number of casualties (aircraft accident)

2020							(Persons)
Aircraft category	Fatal Injuries		Missing		Serious/Minor Injuries		Total
	Crew	Passengers and others	Crew	Passengers and others	Crew	Passengers and others	
Large aeroplane	0	0	0	0	0	2	2
Small aeroplane	0	0	0	0	1	1	2
Helicopter	1	0	0	0	2	5	8
Ultralight plane	1	0	0	0	3	2	6
Self-made aircraft	0	0	0	0	0	0	0
Glider	0	0	0	0	0	0	0
Total	2	0	0	0	6	10	18
	2		0		16		

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

5 Summaries of aircraft accidents and serious incidents which occurred in 2020

The aircraft accidents and serious incidents which occurred in 2020 are summarized as follows: The summaries are based on information available at the start of the investigations and therefore are subject to change depending on the course of investigations and deliberations.

(Aircraft accidents)

1	Date and location	Operator	Aircraft registration number and aircraft type
	January 3, 2020 In the vicinity of Gusukube Nagama, Miyakojima City, Okinawa Prefecture	Privately owned	JR0251 Maxair drifter XP-R503L (Ultralight plane)
	Summary	The plane collided with a tree during flight at the above-described location and crashed to the ground. One passenger was seriously injured.	
2	Date and location	Operator	Aircraft registration number and aircraft type
	January 12, 2020 About 30 km Northwest of Fukuoka Airport	Jin Air Co., Ltd.	HL8243 Boeing 737-800 (Large aeroplane)

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

	Summary	After departing a Nara prefectural heliport, the rotorcraft made a hard landing on a temporary airfield in Fukuzaki-cho, Kanzaki District, Hyogo Prefecture.	
9	Date and location	Operator	Aircraft registration number and aircraft type
	July 19, 2020 In the vicinity of Minamifurano-cho, Sorachi District, Hokkaido	Privately owned	JA3825 Cessna 172N Ram (Small aeroplane)
	Summary	After departing Sapporo Airfield, the aircraft crashed into the mountain described above, injuring two persons on board.	
10	Date and location	Operator	Aircraft registration number and aircraft type
	August 1, 2020 Temporary airfield in Aisai City, Aichi Prefecture	Privately owned	JR7151 New Wing MAX-447 MAW (Ultralight plane)
	Summary	At a temporary airfield in Aisai City, Aichi Prefecture, the aircraft was performing a jump flight, when it entered a partial stall and crashed. The pilot was seriously injured.	
11	Date and location	Operator	Aircraft registration number and aircraft type
	August 29, 2020 About 15 km east-southeast of Tokyo International Airport and an altitude of about 3,300 m	Skymark Airlines Inc.	JA73NM Boeing 737-800 (Large aeroplane)
	Summary	During its ascent after departing Tokyo International Airport, the aircraft collided with a bird at the above-described location, causing damage to its outer plate and other parts.	
12	Date and location	Operator	Aircraft registration number and aircraft type
	October 23, 2020 A runway of Fukue Airport	Oriental Air Bridge Co., Ltd.	JA845A Bombardier DHC-8-402 (Large aeroplane)
	Summary	After departing Fukuoka Airport and during its landing at Fukue Airport, the posterior portion of the fuselage struck the runway, damaging the aircraft.	
13	Date and location	Operator	Aircraft registration number and aircraft type
	December 30, 2020 In the vicinity of Ojira, Shimada City, Shizuoka Prefecture	Privately owned	JA77AR Robinson R66 (Rotorcraft)
	Summary	After departing Tsu City Isewan Heliport, the rotorcraft crashed at the above-described location, resulting in the death of the captain.	

(Aircraft serious incidents)

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

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

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

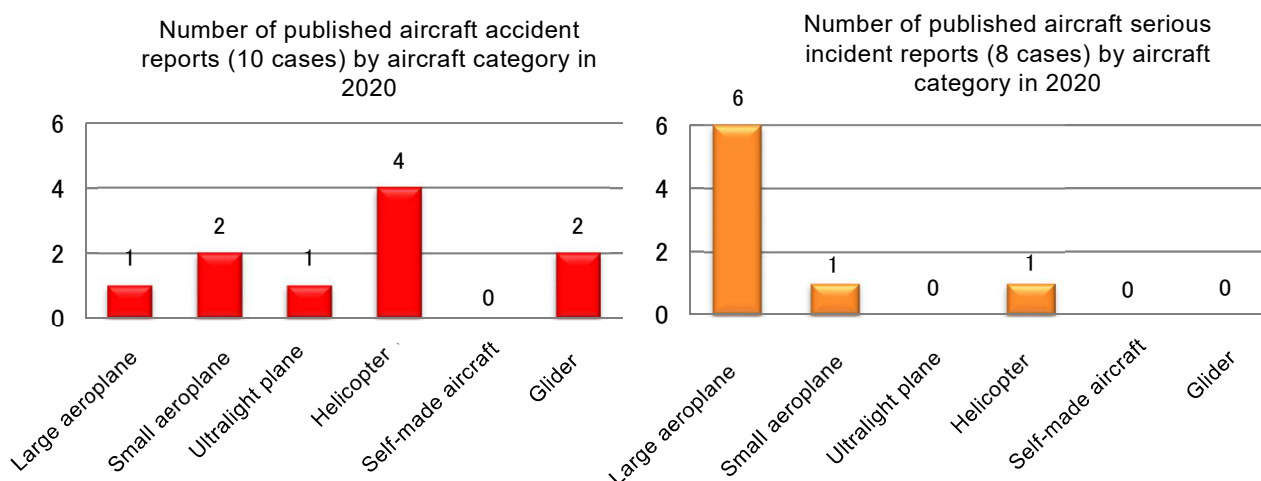
6 Publication of investigation reports

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

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


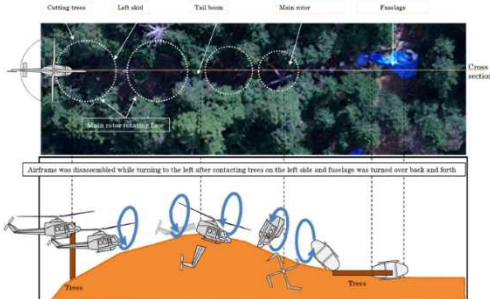
Note: In Aircraft accidents and serious incidents, two or more aircraft are sometimes involved in a single case. See page 44 to 50 for details.

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

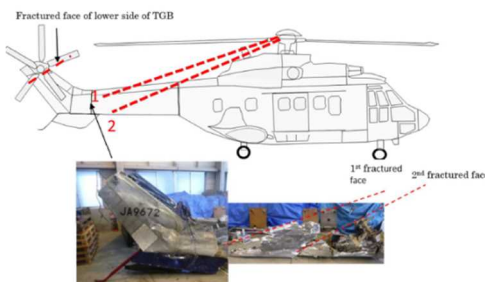



The aircraft accidents and serious incidents which occurred in 2020 are summarized as follows.

Aircraft accident investigation reports published in 2020

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

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



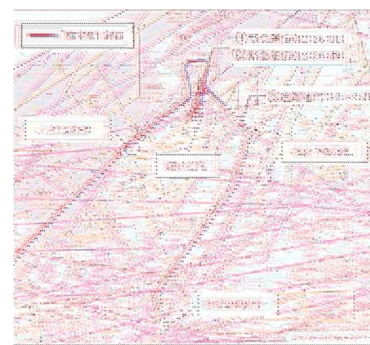
	Report	https://www.mlit.go.jp/jtsb/aircraft/rep-acc/AA2020-3-1-JR1102.pdf (Japanese only)		
6	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	July 30, 2020	September 25, 2017 Satsuma Iojima Airport in Mishima-mura, Kagoshima-gun, Kagoshima Prefecture	New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

	Probable Causes	<p>It is highly probable that in this accident, as the rotorcraft was coming close to the power lines while flying for a pesticide spray, the captain tried to perform an evasive maneuver just in front of the power lines, but a part of its airframe contacted with a power line, the rotorcraft lost its balance and crashed.</p> <p>It is probable that the rotorcraft came close to the power lines because the captain failed to change direction at the right position to make a 180° turn.</p>		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA9252.pdf		
10	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	October 1, 2020	August 27, 2019 Nishio City, Aichi Prefecture	Privately owned	JA2529 Scheibe SF-25C Falke (Motor Glider, Two-Seater)
	Summary	<p>The aircraft took off from Kohnan Aerodrome in Okayama Prefecture to make a ferry flight, to Makabe Gliderport. On the way, the Aircraft landed for refuel on riverbed of the Yahagi River in Nishio-city, Aichi Prefecture. After refueling, when the Aircraft tried to take off from the riverbed, the left wing and left outrigger*1 were entangled with the tall grass, and the Aircraft veered to the left and fell down from the riverbed and stopped, which resulted in the damage to the main wings and propellers. The captain and one passenger on board the Aircraft suffered no injury.</p>		
	Probable Causes	<p>In this accident, when the Aircraft tried to take off, it is highly probable that it was not able to accelerate enough within the riverbed length, plunged into tall grass area before airborne, therefore its left main wing and left outrigger were entangled with tall grass, and veered to the left and fell down from the riverbed, which resulted in the damage to the main wings and propellers.</p> <p>Concerning the reason why the Aircraft did not accelerate within riverbed length, it is likely that it might involve the following facts; the wet ground created a big drag, the wings were wet by rain and reduced lift, and the weight exceeded the maximum takeoff weight.</p>		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA2529_190827.pdf		

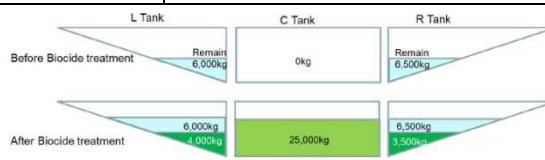


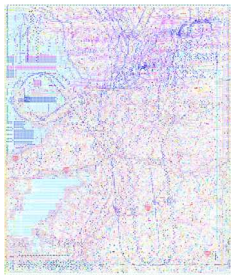
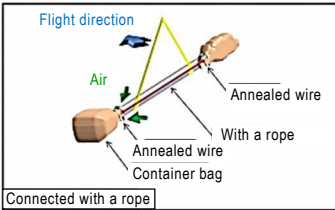
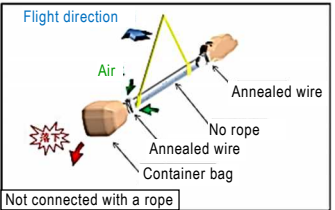
Aircraft serious incident investigation reports published in 2020

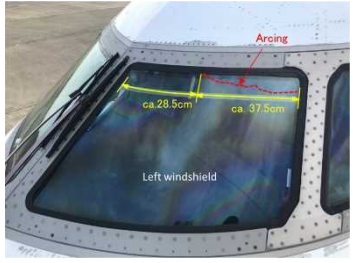
1	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	January 30, 2020	July 8, 2018 About 15 nm North of Toyama Airport at an Altitude of About 9,600 ft	CHINA AIRLINES	B18667 Boeing 737-800 (Large aeroplane)
	Summary	<p>The aircraft, as a scheduled flight 170,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



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



	Airport			
Summary	<p>The aircraft had noise accompanied by vibration as well as reduced rpm of No. 1 engine (left side) indicated on instrument panel during the climb after the take-off from Kumamoto Airport. The Aircraft therefore set engine thrust idle and returned to the Airport for landing after air traffic control priority was granted.</p> <p>The post-flight inspection revealed that high-pressure and low-pressure turbines of the engine were damaged in several stages and a hole was generated in the engine casing. Besides, fragments of inner parts exhausted from the engine damaged windows and roofs of buildings and windshield of vehicles on the ground.</p>			
Probable Causes	<p>It is highly probable that this serious incident was caused by the fractured blade #13 on HPT (high pressure turbine) stage 2 of No. 1 engine (left side), when the Aircraft was climbing, that damaged blades and stator vanes of aft stages, fragments of which collided with LPT (low pressure turbine) casing and generated a hole (crack).</p> <p>It is highly probable that the fractured blade #13 was caused by cracks that were generated on TA (Turning Around (branching and turning around of cooling air flowing inside blades)) area and progressed thereafter.</p> <p>It is likely that cracks generated on TA area were caused by hot corrosion swelling (blister) generated on the coating layer of the blades and low-cycle fatigue initiating from the cracks.</p>			
Report	<p>https://www.mlit.go.jp/jtsb/eng-air_report/JA8980.pdf https://www.mlit.go.jp/jtsb/aircraft/p-pdf/AI2020-3-2-p.pdf (Explanatory Material (Japanese only))</p>			
Reference	Case Studies (page 61)			
5	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	August 27, 2020	July 16, 2019 Komatsu City, Ishikawa Prefecture	Nakanihon Air Service Co., Ltd.	JA9478 Fuji-Bell 204B-2 (Rotorcraft)
Summary	<p>During flight above a mountain forest in Ikenojomachi, Komatsu City, Ishikawa Prefecture, a container bag covering the material suspended from the rotorcraft dropped. There was no damage to people or property on the land.</p>			
				
Probable Causes	<p>It is highly probable that this serious incident occurred as follows: The rotorcraft was flying while suspending material (steel tower components) from it. As it accelerated and wind pressure increased, air entered the container, inflating it and allowing both the bag and a length of annealed wire to separate from the steel tower component and fall to the mountain forest. It is probable that the container bag and annealed wire dropped from the iron tower component was due to inadequate drop prevention measures that did not take into consideration wind pressure increases from acceleration.</p>			
Report	https://www.mlit.go.jp/jtsb/aircraft/rep-inc/ai2020-4-1-ja9478.pdf (Japanese only)			
6	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	October 1, 2020	October 30, 2019 Over Ohnan-cho, Ohchi-gun, Shimane Prefecture, FL260	IBEX Airlines Co., Ltd.	JA11RJ Bombardier CL-600-2C10 (Large aeroplane)

	Summary	The aircraft took off from Sendai Airport as a scheduled flight 16 of the operator, and was flying at FL 340 to Fukuoka Airport, but the Pilot in Command found something like cracks in a cockpit windshield on his side. When the Pilot in Command was dealing with the situation according to the check list to be followed at the time of occurrence of damage to the windshield, the instrument indicated cabin decompression, therefore, he made an emergency descent to about 10,000 ft. In an emergency descent, the oxygen masks in the cabin were automatically deployed. The aircraft kept on flying and then landed at Fukuoka Airport.		
	Probable Causes	It is highly probable that this serious incident occurred because an arcing occurred in the left windshield while the aircraft was flying at FL 340, and the PIC performed the operation to raise the cabin altitude in accordance with the check list, resulting in abnormal decompression inside the aircraft. It is also highly probable that the abnormal decompression inside the aircraft occurred because irrespective of the flight altitude, the procedure in the check list would require the pilot to perform the set to climb the cabin altitude at the maximum climb rate without any exception.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA11RJ.pdf		
7	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	October 29, 2020	May 4, 2019 Oshima Airport	Privately owned	JA121C Piper PA-46-350P (Small aeroplane)
	Summary	The aircraft took off from Yao Airport to make a leisure flight. When landing on Runway 21 at Oshima Airport, it overran the runway and was disabled to perform taxiing. A total of five persons on board the aircraft, including a captain and other four passengers, and there were no injuries.		
	Probable Causes	In this serious incident, it is highly probable that because the Aircraft touched down in a tail wind at an excess speed at the point beyond the halfway marking on the runway when landing at Oshima Airport, it overran the runway and was disabled to perform taxiing with its gears damaged.		
Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA121C.pdf			
8	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	November 26, 2020	June 1, 2019 At FL 430 About 280 nm Northeast of Narita International Airport	All Nippon Airways Co., Ltd.	JA828A Boeing 787-8 (Large aeroplane)
	Summary	The aircraft took off from San Jose International Airport, USA bound for Narita International Airport. When it was flying over at FL 430 over the Pacific Ocean about 280 nm northeast of Narita International Airport, both of the two air conditioning systems became inoperative.		
	Probable Causes	In this serious incident, it is highly probable that both of the two air conditioning systems shut down at the same time because the Left air conditioning system was unable to restart and the normally having been working Right air conditioning system also shut down during the reset of air conditioning systems of the Aircraft after the Left air conditioning system shut down. It is highly probable that the Left air conditioning system was unable to restart and the normally having been working Right air conditioning system also shut down because the reset of air conditioning systems was performed at high altitude and under environmental conditions where the CACs tend to more sensitive to surge.		
Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA828A.pdf			

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

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

(1) Aircraft accident involving Eurocopter AS350B3, operated by Excel Air Service Inc.

(Safety recommendations on February 27, 2020)

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

(2) Aircraft accident involving Aerospatiale AS332L, operated by Toho Air Service Co., Ltd.

(Safety recommendations on April 23, 2020)

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

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

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

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

(Information provided on December 28, 2020)

Summary of the aircraft serious incident

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

Provided information

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

- Fan blades of the left engine were damaged.
- Damaged sections of the fan blades and damage to the aircraft are shown in the Appendix below.

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

Appendix

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

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

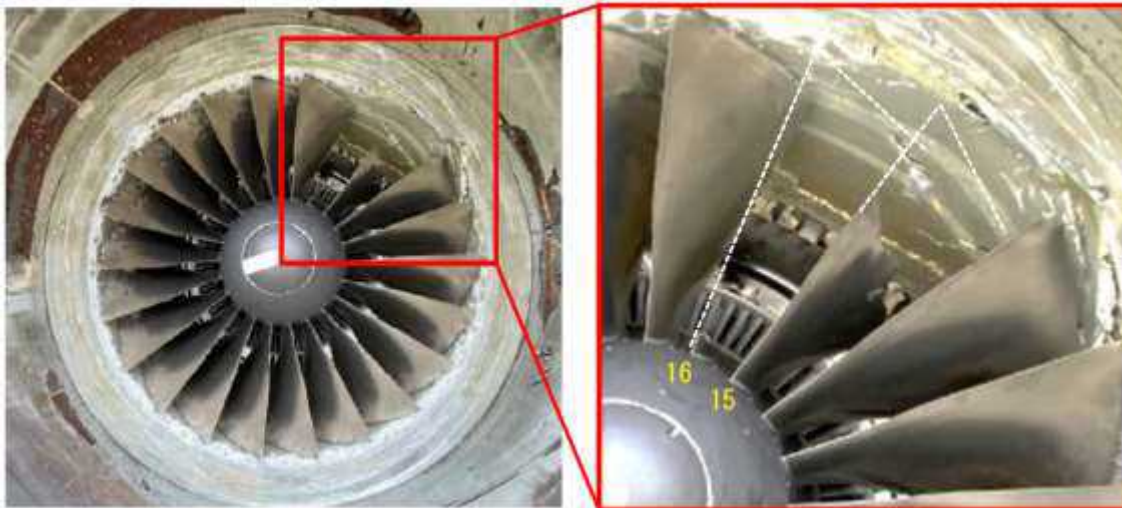


Figure 1. Left engine inlet

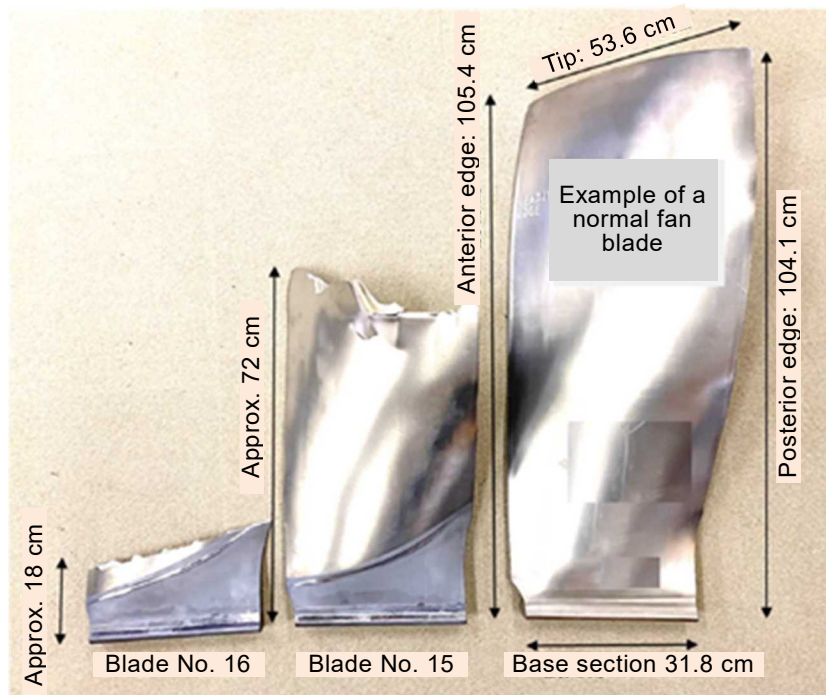


Figure 2. Damaged fan blade

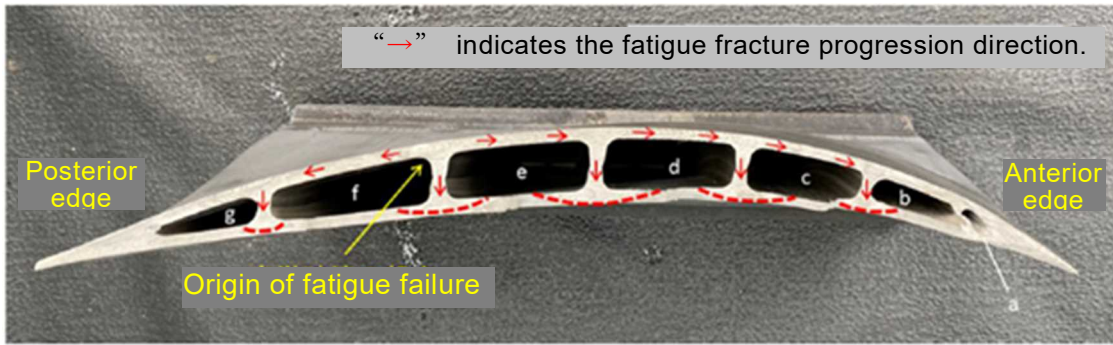


Figure 3. Fractured surface of blade No. 16

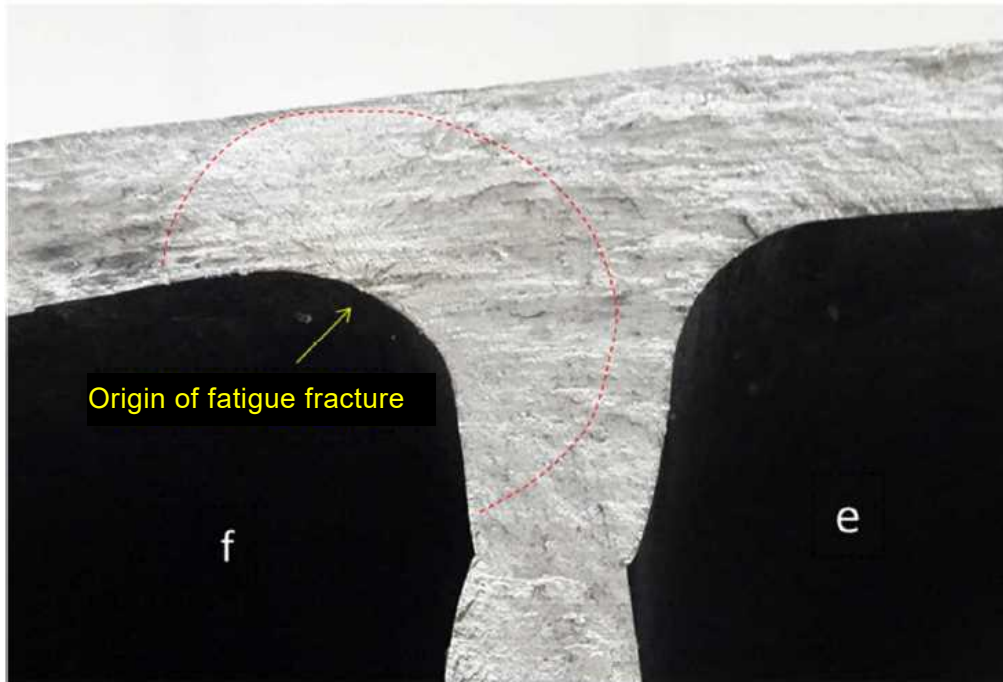


Figure 4. Closeup photo of the fracture surface of blade No. 16

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



Figure 5. Damaged engine cowl

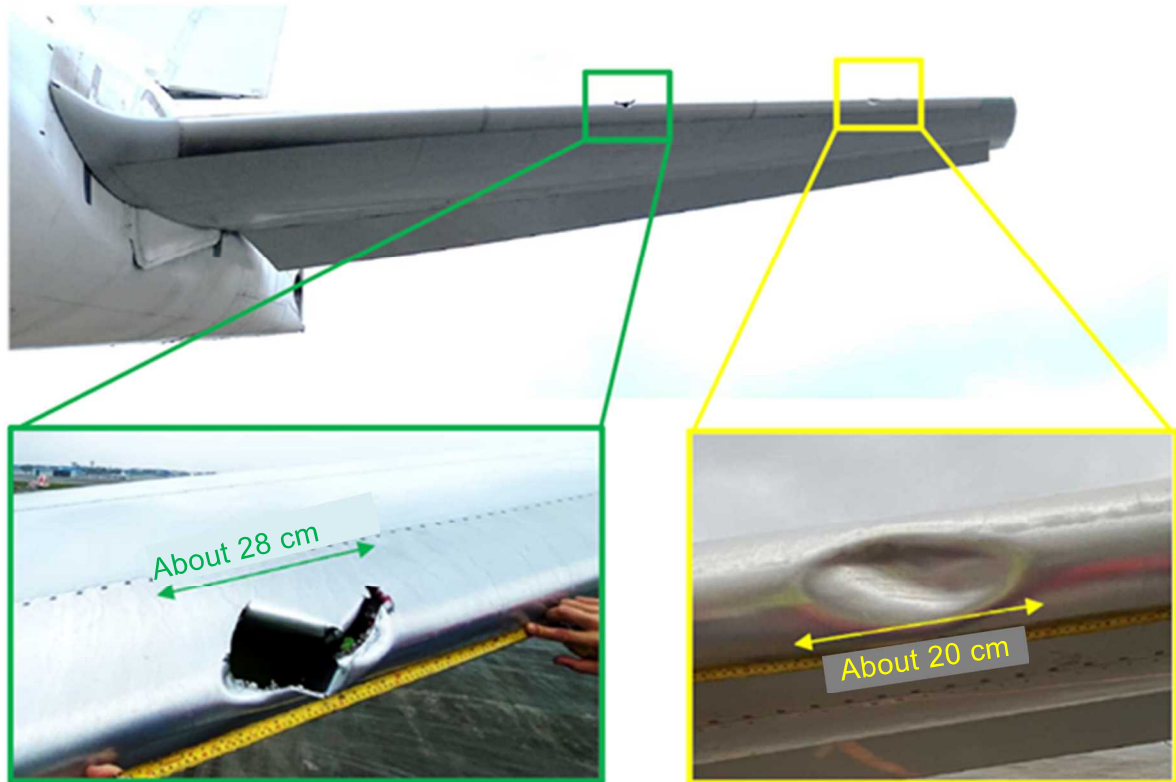


Figure 6. Damaged horizontal stabilizer



Figure 7. Damaged fuselage

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

Column

A training course participated by accident investigators at an overseas institution Aircraft Accident Investigator

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

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

1 Regarding Cranfield University

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

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

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



2 Regarding the training course

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

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

3 Simulated one-week aircraft accident investigation

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

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



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

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

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

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

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

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

4 After the training course

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



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

DAMAGE TO AIRFRAME IN DITCHING

EXCEL AIR SERVICE INC., EUROCOPTER AS350B3 (ROTORCRAFT), JA350D

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



Findings

History of the flight

JA350D parking on the ground (right)



Flight factors	IAS about 20 - 30 kt	IAS about 50 kt Nr about 370 rpm ALT about 300 ft	IAS 100 kt, Nr about 370 rpm	IAS 100kt, Nr about 370 rpm	IAS 100kt, Nr about 370 rpm	IAS 110 kt, ALT 1,000 ft Nr 394 rpm
image						
time	Around 15:26			Around 15:25		

- Estimated flight route (Upper left)
- From GOV warning activation to ditching of JA350D (Upper right)
- Floating wreckage gathered (Right)
- ※ “GOV (governor)” denotes a sensing device that senses the rpm of main rotor and engine and automatically controls fuel flow in order to keep main rotor rpm constant



Analysis

- It is likely that, during the flight, a GOV warning went off, the nose of the helicopter veered rightward, the rpm of the main rotor decreased and the output of the engine dropped.
 - The engine’s failure to recover from its low output state was likely due to the manual throttle control (for increasing output) failed, or because adequate fuel flow could not be achieved. In the end, the helicopter subsequently sank into the water and therefore further physical investigations into the causes of the malfunction were not possible.
 - To maintain the rpm of the main rotor, it was necessary for the pilot to check flight parameters (e.g., speed and altitude) and control the helicopter accordingly. In this case, it is likely that if the pilot had maintained the main rotor rpm by reducing air speed and thereby decreasing the descent rate, he has had adequate time to take emergency action.
 - It is highly probable that the captain elected to attempt an emergency water landing and therefore performed emergency operations, (i.e., sending out a mayday call and readying his emergency floatation equipment) but failed to decelerate in time and ditched the helicopter into the sea at an excessive descent rate, resulting in damage to the emergency floatation equipment and subsequent sinking of the helicopter.
- In the water, the captain managed to unbuckle his shoulder harness and seat belt and exit the aircraft but was unable to retrieve his life jacket from under the right pilot seat (according to the captain’s post-accident testimony).

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

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

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

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

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

Findings

History of the flight

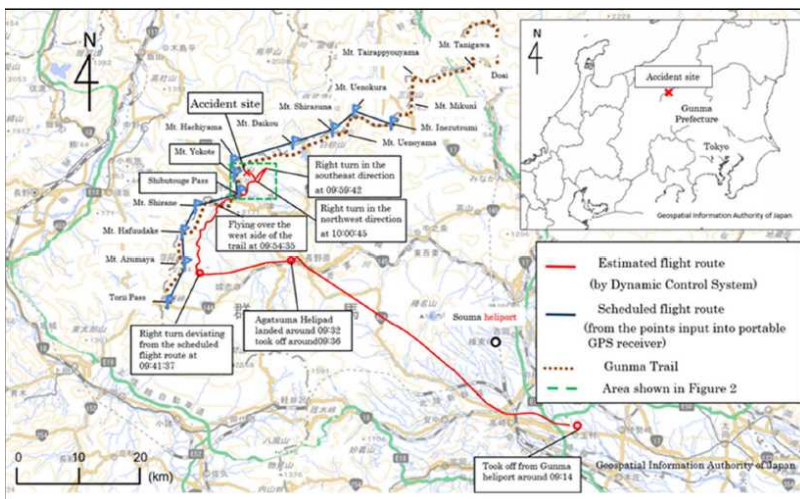


Photo taken at 10:01:07, five seconds before the crash landing (Flight controller mode change was attempted.)



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

Analysis

Estimated flight route of the Helicopter

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

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

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

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

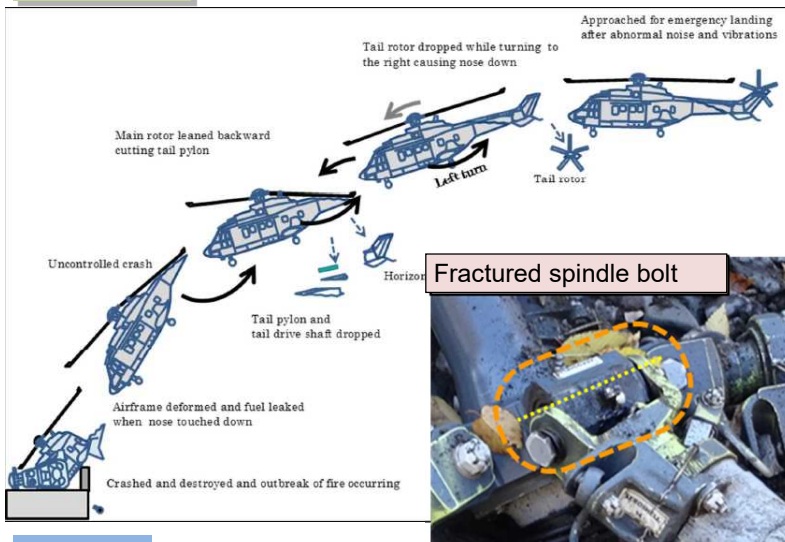
The Japan Transport Safety Board has stated recommendations to the Ministry of Land, Infrastructure, Transport and Tourism. For details, please refer to “Chapter 2: Summary of recommendations and opinions issued in 2020 (page 27)”

UNCONTROLLED CRASH AEROSPATIALE AS332L (ROTORCRAFT), JA9672

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

Findings

Flight situation before the crash and damaged parts



Separation of tail rotor



Fractured spindle bolt



Smashed inner ring



Analysis

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

○ During maintenance work from September 20 to 23, 2017, the certifying mechanic found inner rings in a fractured state. The certifying mechanic elected to replace the defective inner rings and washers only. However, after finding defects such as these, it is probable that he should have reported them to the maintenance and management department for technical review.

○ To prevent similar malfunctions in this type of helicopter, it is probable that the maintenance and management department of Toho Air Service Co., Ltd., should have proactively made a detailed inspection of the fractured inner rings and reported all defects to their designer and manufacturer of the aircraft. Moreover, they also failed to share important information regarding the lubricants with the site mechanics.

Probable Causes: In this accident, it is highly probable that, when the Helicopter attempted an emergency landing due to abnormal vibrations occurring in the airframe in flight, the tail rotor was separated leading to loss of control and subsequent crash. It is highly probable that the separation of the tail rotor from the airframe was caused by imbalanced rotation of the tail rotor due to the fracture of the spindle bolt of the flapping hinge of the White Blade, which generated excessive vibrations and damaged the section attached to the tail rotor.

It is highly probable that the fractured spindle bolt was caused by damaged and stuck bearings of the flapping hinge. Besides, it is highly probable that this resulted from the fact that the damaged condition of the bearings was not grasped in inspections and maintenance work performed on the Helicopter and the appropriate measures were not taken.

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

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

EMERGENCY OPERATION TO AVOID CRASH INTO THE GROUND

THAI AIRWAYS INTERNATIONAL PUBLIC CO., LTD. BOEING 747-400, HS-TGX

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

Findings

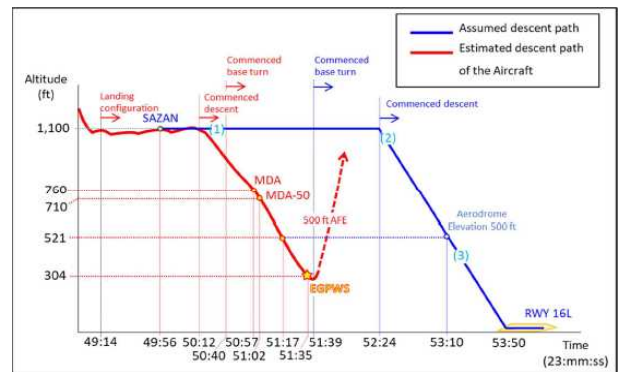
Captain's testimony (excerpt)

PIC: Approach briefing in anticipation of landing on Runway 22

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



Assumed descent path and estimated descent path of the aircraft



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

Analysis

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

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

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

Descent

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

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



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

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

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

For details, please refer to the accident investigation report. (Published on July 20, 2020)

https://www.mlit.go.jp/jtsb/eng-air_report/HS-TGX.pdf

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

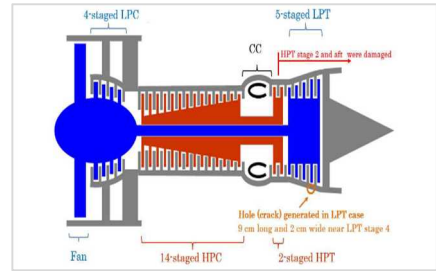
JAPAN AIRLINES CO., LTD. BOEING 767-300, JA8980

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

Findings

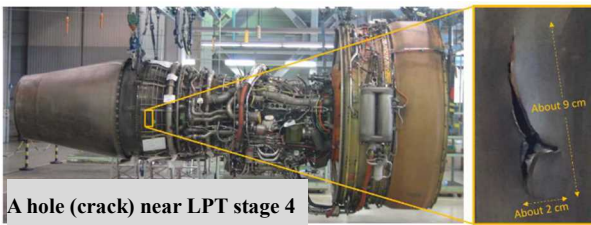
Damages

Engine composition and damaged sections (right)

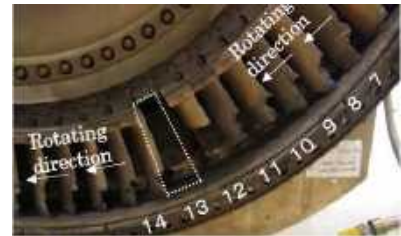
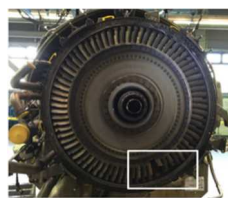


Engine damage

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



A hole (crack) near LPT stage 4



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

Analysis

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

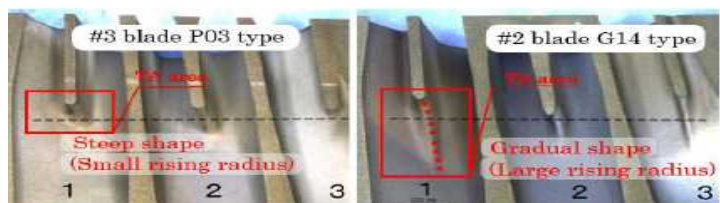
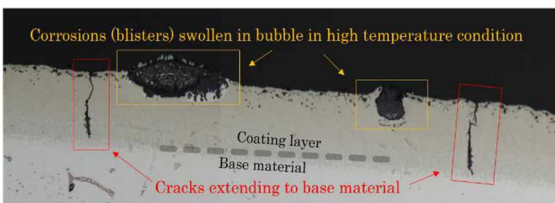
It is highly probable that No. 13 blade fractured because a crack generated on the coating layer of the TA section* progressed to its base material.

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

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

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

- A possibility of the impact of increased operating cycles
⇒ Coating quality deterioration, base material cracking and its progress
- It is likely that the steep rising shape of the cooling air passage bulkhead became a contributing factor.
⇒ Stress concentration on the section, cracking the base material
- It is likely that the large thickness of the coating layer became a contributing factor.
⇒ A thick coating layer is prone to cracking.



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

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

For details, please refer to the accident investigation report. (Published on July 30, 2020)

https://www.mlit.go.jp/jtsb/eng-air_report/JA8980.pdf