

Chapter 1 Aircraft accident and serious incident investigation

1. Summary of major investigation report

Summaries of five of the 20 investigation reports publicized in 2011 are presented below.

Aircraft 1 The tail rotor became uncontrollable while the aircraft was flying, and the aircraft rapidly lost its altitude and crashed into terrain.
 (All Nippon Helicopter Co., Ltd. Eurocopter EC135T2, registered JA31NH)
 Full text of the investigation report : http://www.mlit.go.jp/jtsb/eng-air_report/JA31NH.pdf

1. Summary of the accident

- (1) Date and time: At around 10:53 JST, December 9 (Sunday), 2007
- (2) Location: Minami-Numagami, Aoi-Ku, Shizuoka City, Shizuoka Prefecture
- (3) Outline of the accident:

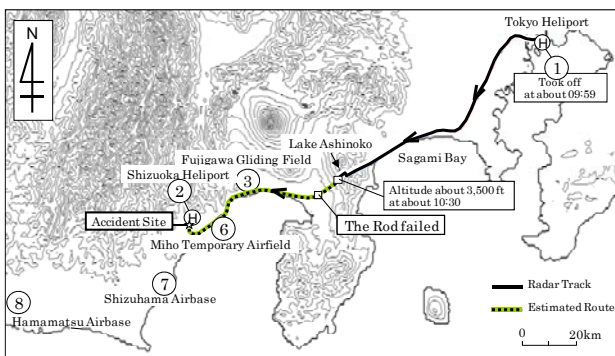


The accident aircraft

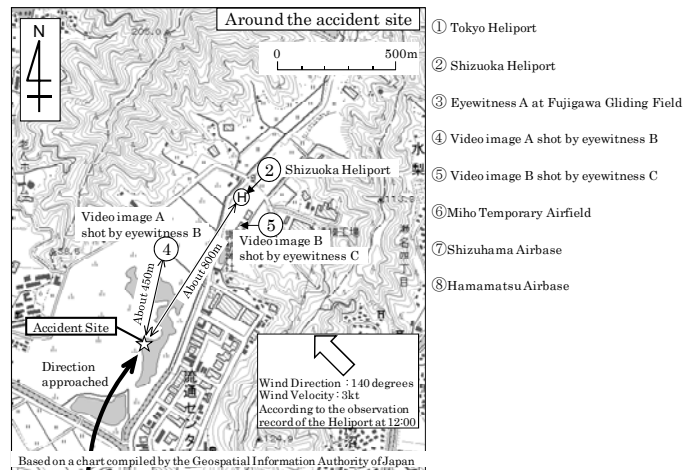
A Eurocopter EC135T2 (Rotorcraft), operated by All Nippon Helicopter Co., Ltd. took off from Tokyo Heliport for a ferry flight. While flying to Shizuoka Heliport, the aircraft crashed in Minami-Numagami, Aoi-Ku, Shizuoka City, Shizuoka Prefecture, at about 10:53 Japan Standard Time.

There were two persons on board the aircraft, consisting of the captain and one mechanic. The captain died and the mechanic on board was seriously injured. The aircraft was destroyed, but there was no outbreak of fire.

- (4) Date of publication: April 22, 2011



Estimated flight route



Around the accident site

2. Findings

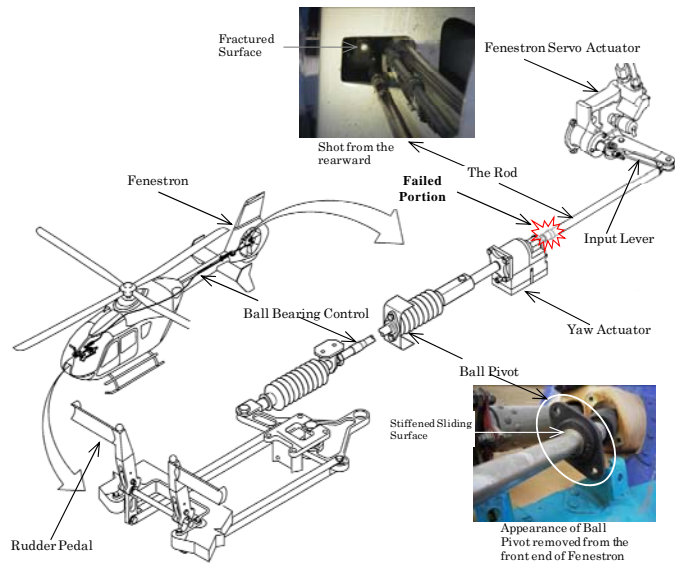
- (1) Failure of the tail rotor control rod

- a. A periodical check for the tail rotor (TR) control system, including the ball pivot, was performed on March 9, 2006, in accordance with the maintenance manual. There was neither looseness in the threaded part of the TR control rod (the Rod) nor abnormality with the ball pivot. But it was stated by the maintenance service company involved that

it was possible to turn the threaded part of the Rod by hand in the trouble shooting for the TR control system performed on October 20, 2007.

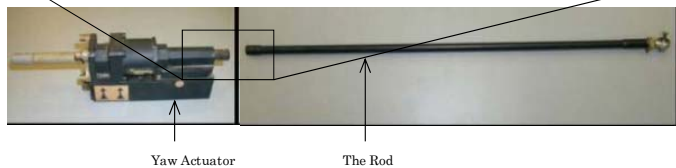
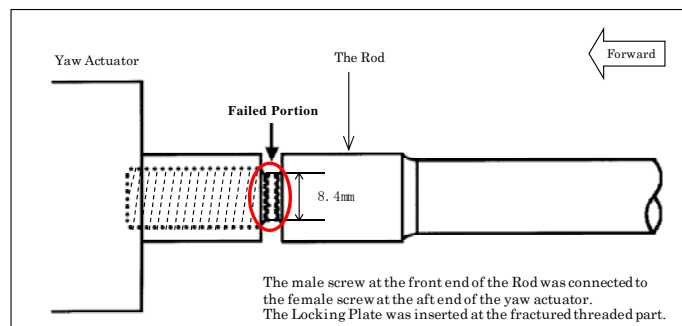
Based on the findings, it is highly probable that the threaded part of the Rod had become loose and the ball pivot had become stiff sometime after the periodical inspection and as a result, a crack had been created in the threaded part of the Rod.

b. There were no records that the threaded part of the Rod had been disconnected and re-torqued after the periodical inspection performed. According to information provided by the maintenance service company involved and the manufacturer about the condition of the threaded part of the same type of rod, there were no reports that the threaded part had become loose due to flight. Therefore, the reason could not be made clear about the phenomenon why the threaded part had become loose sometime after the periodical inspection performed.



TR control system

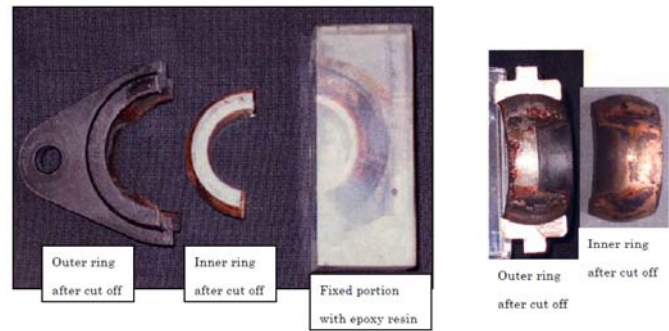
c. Troubleshooting was performed on October 20, 2007, in pursuit for the causes for the unusual feeling in the rudder pedal movement, which had been reported by several pilots. But because the inspection was not performed in accordance with the troubleshooting procedure provided in the maintenance manual, the stiffening of the ball pivot was not found. It is highly probable that after the troubleshooting, the aircraft had been flying with the threaded part of the Rod loosened.



Failed portion of the Rod

d. After the accident, it was found that the Rod had been fractured in the threaded part. In view of the result of an observation of the fracture surface, it is highly probable that the Rod had been fractured by a fatigue failure due to repetitive loads.

e. After the accident, it was found that the ball pivot had become stiff in the sliding surface due to corrosion. It is highly probable that the unusual feeling in the rudder pedal movement, which had been reported by several pilots before the occurrence of the accident, was caused by the stiffening of the ball pivot in light of remarks in the maintenance manual.



Ball pivot after cut off

f. As to the stiffening of the sliding surface of the ball pivot, it is highly probable that the phenomenon had occurred because the red rust was formed due to galvanic corrosion or crevice corrosion on the contact surface between the inner ring of copper-based alloy and the outer ring of iron-based alloy and it expanded in volume in the space between the two rings, restricting the movement of the two rings.

g. As to the failure of the Rod, it is highly probable that the repetitive bending loads in excess of the fatigue strength had been applied on the Rod because the bending loads on the Rod had increased by the operation of the rudder pedal and the movement of the yaw actuator under the condition that the joint of the Rod and the yaw actuator had been loosened and the ball pivot had been stiffened due to corrosion, and also because the stress concentration had occurred due to the resonance phenomenon with the airframe vibrations and the loosening of the joint.

(2) Flight control

- a. It is highly probable that because the Rod was failed while the aircraft was flying, TR became uncontrollable.
- b. It is highly probable that after the failure of the Rod, the input lever of the Fenestron servo actuator had been displaced to the most aft position where the TR pitch angle had gone to the minimum pitch angle due to air pressure generated in forward flight and remained at the position. It is highly probable that TR was generating the thrust deflecting the nose to the right.
- c. The captain did not select a landing area with a runway that has a wide air space available for the aircraft with the failed TR, and decided to land on the heliport which was the destination aerodrome in the flight plan and was the base of the company involved. As to the geographic features in the surrounding areas, the north, the east and the west of the heliport were surrounded by hills and only the south of it was open. The aircraft approached the heliport from the south at the time of the accident.
- d. The aircraft deflected the nose to the right about 20 minutes after the Rod failure and after that, while keeping the attitude unchanged, it reached a point near the accident

site about 800 m short of the heliport on its approach route.

- e. The aircraft, while decelerating, gradually entered a rotation to the right. Then, its attitude became nose-down. After the rotation to the right accelerated with the altitude unchanged, the aircraft rapidly lost its altitude and crashed.
- f. It is highly probable that the aircraft behaved as mentioned above because the captain tried to pitch-down by pressing the cyclic stick forward to perform a go-around and also to increase the engine power by raising the collective lever up, recognizing that the aircraft gradually entered the rotation to the right when he performed an operation for deceleration.
- g. Following these operations, it is highly probable that the reactive torque by the MR rotation increased due to the increase of the engine power under the condition that the forward speed was slow and the lift of the vertical stabilizer to deflect the nose to the left was limited and as a result, the aircraft became uncontrollable and its rotation to the right accelerated.
- h. As a result of the flight tests and flight simulator tests performed by the manufacturer after the accident, it was found that a wide air space was necessary to perform a go-around for the aircraft with this TR failure condition.

(3) Impact at the crash

- a. Because the aircraft crashed on a marsh with its landing gear first hitting the ground, it is highly probable that the impact to the aircraft was smaller than that of crashing on a hard ground.
- b. The cause of the captain's death was the heart damage. It is highly probable that because the captain was not fastening his shoulder harness at the time of the accident, his body bent forward due to the impact at the time of the crash and his chest hit against the cyclic stick. The mechanic on board with the shoulder harness fastened sustained serious injuries.

3. Probable causes

It is highly probable that the failure of the Rod during flight made TR uncontrollable, and that after flying over around the accident site and decelerating, the aircraft entered a rotation to the right and then, rapidly lost its altitude, and crashed. As a result, the captain died and the mechanic on board sustained serious injuries.

As to the failure of the Rod, it is highly probable that repetitive bending loads in excess of the fatigue strength had been applied on the Rod due to the loosening of the joint of the Rod and the yaw actuator and the stiffening of the ball pivot as well as the resonance phenomenon following the stiffening.

As to the stiffening of the ball pivot, it is highly probable that the phenomenon had occurred because the red rust was formed due to the corrosion of the contact surface of the inner ring and the outer ring and it expanded in volume in the space between the two rings

restricting the movement of the two rings.

As to the crash of the aircraft, it is highly probable that because the aircraft entered the rotation to the right when the captain performed an operation for deceleration and also because he tried to increase the engine power after that in an attempt to perform a go-around, the rotation to the right accelerated and this made the aircraft uncontrollable and it rapidly lost its altitude.

As to the cause for the captain's death, it is highly probable that because the captain had not fastened his shoulder harness, his body bent forward due to the impact at the time of the crash and his heart was damaged as his chest hit against the cyclic stick.

4. Opinions

The JTSB expressed its opinions to the Minister of Land, Infrastructure, Transport and Tourism recommending that the Civil Aviation Bureau of the Ministry should give guidance once again to those in charge of maintenance of rotorcraft and small aircraft so that they will fully understand the contents of manuals and other materials provided by the aircraft manufacturers and it should also give guidance to those who operate rotorcraft and small aircraft so that they will select flight training syllabuses for emergency operations in an appropriate manner and urge them to have pilots and other personnel on board fasten their shoulder harness appropriately not only during takeoff and landing but also during other flight phases depending on the situation.

(For the details of the opinions, refer to "Chapter 1 - 2. Summary of recommendations and opinions" (Page 36).)

Aircraft 2 When the passenger aircraft landed, its tail struck the runway and the aircraft sustained damage.

(All Nippon Airways Co., Ltd. Boeing 737-800, registered JA56AN)

Full text of the investigation report : http://www.mlit.go.jp/jtsb/eng-air_report/JA56AN.pdf

1. Summary of the accident

(1) Date and time: At around 20:23 JST,
August 10 (Monday), 2009

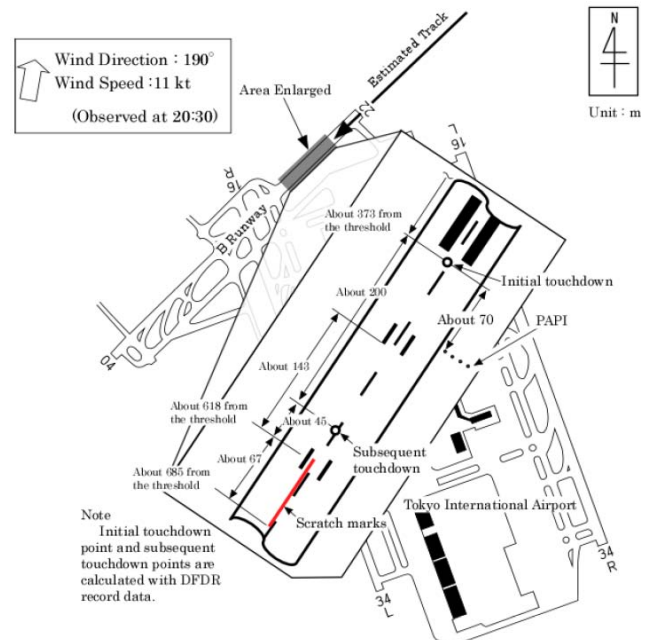
(2) Location: Runway 22, Tokyo
International Airport

(3) Outline of the accident:

A Boeing 737-800, operated by Air Nippon Co., Ltd., which was on a regularly scheduled service as All Nippon Airway's flight 298 under the agreement of joint transportation, made a tail strike with the surface of runway 22, Tokyo International Airport, upon landing at around 20:23 JST, and the aircraft sustained damage.

A total of 153 persons consisting of the pilot in command, five crewmembers and 147 passengers were on board the aircraft, but nobody sustained injuries. The aircraft was substantially damaged, but no fire broke out.

(4) Date of publication: April 22, 2011



Scratch marks on the runway 22

1. Findings

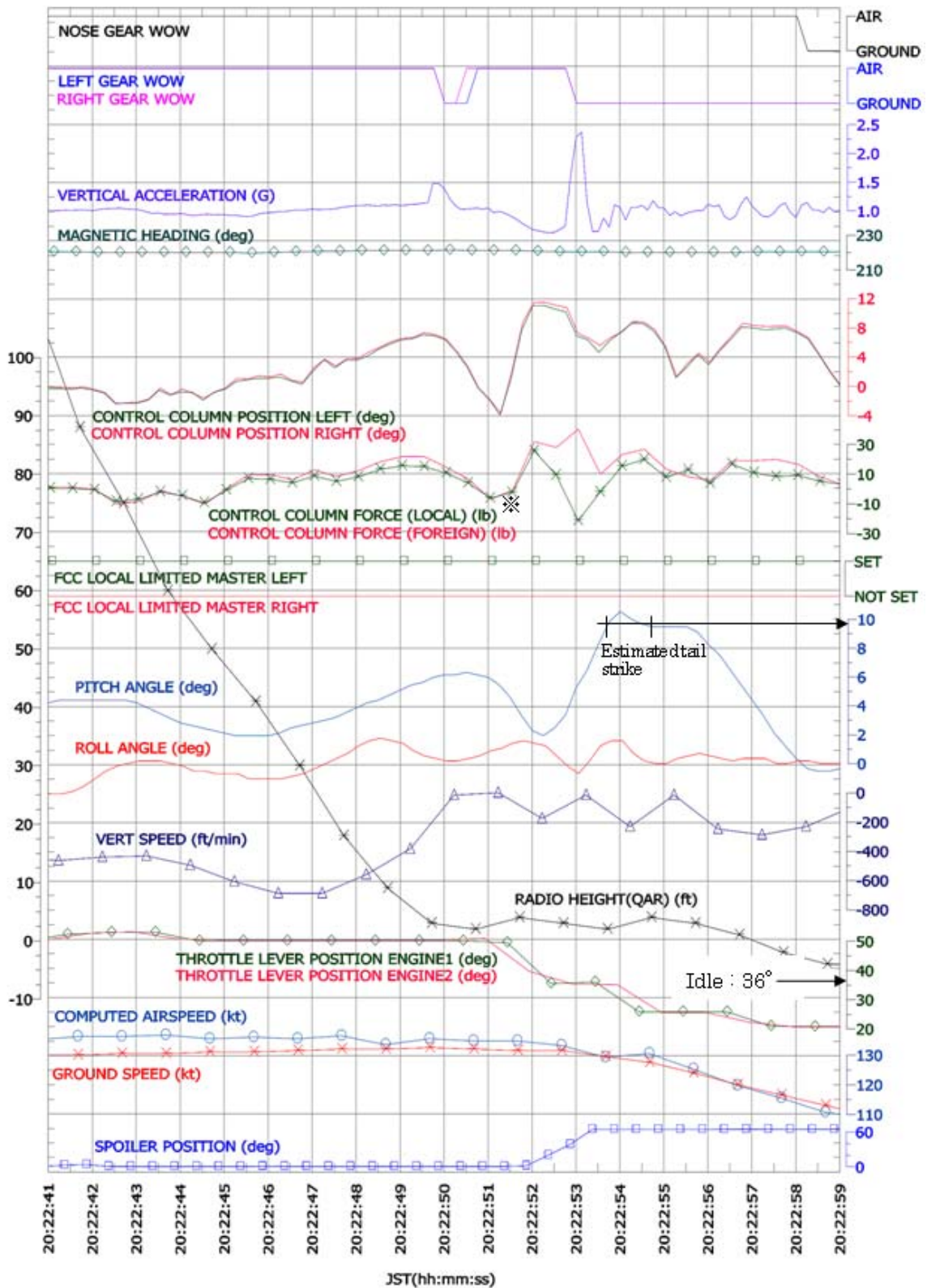
(1) Analysis of FO's flight operations

a. 200 ft to the bounce

The flight officer (FO) of the aircraft sat in the right seat while serving as the pilot-flying (PF) (mainly in charge of flying the aircraft), while the pilot in command (PIC) in the left seat as the pilot-not-flying (PNF) (mainly in charge of duties other than flying the aircraft).

The FO was correcting the glide path near 150 ft, which the PIC mentioned had been lower near 200 ft, by adding thrust and increasing the pitch angle. Then he pushed the CCP*1 after the aircraft passed 90 ft. It is highly probable that this input is linked to the decrease in the pitch angle after the aircraft flew over the runway 22 threshold at an altitude of approximately 60 ft RA and a delayed increase in the descent rate.

*1 The CCP denotes the control column position.



※ CONTROL COLUMN FORCE LOCAL applies to the left control column input while suffix FOREIGN to right control column input

DFDR (Digital Flight Data Recorder) records

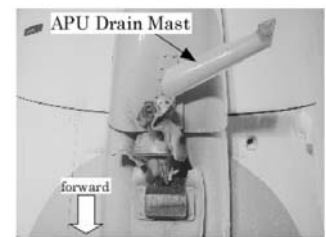
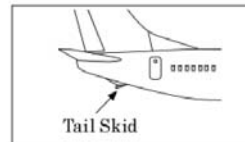
The FO stated that he felt the interval between automatic call-outs*2 of “Fifty” and “Forty” was shorter than usual. It is probable that his statement corresponds to the

then increasing descent rate of 600 to 700 fpm.

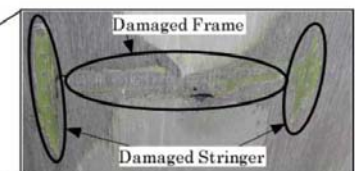
*2 The automatic call-out means a system which automatically reads out an aircraft's altitude with a synthesized voice as a reminder for the pilot. Altitude data obtained with the radio altimeter are used for the called out altitudes.

The FO stated that when he heard "Thirty", he started to flare the aircraft with an intention of maintaining the glide path. It is probable that this statement corresponds to the descent rate which started to decrease at around the time when the aircraft passed 30 ft, in terms of the DFDR records. It is probable that the flare maneuver was started approximately 3 seconds before the first touchdown, and with the control column pulled to reduce the descent rate from the earlier level of 700 fpm, it is probable that the aircraft touched down with a descent rate of approximately 100 fpm, and the pitch angle continued to increase even after the touchdown, though it was in a brief period. As for the thrust lever control, the FO stated that he retarded the thrust lever to the idle position upon hearing an automatic call-out of "Ten," but the lever remained in the approach

setting, according to the DFDR records, at the time of the first touchdown. It is probable that he could not retard the lever to the idle position because if he had done so, with the descent rate still at approximately 400 fpm, the descent rate would have increased further. It is probable that the aircraft bounced because the power setting remained as it was, with the thrust lever left to be retarded to the idle position, with a pitch angle of approximately $+6^\circ$ at touchdown and an airspeed of approximately 135 kt, and also because the pitch angle continued to increase even after the touchdown, though it was in a brief period.



Damage on tail skid



Damage on fuselage

b. During the bounce

The FO stated that he had held the control column in preparation for the second touchdown. However, the CCP registered large push and pull movements. It is probable that he had pushed the control column (from approximately $+7^\circ$ to approximately -4°) to avoid further bounce, and then pulled it (from approximately -4° to approximately $+11^\circ$)

to establish the landing attitude for the second touchdown. The CCP movement was reversed to decrease at around 20:22:52, approximately one second before the subsequent touchdown. However, the pitch angle conversely turned to increase.

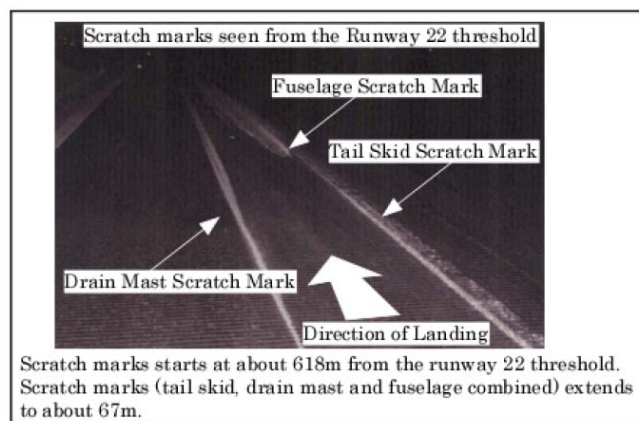
At around 20:22:51, with the thrust lever retarded to the idle position, the operating conditions for the auto speed brake had been met and at around 20:22:52 during the bounce, spoilers began to deploy.

It is somewhat likely that although the FO had been aware of the adverse outcome of retarding the thrust lever to idle during a bounce, he did so as an impulsive action.

On the other hand, the PIC's control column force had been applied as a push at around 20:22:52. It is probable that this push was the PIC's attempt to control the aircraft as he felt that the FO's control input was excessive.

c. After the subsequent touchdown

The subsequent touchdown was made with a pitch angle of approximately $+6^\circ$ at around 20:22:53. It is highly probable that the aircraft landed with a vertical acceleration of 2.4G after losing its lift following the deployment of spoilers. It is probable that although the CCP had decreased from 11° to 8° between 20:22:52 and 20:22:53, the pitch up attitude



Scratch marks on the runway 22

exceeded 9° as a result of the combined effects of a bigger CCP value and a pitch up moment generated by the deployment of spoilers which took place from 20:22:52 to past 20:22:53.

It is highly probable that the effects of the FO's large push-pull movements with the control column during the bounce led the pitch angle, which had been earlier reduced at one time with a delay, to become large and with an added nose-up moment generated by the deployment of spoilers, the pitch angle increased to over approximately 9.7° and consequently the aircraft made a tail strike*³ with its fuselage damage.

*³ A tail strike means a situation in which an aircraft's aft fuselage touches the runway when the aircraft lands or takes off.

According to a chart inserted in the MTG*⁴, a tail strike occurs with compressed main gear struts*⁵ at a pitch angle of approximately 9° , whereas with extended struts, it occurs at approximately 11.5° . The aircraft's aft fuselage is estimated to have touched the runway with a pitch angle of approximately 9.7° . Therefore, it is highly probable that the struts had been partially compressed, not fully extended.

*4 The MTG means the Boeing 737 Maneuvers and Techniques Guide, which is used as a reference material to show guidelines for operating the 700 Series and 800 Series aircraft owned by the company involved.

*5 The struts denote landing gear struts as part of the landing system. The struts form the landing system along with a shock absorber designed to cushion impact loads on landing.

(2) PIC's takeover

The PIC stated that approach operations performed by the FO had been within allowable stabilization limits until the initial touchdown. As a result, he did not have to add his control input, and there was no advice recorded in the CVR data. Therefore, it is highly probable that he had judged that a takeover*⁶ was unnecessary until the first touchdown. The aircraft bounced just after the first touchdown and the resultant touchdown occurred approximately 2 seconds later. During the bounce, the FO pushed and then pulled the control column and at that time, the PIC was pushing the control column to restraint an excessive pull input, but this push did not prevent a tail strike from occurring.

*6 The takeover means an action which must be done by a PIC to take over the control of the aircraft from an FO when he judges that the FO's controlling is inappropriate.

(3) Recurrence prevention

A proper landing requires a pilot to stabilize the last portion of an approach with proper control of speed, height, descent rate and other elements. In order to achieve this, it is important to establish a stabilized approach path in its early stage and precisely maintain it with a small control input.

During the course of an approach, if a PIC judges an FO's approach is unstable, he should not hesitate to execute a takeover.

In case of a bounce where the aircraft becomes unstable, it is necessary to execute the countermeasures stipulated in the MTG.

3. Probable causes

In this accident, it is highly probable that the aircraft, under the FO's piloting, was damaged in its aft fuselage as it made a tail strike at the second touchdown following the bounce immediately after the initial touchdown, with the continued nose-up attitude in addition to the compression of main landing gear struts by the large vertical acceleration.

It is probable that the big amount of control column pull input during the bounce and the pitch-up moment generated by the deployment of auto speed brake activated by the retarded thrust levers had contributed to the continued pitch up attitude after the second touchdown.

Aircraft 3 A rescue helicopter crashed during a rescue activity in the Northern Alps Mountains as its main rotor blade hit a rock wall when it was hovering at a high altitude.

(Gifu Air Rescue Team BELL 412EP, JA96GF)

Full text of the investigation report : http://www.mlit.go.jp/jtsb/eng-air_report/JA96GF.pdf

1. Summary of the accident

- (1) Date and time: At around 15:22 JST, September 11 (Friday), 2009
- (2) Location: Takayama City, Gifu Prefecture (near Mt. Okuhotaka-dake of the Northern Alps Mountains)
- (3) Outline of the accident:

A BELL 412EP, registered JA96GF (No. II Wakaayu), operated by the Gifu Air Rescue Team, took off from Gifu Air Base for a rescue activity at 14:09 and it crashed at around 15:22 during the rescue activity near a mountain trail at the so-called Roba-no-mimi (the donkey's ear) located near Gens d'Armes of Mt. Okuhotaka-dake of the Northern Alps Mountains in Takayama City, Gifu Prefecture.

The captain, a mechanic and a firefighter, the three of the five persons aboard the aircraft excluding the two who had descended from the aircraft at the rescue site, were fatally injured.

The aircraft was destroyed and a fire broke out.

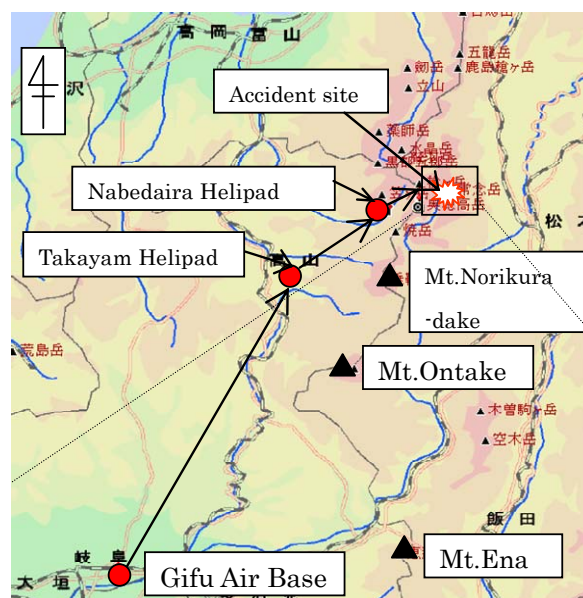
- (4) Date of publication: October 28, 2011

2. Findings

- (1) Weather and geographical features which influenced the aircraft

- a. It is highly probable that the upward air currents in addition to the prevailing wind from the west, influenced by the complex geographical features such as steep cliffs and valleys, created a complex, quickly changing turbulence around the accident site which is typical of higher mountainous areas.

- b. It is highly probable that the aircraft was receiving cross wind from the left. But, because the aircraft had been operated by a single pilot, it is probable that the captain had given priority to keeping a watch at rock walls as obstacles and securing an emergency breakaway route over stabilizing the aircraft with its heading facing the wind. It is probable that when the aircraft started hovering before the lifting at the rescue site, the captain initially tried to keep its altitude at around 80 ft. But it is probable that the captain raised its hovering altitude to around the same height as the top of Roba-no-mimi to avoid a rock wall running north and south and a rock wall running east and west (which was in the pilot's blind spot).

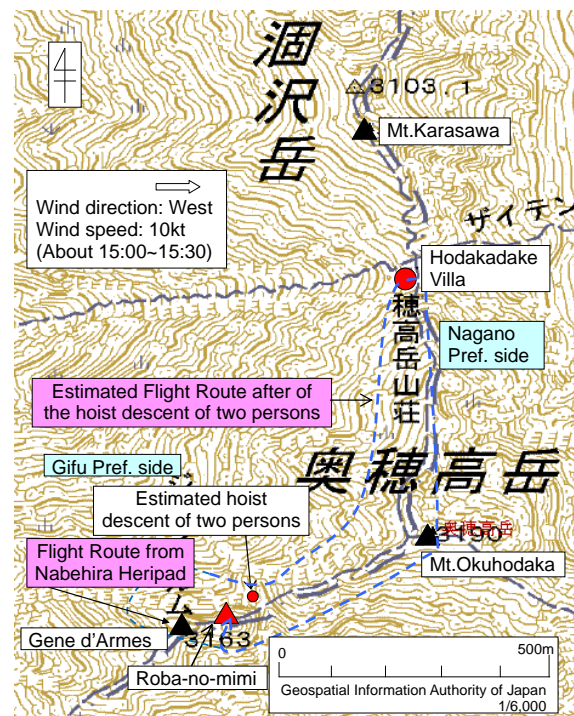


Estimated flight route

c. It is somewhat likely that the aircraft's altitude was suddenly lowered while it was hovering because of the influence of complex air currents typical of higher mountainous areas and when the aircraft moved backward with its altitude lowered, it became difficult for the captain to maintain the position of the aircraft relative to the mountain across the valley, which he had identified during the initial hovering, and that this made it difficult for him to precisely adjust the position and altitude of the aircraft and as a result, the aircraft moved backward and its main rotor blade (MRB) hit one of the rock walls.

The allowable maximum weight of the aircraft when it was hovering before the start of the lifting at about 15:19 was almost equal to the out of ground effect (OGE) hovering allowable maximum weight. Also because the aircraft was operating at a high altitude in an unfavorable condition in which its engine power and flight performance were likely to be influenced by changes in air currents as well as by cross winds, it is possible that the aircraft's altitude lowered due to an insufficient engine power and other reasons, making it difficult to maintain its heading, and thereby the MRB hit the rock wall. It is highly probable that when the aircraft hit the rock wall, it was about 7 m north-northwest of the rock wall where the contact marks were found, and its altitude was about 3,148 m.

- d. It is probable that the downwash generated by the aircraft converged toward the valley on the northern side to create an even stronger current without dispersing due to the geographical features around the accident site. It is probable that the hoist cable and the hook of the aircraft had been swayed toward the valley in the stream of the downwash. Because the aircraft raised its altitude, the length of the hoist cable wound out became about 48 m (including the surplus length), which was more than twice as long as the usual training length (about 21 m), it is probable that the cable started swinging even more erratically, requiring a longer time for rescue personnel on the ground to catch the hook.
- e. During the hovering, the captain raised the aircraft to an altitude around the top of Roba-no-mimi in order to avoid the rock wall running north and south and the rock wall



**Estimated flight route
(Around accident site)**



Layout of accident site

running east and west which was in his blind spot. As a result, it is somewhat likely that the captain had considered that he could have maintained a sufficient distance between the aircraft and the rock wall, which would be hit by the MRB of the aircraft later. Regarding how to watch the right side behind the aircraft, the sub-chief of the Gifu Air Rescue Team, who was the airborne safety manager at the time of the accident, is believed to have been in charge of keeping a watch on the area. But it is somewhat likely that just like the captain, he had also considered that a sufficient distance had been secured between the aircraft and the rock wall because its altitude had been raised to near the height of Roba-no-mimi.

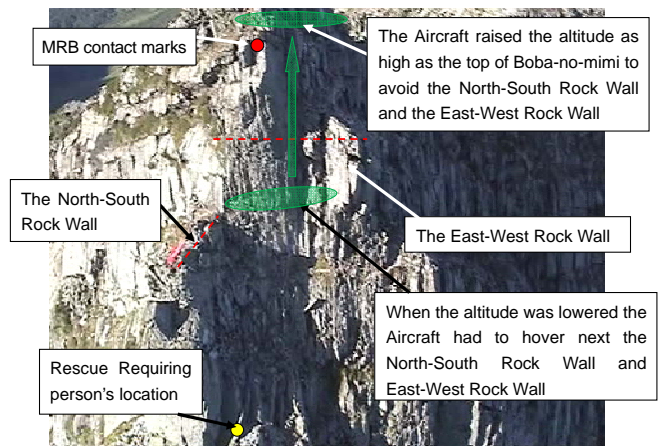
It is highly probable that it was very difficult to relocate the rescue-requiring person to a different place at that time because the rescuers would have to pass so dangerous a place that they might slip down while carrying the person.

(2) Fracture and detachment of tail boom

- a. It is probable that because the right side of the MRB's rotating plane hit the rock wall, the transmission leaned backward and at the same time, the MRBs were damaged, and they became unable to keep a proper rotation and hard hit the left side of the tail boom, fracturing it.
- b. It is probable that the engines of the aircraft were normally operating and that there was no abnormality with the aircraft.

(3) Flight plan, decision on dispatch of the aircraft and organizational system

- a. It is probable that the captain had been in effect in a position to make a judgment on whether to dispatch an aircraft at the Disaster Prevention Aviation Center (the Center) of Gifu Prefecture. It is probable that the manager of the Center made a decision to dispatch the aircraft involved simply following the captain's judgment and notified his decision to the Disaster Prevention Division of the Gifu Prefectural Government.



Viewed from the northwest Roba-no-mimi

Neither the Operation Management Rule for Gifu Prefecture rescue helicopters (the Rule) nor the Emergency Operation Guideline for these helicopters had a provision for checking the advisability of dispatching an aircraft from the Center. There was no provision, either, requiring the operation control manager and the operation control supervisor to have professional knowledge and experience related to aviation. As a result, there was no responsible person at the Center, except the captain, who could make a judgment on the dispatch of an aircraft.

Although the Rule and the Emergency Operation Guideline resembled comparable regulations established by other local governments in terms of their contents, it is probable that they lacked an appropriate provision to secure a safe

operation for the aircraft involved.

- b. The captain tried to depart quickly for the rescue activity despite his failure to obtain a reply from the Prefectural Police Aviation Unit to his request for providing a copilot to assist his flight. The aircraft involved was a model which can be operated with a single pilot and it had actually been operated with only one pilot in the past. Also because the Rule and other regulations lacked a provision about the number of pilots, it is somewhat likely that the captain may have decided to use the aircraft with a single pilot aboard.

Had it been operated with two pilots, it is probable that the aircraft could have flown in a better condition and its safety would have been enhanced.

- c. According to the minutes of a meeting between the prefectural police staff and the Center, it had been agreed between the two sides that rescue activities in the Northern Alps Mountains should be basically done by the police side and firefighters at the Center should not be engaged in rescue activities there. But this had not been clearly stated in the Agreement or the Operation and Management Procedure which were concluded between the two sides later.

It is somewhat likely that the Center had not clearly recognized the division of jobs in rescue activities in the Northern Alps Mountains between the Center and the Prefectural Police Aviation Unit.

It is probable that the captain had been aware that the Prefectural Police Aviation Unit was always in charge of rescue activities in the Northern Alps Mountains. But it is somewhat likely that he judged that an aircraft should be dispatched as quickly as possible from the point of view of life saving, in accordance with the Operation Management Rule for Gifu Prefecture rescue helicopters and the Operation and Management Procedure.

The captain is believed to have had general knowledge and experience of mountain rescue activities, but he had no records of training or rescue activities in the higher Northern Alps areas. Therefore, it is probable that he had not fully recognized the difficulty of flying an aircraft for rescue activity at a place very close to a rock wall, just like the rescue site in the case, in the higher mountainous areas in the Northern Alps Mountains with the elevation of over 3,000 m.

If the agreement between the Prefectural Police Aviation Unit and the Center regarding rescue activities in the Northern Alps Mountains had been clearly documented and if their job sharing and conditions for dispatching their helicopters had been clarified, it is probable that the captain would have made a judgment under these rules on whether to dispatch the aircraft involved, and it is also probable that comprehensive coordination between the Police Aviation Unit and the Center would have been made among a range of persons, including the sub-chief of the air rescue team and the manager of the Center, who might have exchanged their views not only about the Center's receipt of the rescue request and the necessity for the Center to have a pilot provided from the Police Aviation Unit but also about the fact that the Center had no team of ground personnel capable of operating in the higher mountainous areas.

- d. In view of the records of dispatch for the aircraft involved and the records of training, it is highly probable that the Center had not assumed that its helicopters would be dispatched for rescue activities in the higher Northern Alps areas.

Because the Center had not assumed its personnel would operate anywhere in

the Northern Alps Mountains, it is believed to be desirable for the Center to have left rescue activities in the steep higher mountainous areas in the Northern Alps Mountains, just like the rescue site in the case, to the Prefectural Police Aviation Unit, which was well experienced in activities in those areas.

- e. The captain is believed to have prepared a simplified chart which showed such data as the weight and the center of gravity (CG) of the aircraft when he prepared a flight plan for the aircraft, but the chart could not be found after the accident. As a result, his flight plan for the day of the accident could not be determined.

The aircraft was hovering with the gross weight exceeding the OGE hovering allowable maximum weight. It is probable that the captain started hovering because he could confirm in the course of the power check that the indications on the instruments were within the allowable ranges.

When a helicopter hovers with a gross weight exceeding its flight performance at a high altitude, serious problems could occur during flight. When a mission includes hovering at a high altitude, just like at the rescue site, even in the case of an emergency rescue operation, the weight at the hovering must be precisely calculated beforehand and the fuel load must be adjusted in an appropriate manner before takeoff.

- f. According to the Emergency Operation Procedure and the related manual, a final decision to dispatch the aircraft involved at the Center was to be made by the manager of the Center, but the captain was in effect in charge of this job.

The Center should establish a systematic decision-making process of aircraft dispatch, upon assessing the danger of the destination and conformity of its own preparedness in accordance with the Emergency Operation Procedure and the related manual. In order to make this process effective, the Center should assure its staff to ascertain the condition of the destination before a decision is made and require each group chief to have a briefing so that a clear judgment can be made on whether the groups will be able to operate in their respective areas, before the manager of the Center confirms an agreement among the groups and it makes a decision for the dispatch.

The Northern Alps Mountains are among the areas under the jurisdiction of the Center, and an aircraft may be dispatched to places in the higher Northern Alps areas, and if its aircraft is to be dispatched to places where rescue work must be done in a very difficult situation, just like the higher mountainous areas in the Northern Alps Mountains, including the rescue site in this case, it is considered necessary for the Center to carry out not only researches and studies about geographical features, meteorological phenomena and other factors in advance but also hovering trainings at high altitudes, and furthermore a mission-oriented broad range of trainings with actual operations in mind.

As to the formation of pilots for similar rescue operations, because flight planning, a go-or-not-go decision and other preparations must be done quickly under a bustled pre-launch situation, it is desirable to dispatch a helicopter with two pilots when it has to operate in an area where rescue work must be done in a very difficult condition, such as the higher mountainous areas in the Northern Alps Mountains. The Center also needs to introduce a more appropriate system for helicopter operations by creating clear provisions about the decision making of dispatch and the coordination with the prefectural police.

3. Probable causes

It is highly probable that the aircraft crashed while it was operating for a rescue activity in the higher mountainous areas in the Northern Alps Mountains, where trainings or rescue operations had not been made, and the altitude of the aircraft declined when it was hovering near the top of Roba-no-mimi and as a result, the aircraft moved backward and consequently, its MRBs hit an adjacent rock wall.

As to the MRBs' contact with the rock wall after the decline of the aircraft's altitude, it is somewhat likely that either of the following two factors listed below or both had contributed to the consequence.

- (1) Because of the influence of the turbulence typical of higher mountainous areas and the aircraft movement due to altitude loss, it became difficult for the captain to maintain his sense of distance with the target (a mountain across a valley) which is considered to have been identified during the initial hovering.
- (2) The aircraft's gross weight at the time of the accident was almost equal to the OGE hovering allowable maximum weight. Also in view of the fact that the aircraft was operating at a high altitude in an unfavorable condition, in which its engine power or its flight performance might easily be influenced by cross winds and by changes in air currents typical of the higher mountainous areas, it became difficult to maintain the aircraft's heading following the altitude loss due to the insufficient engine power and other factors.

As to the rescue dispatch of the aircraft to the higher mountainous areas in the Northern Alps Mountains, where trainings or rescue operations had not been made by the Gifu Air Rescue Team, it is somewhat likely that the absence of a clear provision between the Center and the Prefectural Police Aviation Unit regarding the task sharing for mountain rescue activities in the Northern Alps Mountains contributed to the Center's lack of clear recognition about the task sharing with the police side

4. Remarks

The JTSCB made its remarks to local governments which have helicopters for rescue activities regarding the need to review their own safety management systems, rules and other related matters in order to ensure the safety of helicopter operations, and also to the Fire and Disaster Management Agency regarding the need to make necessary advices for local governments concerned with regard to their reviews.

(For the details of the remarks, refer to "Appendix 8 Remarks made in 2011" (Page 14 in Appendixes).)

Aircraft 4

When an aircraft was approaching a runway which it had been cleared to use, a different aircraft entered the runway upon receiving a take-off clearance.

(Air Flight Japan Co., Ltd. Piper PA-28R-201, JA4193)

(Oriental Air Bridge Co., Ltd. Bombardier DHC-8-201, JA802B)

Full text of the investigation report (Japanese text only):

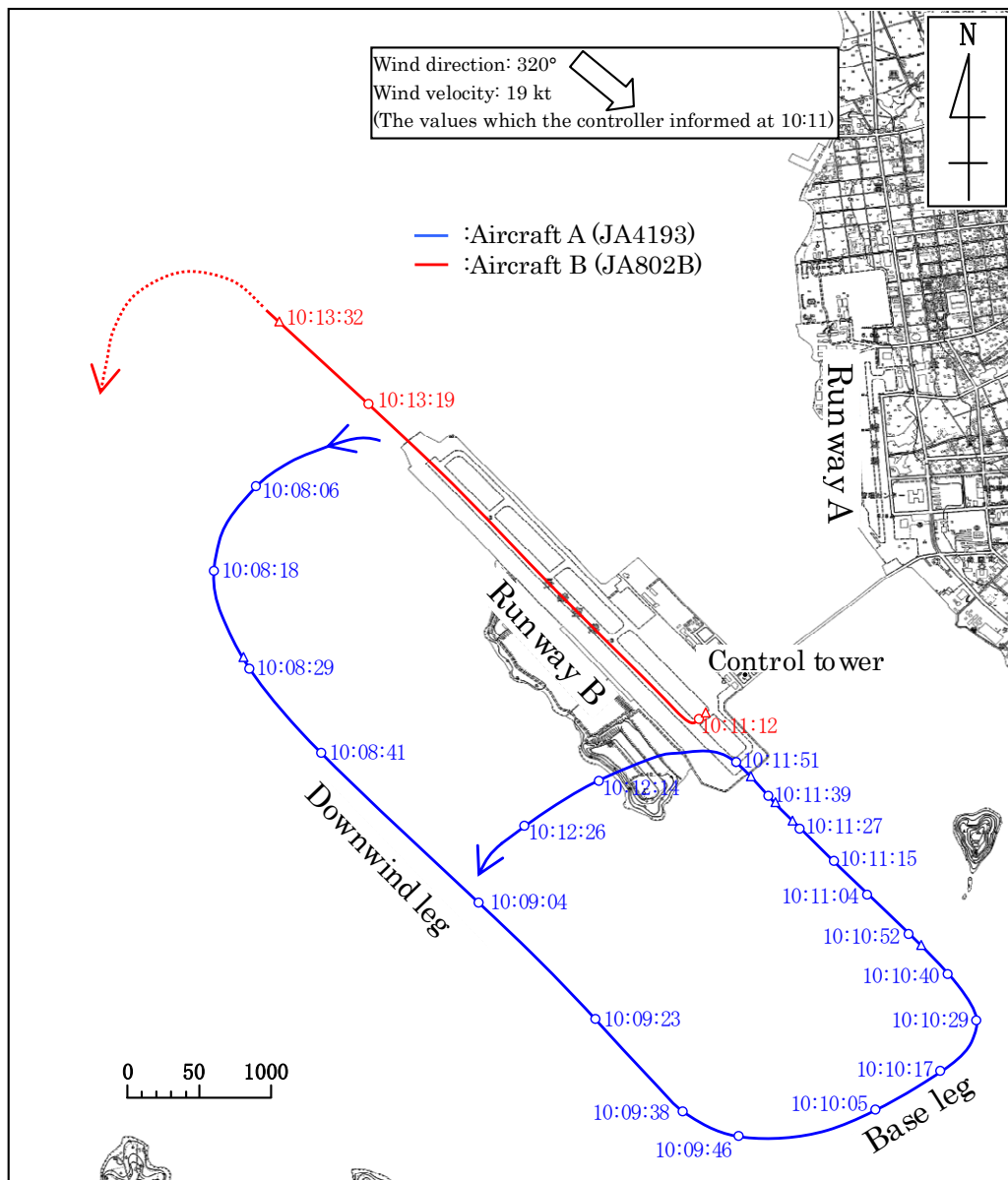
<http://www.mlit.go.jp/jtsb/aircraft/rep-inci/AI2011-2-1-JA4193-JA802B.pdf>

1. Summary of the serious incident

(1) Date and time: At around 10:11 JST, March 25 (Wednesday), 2009

(2) Location: On the final approach to runway 32, Nagasaki Airport

(3) Outline of the incident:



Estimated flight routes

A Piper PA-28R-201, registered JA4193 (the Aircraft A), operated by Air Flight Japan Co., Ltd. was approaching runway 32 (runway B) of Nagasaki Airport in Nagasaki

Prefecture upon receiving a clearance for using the runway for touch and go landing (TGL) training. Meanwhile, a Bombardier DHC-8-201, registered JA802B (the Aircraft B), operated by Oriental Air Bridge Co., Ltd. entered runway 32 via taxiway T2 after receiving a take-off clearance for Fukue Airport, also in Nagasaki Prefecture, as the company's scheduled flight 311. As the Aircraft A noticed the Aircraft B's entry into runway 32, the Aircraft A performed a go-around.

There were three persons on board the Aircraft A, consisting of an instructor, a student pilot and an observer, while 32 persons were aboard the Aircraft B, consisting of the captain, two crewmembers and 29 passengers. No one was injured. There was no damage, either, to both aircraft.

10:08:18	The Aircraft A reported to the aerodrome control air traffic controller (the Tower) that it has entered a left downwind leg toward runway 32 and requested a permission for touch and go landing (TGL)
10:08:23	The Tower cleared TGL on runway 32 for the Aircraft A.
Around 10:08:30	The Aircraft B started taxiing to runway 32 from the spot No. 3
Around 10:09:40	The Aircraft A started turning from the left downwind leg to the base leg (the base).
Around 10:10:30	The Aircraft A turned to the left from the base while maintaining an altitude of about 800 ft and entered the final approach.
10:10:42	The Aircraft B established communication with the Tower and reported "ready for take-off,"
10:10:47	The Tower issued a take-off clearance from runway 32 to the Aircraft B.
Around 10:11:00	The Aircraft A started descending from about 800 ft at a place about one nm from the runway 32 threshold.
Around 10:11:08	The Aircraft B started turning to the right from taxiway T2 to runway 32.
10:11:29	The Aircraft A was descending at about 500 ft.
10:11:31	The Tower issued an instruction to the Aircraft A, "Sorry, report downwind."
Around 10:11:35	The Aircraft B finished the turn to the right and aligned with runway 32.
10:11:42	The Aircraft A started climbing from about 200 ft at a place about 0.5 nm from the Aircraft B.
10:11:47	The Tower instructed the Aircraft A to turn to the left.
10:11:49	The Aircraft B asked the Tower "confirm cleared for for take off."
10:11:49	The Tower replied to the Aircraft B "affirm."
Around 10:11:50	The Aircraft A passed near the runway 32 threshold while turning to the left westward and climbing at about 400 ft.
10:12:00	The Aircraft A got out of the area over runway 32 while flying westward.

(4) Date of publication: February 25, 2011

2. Findings

(1) Circumstances concerning the Tower's issuance of take-off clearance

a. The circumstance in which the Aircraft A was forgotten

At the time when this serious incident occurred, the Tower was having a chat with two other air traffic controllers after issuing the clearance for TGL to the Aircraft A, as the number of aircraft to be handled was small then. It is probable that the Tower, preoccupied with the conversation, was not looking at the Aircraft A and this led to a non-compliance of a provision in the air traffic control procedure standard that required air traffic controllers to make every possible effort to visibly recognize aircraft concerned continuously, rendering him, along with the other controllers, forgetful of the presence of the Aircraft A.

b. The circumstance in which the take-off clearance was issued to the Aircraft B while the Aircraft A was forgotten

It is highly probable that the Aircraft B started taxiing around when the Aircraft A read back TGL clearance. It is probable that when the Tower received a notice from the terminal control facility for clearing a take-off standby for the Aircraft B while it

was taxiing and the Aircraft B reported to the Tower that it had finished take-off preparations, the Tower issued a take-off clearance almost reflexively for the Aircraft B, while forgetting the Aircraft A which had entered the final approach. It is probable that because the two other controllers at the control tower had also forgotten the Aircraft A, they could not correct the Tower's double issuance of clearances for the same runway.

It is somewhat likely that the Tower had customarily looked into the runway for a safety check just before he issued a take-off clearance for the Aircraft B. However, it is probable that the Tower had forgotten the presence of the Aircraft A itself, and that because the Aircraft A was far away from the area where he usually searched for traffic, the Tower could not visibly recognize the Aircraft A.

c. The circumstance in which it was realized that the Aircraft A had been forgotten

It is probable that the Tower came to realize for the first time that he had forgotten the Aircraft A when it reported a decision to perform a go-around to the Tower.

It is probable that after the Tower realized that he had forgotten the Aircraft, he instructed the Aircraft A to report its downwind and turn to the left and after that, permitted the Aircraft B to continue its take-off.

The safety of the two aircraft was actually secured, but when the Aircraft A reported to the Tower that it would perform a go-around, the Tower should have at least canceled the take-off clearance for the Aircraft B as soon as possible in order to avoid the possibility of the two aircraft coming close to each other and at the same time, should have provided information about the Aircraft A to the Aircraft B so that it could understand the situation.

(2) Circumstances from the Aircraft A's entry into the final approach to go-around

a. The situation of the Aircraft A when the take-off clearance was issued for the Aircraft B

It is probable that when the Tower issued the take-off clearance from runway 32 for the Aircraft B, the Aircraft A was in the final approach and 12 to 13 seconds before the start of its descent. At this point, the student pilot aboard the Aircraft A heard the take-off clearance for the Aircraft B in ATC communications, but it is probable that the student pilot, while suspecting the double issuance of clearances for the same runway, was not confident enough to report his suspicion to the instructor. The student pilot aboard the Aircraft A should have immediately confirmed with the Tower when he became suspicious of the issuance of the take-off clearance to the Aircraft B.

It is probable that when the Tower issued the take-off clearance to the Aircraft B, the instructor aboard the Aircraft A had been occupied with the training so that dangerous operations might not be performed by the student pilot and as a result, did not realize the issuance of the take-off clearance for the Aircraft B. Instructors should strive to monitor ATC communications even when they are training student pilots.

b. The situation at the time when the Aircraft A noticed the Aircraft B's entry into the runway and reported a go-around to the Tower

It is probable that the student pilot aboard the Aircraft A recognized the Aircraft B which had entered runway 32 but the student pilot did not execute a go-around operation immediately.

It is probable that then the instructor aboard the Aircraft A, who realized the Aircraft B's entry into runway 32, immediately confirmed the TGL clearance with the student pilot and instructed the student pilot to perform a go-around operation and after the student pilot performed operations for a go-around, the instructor reported the go-around to the Tower.

(3) Circumstances in which the Aircraft B could not visibly recognize the Aircraft A in safety check just before entry into runway

It is probable that the Aircraft B confirmed the safety in the direction of the final approach just before it entered runway 32. But the Aircraft B had not monitored the aerodrome frequency until its establishment of communication with the Tower after the completion of take-off preparations in accordance with instructions by the ground control air traffic controller (Ground), whereas the Aircraft A had not made any ATC communication from the time when it read back the issuance of permission for TGL to the time when it reported a go-around to the Tower. Therefore, it is highly probable that the Aircraft B could not recognize the presence of the Aircraft A before its entry into runway 32 by monitoring the aerodrome frequency. Meanwhile, it is probable that the Aircraft A had been far away from the area which was usually searched for traffic. In view of these findings, it is probable that the Aircraft B could not visibly recognize the Aircraft A when it checked the safety in the direction of the final approach to runway 32.

(4) Preventive actions

a. Thorough implementation of continuous visible recognition in aerodrome air traffic control

Aerodrome air traffic controllers should remind themselves of the importance of the provision in the air traffic control procedure standard that calls on air traffic controllers to make every possible effort to visibly recognize aircraft concerned continuously and at the same time, they should strive to abide by the provision without fail.

b. Mutual support with team play among air traffic controllers

In air traffic control services to be executed in team play, each of the air traffic controllers must be aware of the responsibility of duties performed at their respective positions and at the same time, it is important that air traffic controllers should perform their jobs from different points of view and mutually strive to find and correct possible errors while displaying good team work based on favorable communication among themselves. While considering the placement of personnel, area-by-area characteristics in actual operations and other matters, it is necessary to strengthen a mutually complementary system for air traffic controllers mainly by further improving the Team Resource Management (TRM) with the characteristics of specific workplaces in mind.

c. Mutual cooperation in maintenance of safety between air traffic controllers and aircraft personnel

Air traffic controllers and aircraft crewmembers need to faithfully abide by the basics in their respective jobs and at the same time, mutually confirm and remind each other whenever they have doubts about what they saw and what they heard.

(5) Severity in this serious incident

The distance between the Aircraft A and the Aircraft B was about 0.5 nm (about 0.9 km) when the Aircraft A performed a go-around and started climbing, and it is highly probable that visibility was good at the time of the incident. The ICAO manual on the Prevention of Runway Incursions (Doc9870) shows case-by-case severity classifications for runway incursions. According to the judgment tool provided by the ICAO (Please see the table at right), this serious incident can be considered to be a case which falls under Category C “An incident characterized by ample time and/or distance to avoid a collision.”

<i>Severity Classification</i>	<i>Description*</i>
<i>A</i>	<i>A serious incident in which a collision is narrowly avoided.</i>
<i>B</i>	<i>An incident in which separation decreases and there is significant potential for collision, which may result in a time-critical corrective/evasive response to avoid a collision.</i>
<i>C</i>	<i>An incident characterized by ample time and/or distance to avoid a collision.</i>
<i>D</i>	<i>An incident that meets the definition of runway incursion such as the incorrect presence of a single vehicle, person or aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences.</i>
<i>E</i>	<i>Insufficient information or inconclusive or conflicting evidence precludes a severity assessment.</i>

** Refer to Annex 13 for the definition of "incident".*

Runway incursion severity classification

3. Probable causes

It is highly probable that this serious incident occurred because when the Aircraft A was approaching runway 32 upon receiving a permission to use the runway for TGL ahead of other aircraft, the Tower issued a clearance for take-off from the same runway to the Aircraft B while forgetting the presence of the Aircraft A, and the Aircraft B entered the runway without becoming aware of the presence of the Aircraft and therefore, the Aircraft A, which had earlier obtained the permission to use the runway, attempted to land on the runway in use of the Aircraft B.

It is probable that the Tower had forgotten the presence of the Aircraft because it was the period of time in which the number of aircraft to be handled was limited and he failed to visibly recognize the aircraft continuously as he had become preoccupied with conversation with two other air traffic controllers.

Aircraft 5 The aircraft made an approach to a closed runway due to the flight crew's misunderstanding in a visual approach at night.
(Qatar Airways Boeing 777-300, A7BAE)

Full text of the investigation report : http://www.mlit.go.jp/jtsb/eng-air_report/A7BAE.pdf

1. Summary of the serious incident

- (1) Date and time: At around 21:55 JST, August 30 (Monday), 2010
- (2) Location: About 3.8 nm northeast of runway 24R threshold, Kansai International Airport, Japan, an altitude of about 1,000 ft
- (3) Outline of the incident:

A Boeing 777-300, registered A7BAE (the Aircraft), operated by Qatar Airways, took off from Narita International Airport at 20:59. When it was approaching Kansai International Airport (the Airport) at around 21:55 for landing, the Aircraft attempted to land on runway 24R which was closed then. Thereafter, the Aircraft made a go-around and touched down on runway 24L at 22:07.

There were 124 persons on board the Aircraft, including the Captain, 16 crewmembers and 107 passengers, and no one was injured.

- (4) Date of publication: September 30, 2011

2. Findings

- (1) History up to the occurrence of the serious incident

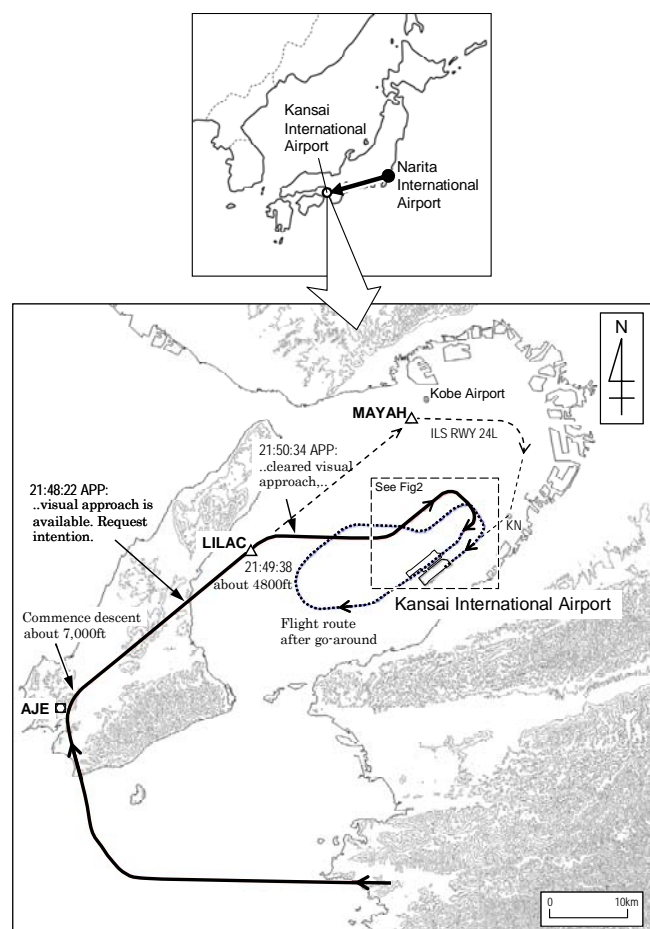
The Aircraft took off from Narita International Airport for the Airport as Qatar Airways' (the Company) regular flight 803 on August 30, 2010.

At the time of the occurrence of the serious incident, the Captain sat in the left seat as PM (Pilot Monitoring) and the First Officer in the right seat as PF (Pilot Flying).

<History of flight based on air traffic control communication records, DFDR records>

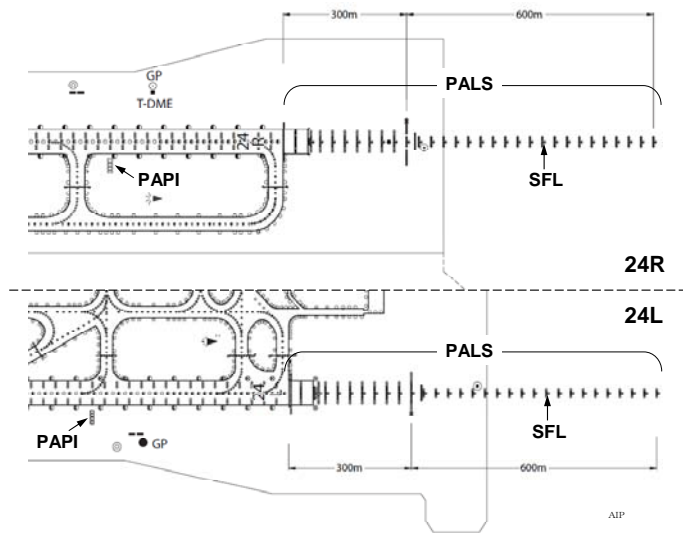
21:52:37: The precision approach lighting system (PALS), the sequenced flashing lights (SFL) and the precision approach path indicator (PAPI) of runway 24R (24R) were turned on.

21:53:11: The SFL of 24R was turned off.



Estimated flight route

- 21:53:35: The autopilot of the Aircraft was set to vertical speed (V/S) mode with a descent rate of 200 ft/min (fpm) selected.
- 21:53:46: A descent rate of 500 fpm was selected.
- 21:53:55: A descent rate of 700 fpm was selected.
- 21:54:22: A descent rate of 900 fpm was selected.
- 21:54:33: The Captain said, "Three reds, one white."
- 21:54:35: A descent rate of 500 fpm was selected.
- 21:54:42: The Tower cleared the Aircraft to land on 24L and the Aircraft read back the clearance to land on 24L.
- 21:54:50: The autopilot of the Aircraft was disconnected manually.
- 21:55:08: The First Officer serving as PF, instructed the Captain to perform a landing checklist, and the Captain performed it.
- 21:55:11: The Tower pointed out that the Aircraft was approaching 24R, and asked whether it was possible to make a left turn to approach 24L. The Aircraft reported to the Tower that it would make a go-around because it was unable to approach 24L.
- 21:56:14: The PALS and PAPI on 24R were turned off.



Lighting arrangements and its names

(2) Information about the Airport and ground facilities

a. Overview of the Airport

The Airport has two runways, i.e., 06R/24L (runway A) with a length of 3,500 m and a width of 60 m on the east side of the Tower and the terminal building and 06L/24R (runway B) with a length of 4,000 m and a width of 60 m on the west side. The separation between the two runways is 2,303 m. When the serious incident occurred, runway B had been closed for maintenance work.

b. Aerodrome lighting conditions

The 24L side:

The PALS, SFL, PAPI, runway touchdown zone lights, runway edge lights and runway centerline lights had been lit normally.

The 24R side:

The SFL was lit between 21:52 and 21:53 and the PALS and PAPI were lit between 21:52 and 21:56. The runway edge lights and runway touchdown zone lights had been turned on in order to secure safety for the maintenance work, but the runway centerline lights had been turned off.

(3) Analysis of piloting by Captain and First Officer

- a. It is highly probable that the Captain and the First Officer had been aware that 24R was closed.
- b. The standard traffic pattern has a width of 2 nm. But it is probable that the First Officer tried to have leeway for approach and decided to take a 4 to 5 nm wide traffic pattern. However, it is probable that the First Officer had to navigate while paying greater attention than usual to timing corrections to descending and flap control because the traffic pattern was wider than usual.
- c. According to the DFDR records, the autopilot was switched to V/S mode when the Aircraft started the base turn (21:53:35) and then, the Aircraft started descending. It is probable that the First Officer tried to descent slowly at a rate of 200 fpm because the runway was invisible at that point and there was no reference object visible on the sea. It is probable that the First Officer then increased the rate of descent to 500, 700 and 900 fpm gradually in order to adjust the Aircraft to an appropriate approach angle toward the runway as it became visible. At 21:54:33, the Captain uttered, "Three reds, one white." It is highly probable that this indicated the PAPI lamps had been lit red, red, red, and white (i.e., the approach altitude was slightly low), and it is highly probable that the First Officer then judged from the PAPI that the rate of descent was slightly high and he selected the rate to 500 fpm from 900 fpm.
- d. It is probable that the First Officer then turned off the autopilot and approached 24R, which had been closed at that time, because the Aircraft was slightly overshooting to enter the final approach course to the runway that he misunderstood as 24L.
- e. The First Officer took the traffic pattern wider than the standard width in order to have leeway to fly. It is probable that this was not a direct cause for the misunderstanding of the runway. However, the traffic pattern was made above the sea, and the visual approach was made at night with limited visual reference objects available, and the downwind leg was close to the standard traffic pattern for 24R. Therefore, it is probable that, after the runway once became invisible in the downwind leg, when the Aircraft made the base turn, the First Officer saw a runway and a PAPI close to the position where they were normally seen, and he assumed it was the right runway, and entered 24R mistakenly.

(4) Analysis of roles of and cooperation between flight crew

- a. The Captain considered that the visual approach at night was difficult and asked the First Officer whether it would be all right and he did not agree when the First Officer instructed him "Flaps 30". From these points, it is somewhat likely that the Captain had been distracted by the First Officer's maneuvering which he felt unsure about, and could not play the role as PM sufficiently well, and that his checking did not function properly.
- b. A communication gap between a Captain and a First Officer is unlikely on the timing of operation of flap and gear, descent and so on if the traffic pattern is approximately 2 nm. It is somewhat likely that the wider traffic pattern taken made it difficult for the Captain and the First Officer to share common perceptions.
- c. A visual approach is an IFR approach by visual references to objects on the ground. It

is highly probable that it was not easy for the Captain and the First Officer to visually recognize the runway (24L) located beyond the bright lights around the terminal building while the Aircraft was in the traffic pattern, and that the runway (24R) located nearer was easier to see. However, the Captain and the First Officer had been aware that 24R, one of the two runways at the Airport, was closed. In addition, there was a good visibility, and the PAPI, PALS and SFL on the 24L runway, where the Aircraft was supposed to touch down, had been lit. Therefore, it is probable that the misunderstanding of the runway would have been avoided if the Captain and the First Officer had recognized the two runways in a wider field of vision.

d. The Captain stated, “24L was inputted into the navigation display (ND).” Therefore, it is probable that the Captain would have recognized earlier that the Aircraft was mistakenly approaching 24R if the Captain as PM had checked the indications on the ND along with its position against visual references to objects on the ground.

(5) Experience in landing at the Airport

The Captain and the First Officer landed at the Airport on the day before the serious incident, serving as PF and PM, respectively. But it was the Captain’s first landing at the Airport in two years and the First Officer landed at the Airport as PF for the first time. In addition, it was the first visual approach to the Airport at night for both of them. It is probable that their landing experience at the Airport was not sufficient. With the circumstance considered, it would have been desirable for them to take a standard traffic pattern or make an ILS approach as originally planned instead of the visual approach.

(6) Operation of airport lighting systems

a. The lighting staff at the Airport shall notify air traffic controllers before turning on the PALS and PAPI. However, the control of the lighting console, including the operation of the PALS and PAPI, had been transferred from the controllers to the lighting staff at the time of the serious incident. Furthermore, the lighting staff had been allowed by the controllers to omit the prior notification. Therefore, it is highly probable that the lighting staff turned on the lights without notifying this to controllers in advance.

b. The PALS and PAPI on 24R had been turned on when the Aircraft was flying in the downwind leg in the traffic pattern. As the PAPI had been lit while there were no visual references on the sea, it is probable that this was a contributing factor for that the Captain and the First Officer assumed 24R as 24L.

c. The controllers pay attention to the movements of aircraft when the control of lighting the PALS and PAPI has been transferred to the lighting staff and the prior notification is omitted. The extinction of approach-related lighting systems on a closed runway, however, is an effective measure to prevent wrong approaches. Therefore, the lighting systems should have been controlled in accordance with the Agreement without omitting the prior notification.

d. The Agreement was reached in 2005, when the Airport was operating with a single runway, as safety measures for controllers following an occurrence at Tokyo

International Airport. In those days, since only a single runway had been used, there were no landing aircraft when the sole runway was closed, and this eliminated the necessity for a prior notification. Therefore, it is probable that the Agreement had not always been observed by controllers, who sometimes allowed the lighting staff to omit a prior notification. After the completion of the second runway at the Airport, it has become possible that an aircraft might mistakenly approach the closed runway when the other runway is open. Under these situational changes, it was necessary to keep controllers informed of the purpose of the Agreement thoroughly.

(7) Controller's response

When the Aircraft entered the final approach course to 24R, which its flight crew assumed to be 24L, the controller involved at the Tower realized early that the Aircraft was approaching the closed runway and asked the crew to reconfirm their approach. It is highly probable that this action contributed to preventing the Aircraft from landing on the closed runway mistakenly.

3. Probable causes

It is highly probable that this serious incident occurred because the Captain and the First Officer, who had assumed 24R to be 24L, approached 24R by mistake after the Aircraft received a landing clearance to 24L during its visual approach to the Airport.

It is probable that the Captain and the First Officer assumed 24R to be 24L because their visual recognition of the runway was insufficient and the PALS and PAPI on 24R had been turned on. It is also probable that the traffic pattern selected by the Aircraft, which was close to the standard traffic pattern for 24R, had contributed to the occurrence.

2. Summary of recommendations and opinions

There was one opinion in 2011, which is summarized below:

(1) Opinions (one case)

- In view of the results of the investigation of All Nippon Helicopter Co., Ltd. Eurocopter EC135T2, registered JA31NH, the JTSTB expressed its opinions to the Minister of Land, Infrastructure, Transport and Tourism on April 22, 2011 as follows:

1. Implementation of reliable maintenance work in accordance with manual

In this accident, the maintenance work had not necessarily been performed in accordance with the English written maintenance manual as follows.

The troubleshooting for the tail rotor control system was not performed in accordance with the trouble shooting procedure provided in the English written maintenance manual of the aircraft manufacturer. As a result, the inspection of the ball pivot was not performed and its stiffening was not found. In addition, the fact that the joint of the tail rotor control rod and the yaw actuator has a left-handed thread is provided in the English written maintenance manual of the aircraft manufacturer, but it is somewhat likely that the mechanic involved in this case, while intending to tighten the joint, actually turned the joint to the opposite direction to loosen it.

An aircraft accident other than this accident has been occurred which had been also concerned with noncompliance with the English written maintenance manual of the aircraft manufacturer. Therefore, JCAB should give guidance once again to those in charge of maintenance of rotorcraft and small aircraft so that they will fully understand the contents of manuals and other materials provided by the aircraft manufacturers.

2. Appropriate selection of flight training syllabuses for emergency operations in flight training

In this accident, it is highly probable that the captain did not perform an emergency procedure for the tail rotor failure conditions, as provided in the flight manual. It is probable that his failure to perform such an operation reflected the absence of a syllabus for tail rotor failure in the periodic training for the captain.

Therefore, JCAB should give guidance to those who operate rotorcraft and small aircraft so that they will select flight training syllabuses for emergency operations in an appropriate manner.

3. Fastening of shoulder harness

It is highly probable that the captain died in this accident because he was not fastening his shoulder harness and as a result, his body bent forward due to the impact at the time of the crash and his chest hit against the cyclic stick.

The fastening of the shoulder harness is effective for preventing injuries on impacts at crashes. Therefore, JCAB should urge those who operate rotorcraft and small aircraft to have pilots and other personnel on board fasten their shoulder harness appropriately during not only takeoff and landing but also other flight phases.

3. Statistics of investigations of aircraft accidents and serious incidents

The JTSB carried out investigations of aircraft accidents and serious incidents in 2011 as follows:

Regarding accident, 19 cases were carried over from 2010, and there were 14 cases newly launched in 2011. Of the total number, investigation reports for 12 cases were published, an interim report for one case was published, and 21 investigations were carried over to 2012.

Regarding serious incident, 15 cases were carried over from 2010, and there were six cases newly launched in 2011. Of the total number, investigation reports for eight cases were published and 13 investigations were carried over to 2012.

Among the publicized reports of 20 cases, one included opinions and two included remarks.

Investigations of aircraft accidents and serious incidents in 2011

(Cases)

Category	Carried over from 2010	Launched in 2011	Total	Publication of Investigation Report	Recommendations	Safety Recommendations	Opinions	Remarks	Carried over to 2012	Interim report
Aircraft accident	19	14	33	12	0	0	1	1	21	1
Aircraft serious incident	15	6	21	8	0	0	0	1	13	0

4. Statistics of investigations launched in 2011

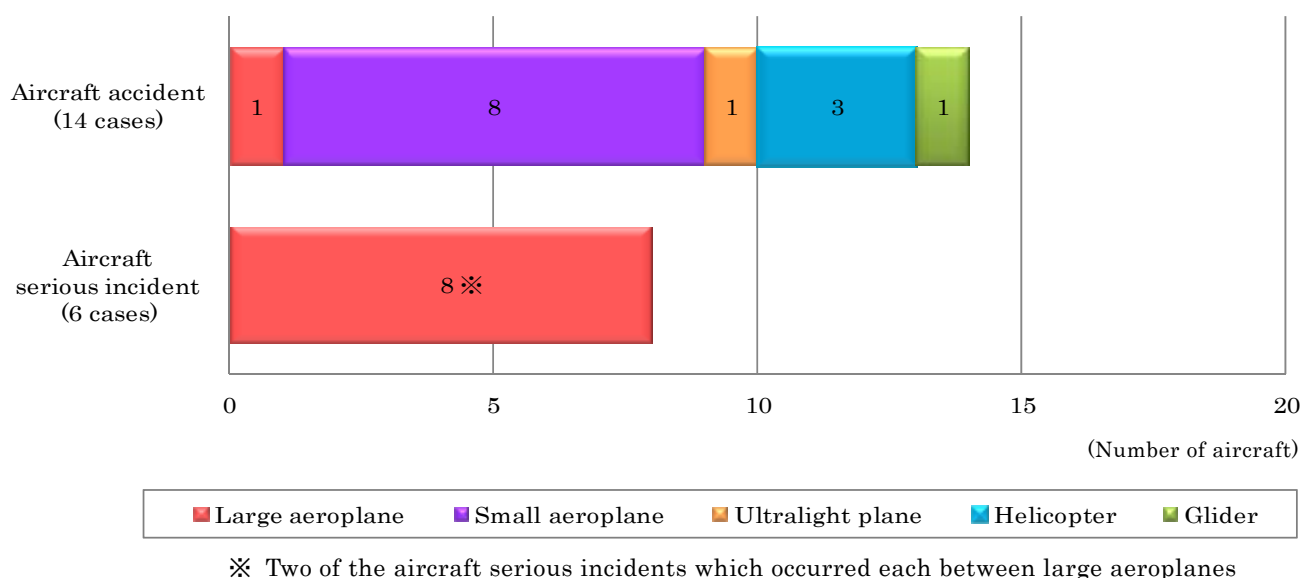
The investigations launched in 2011 included 14 accidents, up two cases from 12 cases for the previous year, and six serious incidents, down six cases from 12 cases for the previous year.

By aircraft category, one of the accidents involved one large aeroplane*1, eight other cases concerned small aeroplanes*2, while one ultralight plane, three helicopters and one glider were involved in the remaining cases. The serious incidents included six cases involving large aeroplanes (two of the six cases occurred each between two large aeroplanes).

*1 Large aeroplanes are aircrafts with a maximum take-off weight of more than 5,700kg.

*2 Small aeroplanes are aircrafts with a maximum take-off weight of 5,700kg or less, excluding ultralight planes.

Number of aircraft accidents and serious incidents by aircraft category



In the 14 aircraft accidents, the number of casualties is 19, consisting of six deaths, one missing persons, and 12 injured persons. In January, 2011, a small aeroplane crashed in a mountainous area and two persons aboard the aircraft were killed. Another small aeroplane also crashed in a mountainous area during training in July, killing three persons on board.

Number of casualties (aircraft accidents)

(Persons)

2011							
Aircraft category	Dead		Missing		Injured		Total
	Crew	Passengers and Others	Crew	Passengers and Others	Crew	Passengers and Others	
Large aeroplane	0	0	0	0	3	2	5
Small aeroplane	5	0	1	0	0	1	7
Ultralight plane	0	0	0	0	1	0	1
Helicopter	1	0	0	0	1	2	4
Glider	0	0	0	0	1	1	2
Total	6	0	1	0	6	6	19
	6		1		12		

5. Publication of investigation reports

The number of investigation reports of aircraft accidents and serious incidents publicized in 2011 is 20: 12 accidents and eight serious incidents.

Looking those accidents and serious incidents by aircraft category, three of the accidents involved large aeroplanes. Small aeroplanes were involved in two accidents, ultralight planes in two accidents, helicopters in three accidents and gliders in two accidents. The serious incidents included four cases*³ involving large aeroplanes, three cases*^{3*4} involving small aeroplanes, two cases involving ultralight planes, and one case*⁴ involving a helicopter.

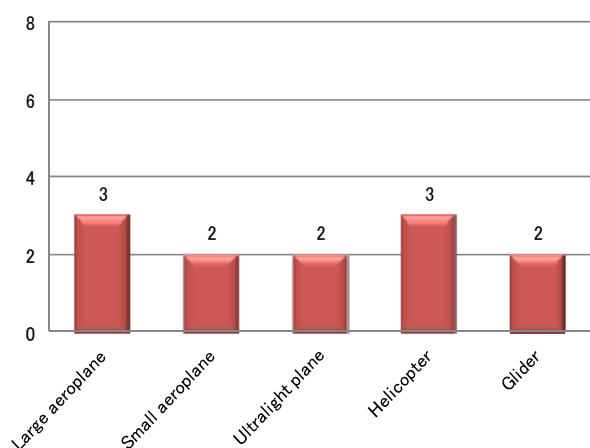
(*3 These cases include one incident involving a large aeroplane and a small aeroplane. *4 These cases include one incident involving a small aeroplane and a helicopter. For the details, see pages 44 to 45, this Chapter)

In the 12 accidents, the number of casualties is 49, consisting of seven deaths and 42 injured persons.

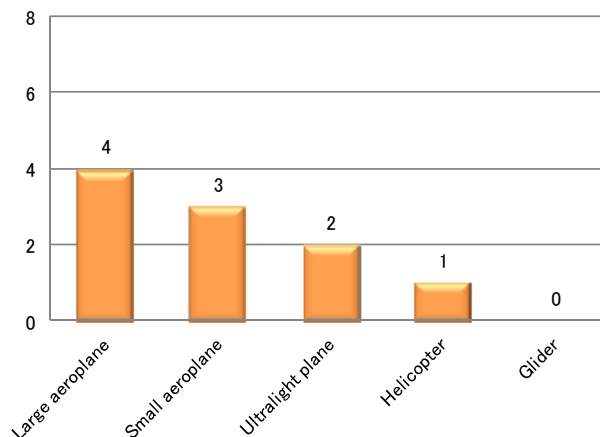
The investigation reports of aircraft accidents and serious incidents publicized in 2011 are summarized as follows:

**Aircraft accidents (12 cases):
reports publicized in 2011**

(Number of aircraft)



**Aircraft serious incidents (eight cases):
reports publicized in 2011**



List of publicized investigation reports on aircraft accidents (2011)

No.	Date of publication	Date and location	Operator	Aircraft registration number and type of aircraft	Summary
1	Jan.28, 2011	June 13, 2010 In the air at about 1,300 ft, about 200 m east of the southern end of Akeno Helipad in Chikusei City, Ibaraki Prefecture	Private	JX0108 Amano A-1 (ultralight plane)	The aircraft fell apart in the air while it was flying after taking off from Akeno Helipad in Chikusei Town, Ibaraki Prefecture, with one pilot on board, and it crashed on a paddy field about 200 m east of the southern end of Akeno Helipad. The pilot: dead. The aircraft: destroyed.
2	Feb.25, 2011	Oct.30, 2009 On the runway of Kagoshima Airport	Civil Aviation College	JA4165 Beechcraft A36 (small aeroplane)	The aircraft took off from Kumamoto Airport for solo flight training and when it arrived at Kagoshima Airport, the aircraft landed on its belly and stopped on the runway. The aircraft: substantial damaged.
3	Mar.25, 2011	June 24, 2010 A gliding field in Nishitakao, Hokuei Town, Tohaku District, Tottori Prefecture	Private	JA80DG DG-800B (motor glider, one-seater)	When the aircraft landed at a gliding field in Nishitakao of Hokuei Town, Tohaku District, Tottori Prefecture, after finishing familiarization flight, its aft fuselage was hit against the edge of the approach end of the gliding field and the aircraft sustained damage. The aircraft: substantially damaged.
4	Mar.25, 2011	Oct.28, 2009 On runway 06L of Kansai International Airport	Asiana Airlines Inc. (the Republic of Korea)	HL7763 Airbus A321-200 (large aeroplane)	When the aircraft landed on runway 06L of Kansai International Airport after taking off from Gimpo International Airport (the Republic of Korea), its aft fuselage struck the runway and sustained damage. The aircraft: substantial damaged.
5	Apr.22, 2011	Dec.09, 2007 Minami-numagami, Aoi-ku, Shizuoka City, Shizuoka Prefecture	All Nippon Helicopter Co., Ltd.	JA31NH Eurocopter EC135T2 (rotorcraft)	The aircraft crashed in Minami-numagami, Aoi-ku, Shizuoka City, Shizuoka Prefecture, while it was flying from Tokyo Heliport, Tokyo, to Shizuoka Heliport for a ferry flight. The captain: dead a mechanic on board: seriously injured. The aircraft: destroyed.

No.	Date of publication	Date and location	Operator	Aircraft registration number and type of aircraft	Summary
6	Jan.22, 2011	Aug.10, 2009 Runway 22, Tokyo International Airport	All Nippon Airways Co., Ltd.	JA56AN Boeing 737-800 (large aeroplane)	When the aircraft landed on runway 22 of Tokyo International Airport, it made a tail strike with the runway and the aircraft sustained damage. A damaged area including fractures (about 5 m by one m) was found in the lower side of the aft fuselage. Scratch marks (in two lines about 25 m and about 7.5 m in length) were confirmed on runway B of Tokyo International Airport. The aircraft: substantially damaged.
7	Jul.29, 2011	Sep.11, 2010 A field about 113 m south-southeast of a helipad in Funatama, Chikusei City, Ibaraki Prefecture	Private	JR7423 AEROS2-R912 (ultralight plane)	The aircraft took off from a helipad with only the pilot on board, and while it was climbing, the aircraft crashed on a field about 113 m south-southeast of the southern end of the helipad. The pilot: seriously injured. The aircraft: destroyed.
8	Sep.30, 2011	Aug.01, 2010 A paddy field about 160 m north of Kamou Helipad in Miuta, Kamoto-machi, Yamaga City, Kumamoto Prefecture	Private	JA22NE Robinson R22 Beta (rotorcraft)	While approaching for landing after finishing familiarization flight, the aircraft crashed in a paddy field about 160 m north of Kamou Helipad in Miuta, Kamoto-machi, Yamaga City, Kumamoto Prefecture. The captain and a passenger: dead. The aircraft: destroyed.
9	Jan.28, 2011	Sep.11, 2009 Near a mountain trail at the so-called Roba-no-mimi (the donkey's ear) located near Gens d'Armes of Mt. Okuhotaka-dake of the Northern Alps Mountains in Takayama City, Gifu Prefecture	Gifu Air Rescue Team	JA96GF BELL 412EP (rotorcraft)	The aircraft took off from Gifu Air Base for a rescue activity and crashed during the rescue activity, near a mountain trail at the so-called Roba-no-mimi located near Gens d'Armes of Mt. Okuhotaka-dake of the Northern Alps Mountains in Takayama City, Gifu Prefecture. The captain, a mechanic and a firefighter: dead. The aircraft: destroyed.
10	Oct.28, 2011	June 12, 2010 Takasu Gliding Filed, Takasu-cho, Matsuzaka City, Mie Prefecture	Private	JA2553 Valentin Taifun 17EII (motor glider, multiple seats)	The aircraft took off from Kakasu Gliding Field. After completing an approximately 30 minutes test flight above the city of Matsuzaka it made a hard landing on the grass of Runway 14 of Takasu Gliding Field, and sustained damage on the airframe. The captain and a passenger: seriously injured. The aircraft: substantial damaged.

No.	Date of publication	Date and location	Operator	Aircraft registration number and type of aircraft	Summary
11	Dec.16, 2011	Feb.20, 2009 In the air about 30,300 ft, about 174 km south-southwest of Narita International Airport,	Northwest Airlines Incorporated (the United States of America)	N676NW Boeing 747-400 (large aeroplane)	When the aircraft was flying to Narita International Airport after taking off from Manila International Airport (the Philippines), it encountered turbulence at about 30,300 ft about 174 km south-southwest of Narita International Airport (about 30 km north of Miyakejima Airport). Four passengers: seriously injured 27 other passengers: minor injuries Seven cabin crewmembers: minor injuries. The aircraft interior: partially damaged.
12	Dec.16, 2011	Dec.02, 2010 On runway 12 of Sendai Airport	Private	JA3891 Beechcraft A36TC (small aeroplane)	When the aircraft touched down on runway 12 of Sendai Airport, it landed on its belly and stopped on the runway. The aircraft: substantial damaged.

List of publicized investigation reports on aircraft serious incidents (2011)

No.	Date of publication	Date and location	Operator	Aircraft registration number and type of aircraft	Summary
1	Jan.28, 2011	Aug.04, 2009 A grass area near the departure edge of runway 33 of Miho Helipad, Shizuoka Prefecture	Private	JA3930 Cessna 172M Ram (small aeroplane)	Runway excursion (limited to when an aircraft is disabled to perform taxiing) The aircraft took off from Miho Helipad for an airworthiness examination, and the aircraft overran when it tried to land after performing the examination flight. The aircraft: minor damage.
2	Feb.25, 2011	Mar.25, 2009 On the final approach route to runway 32 of Nagasaki Airport	Air Flight Japan Co., Ltd. (Aircraft A)	JA4193 PA-28R-201 (small aeroplane)	An attempt to land on a runway being used by another aircraft The Aircraft A was approaching runway 32 (runway B) of Nagasaki Airport upon receiving permission to use the runway for touch and go landing training. Meanwhile, the Aircraft B received a take-off clearance for departure for Fukue Airport as Oriental Air Bridge's scheduled flight and entered runway 32 via taxiway T2. The Aircraft A noticed the Aircraft B which entered runway 32 and performed a go-around.
			Oriental Air Bridge Co., Ltd. (Aircraft B)	JA802B Bombardier DHC-8-201 (large aeroplane)	
3	Mar.25, 2011	June 23, 2009 At of about 33,000 ft, over the vicinity of Hikari City, Yamaguchi Prefecture	Korean Air (the Republic of Korea)	HL7240 Airbus Industrie A300B4-600R (large aeroplane)	An abnormal decompression inside the aircraft The aircraft took off from Jeju International Airport for Chubu Centrair International Airport. While the aircraft was flying at about 33,000 ft over the vicinity of Hikari City, Yamaguchi Prefecture, an instrument indicated a cabin decompression and the pilot in command deployed oxygen masks in the cabin. The PIC requested priority in air traffic control and made an emergency descent. And then, the aircraft flew on and landed at Chubu Centrair International Airport.

No.	Date of publication	Date and location	Operator	Aircraft registration number and type of aircraft	Summary
4	Mar.25, 2011	May 03, 2010 On the sea off Shirahama, Tahara City, Aichi Prefecture	Private	JR1423 Home Build Mikawa HA-500II-R532 L (ultralight plane, control surface type, multiple seats, seaplane)	<p>An occurrence which falls under the category "An overrun, undershoot and deviation from a runway (limited to when an aircraft is disabled to perform taxiing)</p> <p>The seaplane took off from the sea surface off Shirahama, Tahara City, but just after that, it fell on the sea surface and capsized. This serious incident occurred on the sea surface in Mikawa Bay about 300 m off Shirahama, Tahara City, Aichi Prefecture.</p>
5	Mar.25, 2011	Feb.17, 2009 In the air, about 8 nm north-northeast of Kanoya Airfield in Kanoya City, Kagoshima Prefecture	No. 211 Air Training Squadron, Japan Maritime Self-Defense Force (Aircraft A)	JN8776 Kawasaki Hughes OH-6D (rotorcraft)	<p>Captain's report of air prox. pursuant to Article 76-2 of the Civil Aeronautics Act of Japan and Article 166-5 of the Ordinance for Enforcement of the Civil Aeronautics Act of Japan</p> <p>The Aircraft A was performing a flight for student training in the Kasanohara training area northeast of Kanoya Airfield. Meanwhile, the Aircraft B was flying near the Kasanohara training area for airborne picture-shooting under Kanoya City's request. The two aircraft encountered each other about 8 nm north-northeast of Kanoya Airfield at about 2,500 ft. The Aircraft A visibly recognized the Aircraft B on the left-hand side above and performed an operation to avoid a collision downward to the right. But the Aircraft B made no operation for avoidance, because it had not visibly recognized the Aircraft A.</p>
			New Japan Aviation Co., Ltd. (Aircraft B)	JA4061 Cessna 172P (small aeroplane)	
6	May 27, 2011	Dec.11, 2010 In the air, over Osato Town, Kurokawa County, Miyagi Prefecture	Private	JR1352 Quicksilver MXIIHP-R503 (ultralight plane, control surface type, multiple seats)	<p>A continuous loss of power of engines in flight</p> <p>The aircraft took off from a helipad in Morisato of Rifu-cho, Miyagi County, Miyagi Prefecture, with one pilot on board. After flying on a traffic pattern, the aircraft directed itself to the north, but while it was flying over Midorinosato of Higashinarita, Osato Town, Kurokawa County, its engine stopped at about 590 m and the aircraft made an emergency landing on the slope of a hill nearby.</p>

No.	Date of publication	Date and location	Operator	Aircraft registration number and type of aircraft	Summary
7	Aug.26, 2011	June 11, 2010 About 140 ft over runway A of Narita International Airport	Nippon Cargo Airlines Co., Ltd	JA01KZ Boeing 747-400F (large aeroplane)	<p>In-Flight Shut Down (limited to major damage which occurred inside the engine)</p> <p>Just after the aircraft took off from Narita International Airport for Anchorage International Airport, the United States of America, an abnormal noise was heard from one of its engines and an instrument indicated a No. 1 engine failure. Therefore, the flight crew shut down the No. 1 engine after climbing to 7,000 ft. After jettisoning its fuel, the aircraft turned back and landed on Narita International Airport.</p>
8	Sep.30, 2011	Aug.30, 2010 About 3.8 nm northeast of runway 24R threshold of Kansai International Airport, an altitude of about 1,000 ft	Qatar Airways (Qatar)	A7BAE Boeing 777-300 (large aeroplane)	<p>An attempt of landing on a closed runway</p> <p>After taking off from Narita International Airport and while approaching Kansai International Airport for landing, the aircraft attempted to land on runway 24R which had been closed at that time. Later, the aircraft performed a go-around and landed on runway 24L.</p>