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AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

JAPAN COAST GUARD
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January 20, 2022

Japan Transport Safety Board

The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board (and with Annex 13 to the Convention on International Civil Aviation) is to prevent future accidents and incidents. It is not the purpose of the investigation to apportion blame or liability.

TAKEDA Nobuo
Chairperson
Japan Transport Safety Board

Note:

This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.

《Reference》

The terms used to describe the results of the analysis in "3. ANALYSIS" of this report are as follows.

i) In case of being able to determine, the term "certain" or "certainly" is used.
ii) In case of being unable to determine but being almost certain, the term "highly probable" or "most likely" is used.
iii) In case of higher possibility, the term "probable" or "more likely" is used.
iv) In a case that there is a possibility, the term "likely" or "possible" is used.

AIRCRAFT SERIOUS INCIDENT INVESTIGATION REPORT

LOWER PART OF AFT FUSELAGE CONTACT ON RUNWAY
DURING GO-AROUND
JAPAN COAST GUARD
TEXTRON AVIATION 172S, JA393A
KITAKYUSHU AIRPORT, FUKUOKA PREFECTURE
AT 11:30 JST, FEBRUARY 3, 2021

January 7, 2022
Adopted by the Japan Transport Safety Board
Chairperson TAKEDA Nobuo
Member MIYASHITA Toru
Member KAKISHIMA Yoshiko
Member MARUI Yuichi
Member NAKANISHI Miwa
Member TSUDA Hiroka

1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Serious Incident	On Wednesday, February 3, 2021, a Textron Aviation 172S, registered JA393A and belonging to Japan Coast Guard （Kitakyushu Aviation Training Center of the Japan Coast Guard School Miyagi Branch）, executed go-around due to an instable attitude in landing during solo flight training, and the lower part of the aft fuselage contacted on the runway surface at Kitakyushu Airport. A trainee who was alone on board the incident aircraft was not injured.
1.2 Outline of the Serious Incident Investigation	The occurrence covered by this report falls under the category of "Case where any part other than landing gear of an aircraft contacted on the ground in landing" as stipulated in Clause 3, Article 166-4 of the Ordinance for Reinforcement of the Civil Aeronautics Act of Japan and is classified as a serious incident. On February 3, 2021, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and an investigator to investigate the serious incident. The serious incident was notified to the United States of America as the State of Design and Manufacture of the aircraft involved in the serious incident. The State did not appoint its accredited representative and adviser. Comments were invited from parties relevant to the cause of this serious incident and the Relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight	According to the statements of a flight trainee (hereinafter referred to as "the Trainee"), a flight instructor who was supervising the solo flight (hereinafter referred to as "the Instructor") and an aircraft traffic controller of Airport Traffic Control Tower at Kitakyushu Airport office (hereinafter referred to as "the Kitakyushu Tower"), the history of the flight is summarized as follows: The Instructor conducted preflight briefing for approximately 30 minutes from 08:30 JST (JST: UTC+9 hours, unless otherwise noted, all times are indicated in JST in this report on a 24-hour clock) on February 3, 2021 for cross country navigation training (hereinafter referred to as "the Cross Country Solo Flight") to confirm weather conditions, physical conditions and check points necessary for the flight of the day, and judged that the solo flight was practicable as all of the safety criteria pertaining to solo flights defined in the education regulations of Kitakyushu Aviation Training Center (hereinafter referred to as "the Center") of the Japan Coast Guard School Miyagi Branch were met. Besides, the aircraft basic course educated in the Center consists of a private pilot stage and a subsequent commercial pilot stage. Solo flights in the private pilot stage are conducted in the order of traffic pattern flight and takeoff and landing (three times), air maneuvering (three times), and cross country navigation (twice) making a total of eight times. The serious incident was a first cross country navigation, or a seventh flight as a solo flight. The Cross Country Solo Flight plan of the aircraft had expected departure time of 09:40 and expected arrival time of 11:40. The aircraft took off from runway 36 at Kitakyushu Airport at 09:51 with the Trainee sitting in the left pilot seat. After having conducted the Cross Country Solo Flight in Setonaikai sea after takeoff, the aircraft headed for Kitakyushu Airport. Based on the solo flight supervising procedures of the Center, the Instructor was on board the instructor aircraft, took off prior to the aircraft and was flying approximately 8 nm behind the aircraft so as to land following the aircraft after supervising the aircraft in the air. The aircraft requested landing instruction to the Kitakyushu Tower at 11:24 and was notified by the Kitakyushu Tower of runway 36 in use, wind direction 270°, and crosswind at wind velocity of 12 kt. While the Trainee understood that the limitation for crosswind component of the runway in solo flight was 10 kt, he continued approaching judging that safe landing was practicable from the experience of landing in similar level of crosswind with an instructor on board. Besides, the limitation for crosswind component of the runway with an instructor on board training was 15 kt against 10 kt for solo flight. The Instructor heard the wind information the Kitakyushu Tower notified to the aircraft and judged that landing at Kitakyushu Airport, where the Trainee had experienced the same level of crosswind landing during an

instructor-onboard training was more appropriate than diverting to another airport, which was not a destination aerodrome and the Trainee had never experienced to land at.

The aircraft received landing clearance, wind direction 280degrees, and wind velocity 9 kt from the Tower at 11:27.

In view of a slightly strong crosswind and the solo flight by the Trainee, the Tower notified the wind information twice as described below after landing clearance:

at 11:28:41 "Wind check 270 at 12"

at 11:29:24 "Wind check 280 at 13"

While the Trainee recognized crosswind from the wind information notified by the Tower, he or she judged that safe landing was practicable and continued approaching since the aircraft kept a stable attitude. The Trainee also understood that westerly winds caused the air stream to be disturbed by influence of buildings such as a terminal building, etc. located in the west side of the runway when approaching runway 36, and therefore approached attentively.

Although attitude of the aircraft began to be slightly instable by rough air around the time it entered over an airport island*1, the aircraft passed runway threshold with flap extended to full down and at approach speed (65 kt) and approach angle in accordance with the landing procedures (hereinafter referred to as "the Landing Procedures") as stipulated in the aircraft training procedures of the Center.

It is often the case that rough air calms down after passing runway threshold. However, it did not calm down and the Aircraft continued its approach under slightly instable condition.

Although the aircraft took the landing attitude with power set at idle position at 30 ft above ground level (AGL), attitude of the aircraft remained instable. The Trainee, who was focusing on maneuvering thinking that safe landing was still practicable, confusedly performed nose-up maneuvering by pulling control column since the aircraft was shaken by the winds at approximately 10 ft AGL and sunk. The Trainee performed further nose-up maneuvering because the aircraft did not stop sinking. The Trainee, however, thought that excessively pulling the control column was dangerous and set the throttle to maximum after deciding to execute go-around. The aircraft turned to climb immediately after the Trainee had felt an abnormal noise like "gong" and impact, which sounded like main landing gears and tail section simultaneously grounded.

The Trainee continued go-around and landed after receiving another landing clearance from the Kitakyushu Tower. Wind direction and wind velocity notified at this time were 290 degrees and 13 kt, and landing was stable without rough air.

*1 "airport island" means an artificial island where an airport is built.

	The Instructor aircraft was scheduled to land following the aircraft, which was suspended due to go-around the aircraft executed and landed after the aircraft had finished landing. The aircraft taxied to apron after landing and shut down the engine. The Trainee reported to an instructor, who was on standby for post-flight inspection, that the lower part of the aft fuselage possibly contacted on the runway surface. In post-flight inspection by the instructor, it was confirmed that the lower part of the aft fuselage had abrasion marks and a tie-down ring*2 was ruptured at the root. Besides, the tie-down ring was found on the touchdown area of the runway, and abrasion marks, which were seemingly caused by the contact with the aircraft, were confirmed on the nearby runway surface. The serious incident occurred on the runway at Kitakyushu Airport (33'50"23 N, 131'02"11 E) at 11:30.
2.2 Injuries to Persons	None
2.3 Damage to the Aircraft	(1) Extent of damage: slightly damaged (2) Damage conditions of the aircraft (see Figure 1) Lower part of the aft fuselage: abrasive marks of approximately 13 cm long and approximately 4 cm wide Tie down ring: Ruptured

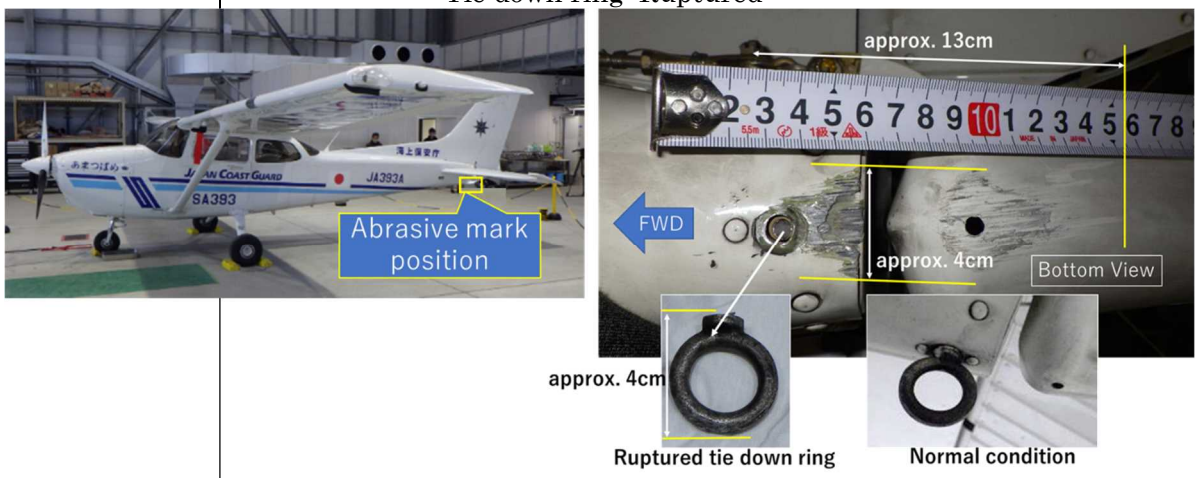

Figure 1 Damage conditions of the aircraft

(3) Runway conditions

Two abrasive marks (approximately : 30 cm and 10 cm long) with approximately 40 cm interval were confirmed on the runway approximately 580 m from runway 36 threshold and approximately 2 m to the right from the centerline (see Figure 2).

Besides, the tie down ring of the aircraft was found near the said position.

*2 "tie-down ring" means a ring on the airframe side and is used to tie down the airframe to the spot with a rope or the like when the aircraft parks at the spot at the time of severe winds.

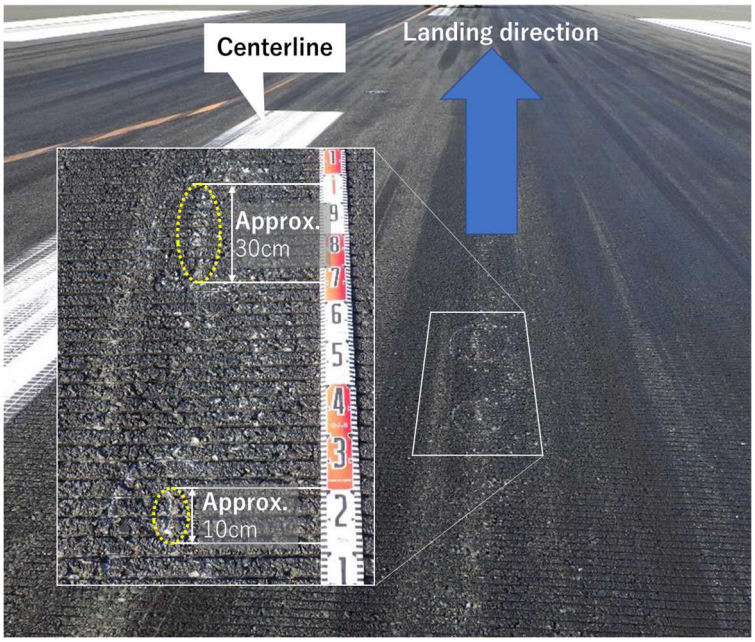

Figure 2　Runway surface conditions

2.4 Personnel Information	(1) JA393A (the aircraft) Trainee: Age 25 Student pilot permit　DAISO 204 issued on March 18, 2020 Total flight time　50 hours 10 minutes Total flight time on the type of aircraft　50 hours 10 minutes Flight time in the last 30 days　8 hours 15 minutes (2) Instructor aircraft Instructor: Age 54 Commercial pilot certificate (airplane)　January 23, 2021 Flight instructor certificate　December 4, 1997 Total flight time　11,290 hours 33 minutes Total flight time on the type of the aircraft　198 hours 12 minutes Flight time in the last 30 days　14 hours 20 minutes
2.5 Aircraft Information	Aircraft type　Textron Aviation 172S Serial number　172S11733 Date of manufacture　November 3, 2016 Certificate of airworthiness　DAI-2020-369 Validity　October 25, 2021 Total flight time　453 hours 31 minutes When the serious incident occurred, weight and position of the center of gravity of the aircraft were within allowable ranges.

2.6 Meteorological Information

(1) Weather forecast for the time relevant to the serious incident at Kitakyushu Airport was as described below, and a maximum value for crosswind component of the runways until 2 hours after expected time of completing the flight was 8 kt.

(i) Terminal aerodrome forecast (TAF)

08:09 24008KT 9999 FEW030 SCT040
BECMG 9:00/11:00 31013KT (reference: crosswind component of the runway 8 kt)
BECMG 18:00/20:00 25006KT

(ii) Aerodrome time-series forecast released at 08 o'clock on February 3 (excerpt)

Time (hour)	till 10	till 11	till 12	till 13	till 14
Wind direction/velocity (degrees/kt)	250/10	310/13	310/13	310/13	310/13
Crosswind component of the runway (kt)	9	8	8	8	8

(2) Observations of Aviation Routine Weather Report (METAR) for Kitakyushu Airport at the time relevant to the serious incident were as shown in the table below:

Time of observation (time: minute)	10:00	11:00	12:00
Wind direction (degrees)	250	290	300
Wind velocity/maximum instantaneous wind velocity (kt)	10	13	14/24
Prevailing visibility (km)	10 or more		

2.7 Additional Information

(1) Record of flight data in the integrated flight deck

The aircraft was installed with the integrated flight deck (GARMIN G1000) that can display and record various flight data. Flight data logging function of the system recorded flight data (hereinafter referred to as "the Data") since April 2017.

Besides, the Data were recorded every second.

(i) Contact position of the approach when the lower part of the aft fuselage contacted on the ground (hereinafter referred to as "the Contact Time") recorded in the Data was approximately 585 m from runway 36 threshold, and touchdown position at the final landing time (hereinafter referred to as "the Final Landing Time") was approximately 430 m from runway 36 threshold (see Figure 3).

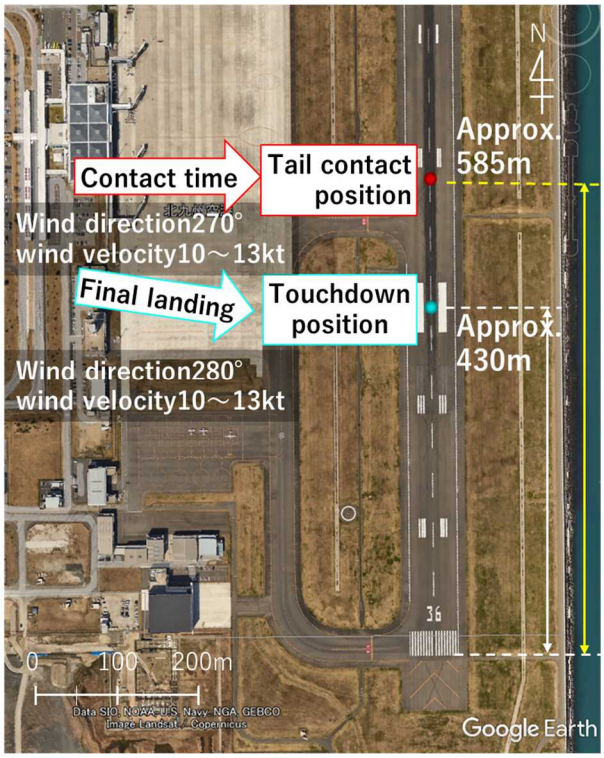

Figure 3　Contact (Touchdown) position

(ii)　Comparative flight paths from the runway threshold to the contact (touchdown) between the Contact Time and the Final Landing Time recorded in the Data were as shown in Figure 4. Flight paths at the path angle of 3° of the aircraft from each AGL of the runway threshold were added as a reference (see Figure 4).

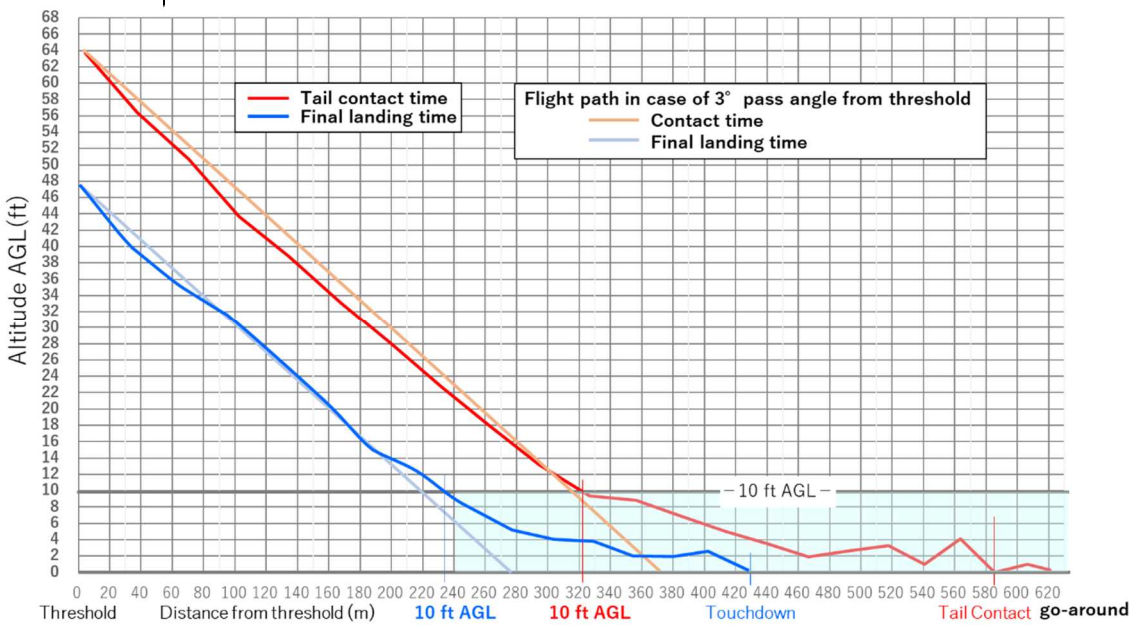

Figure 4　Comparative flight paths from the threshold to the contact (touchdown)

(iii) Comparative pitch attitude, indicated air speed, ground speed, roll attitude and vertical acceleration from the runway threshold to the contact (touchdown) between the Contact Time and the Final Landing Time recorded in the Data were as shown in Figures 5, 6 and 7.

Besides, the records of the fuel flow rate and rotational speed of the engine revealed that the go-around commenced approximately one second before the contact. Stall speed at the time of flap full-down was 40 kt indicated air speed.

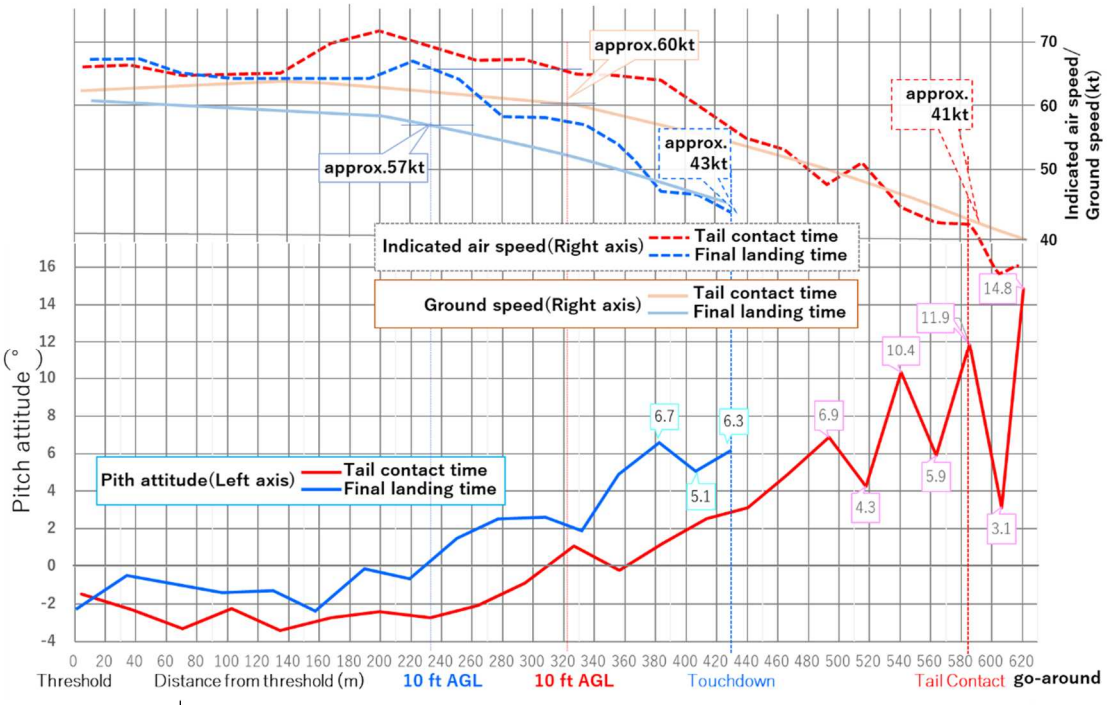

Figure 5 Comparison of pitch attitude (°), indicated air speed and ground speed

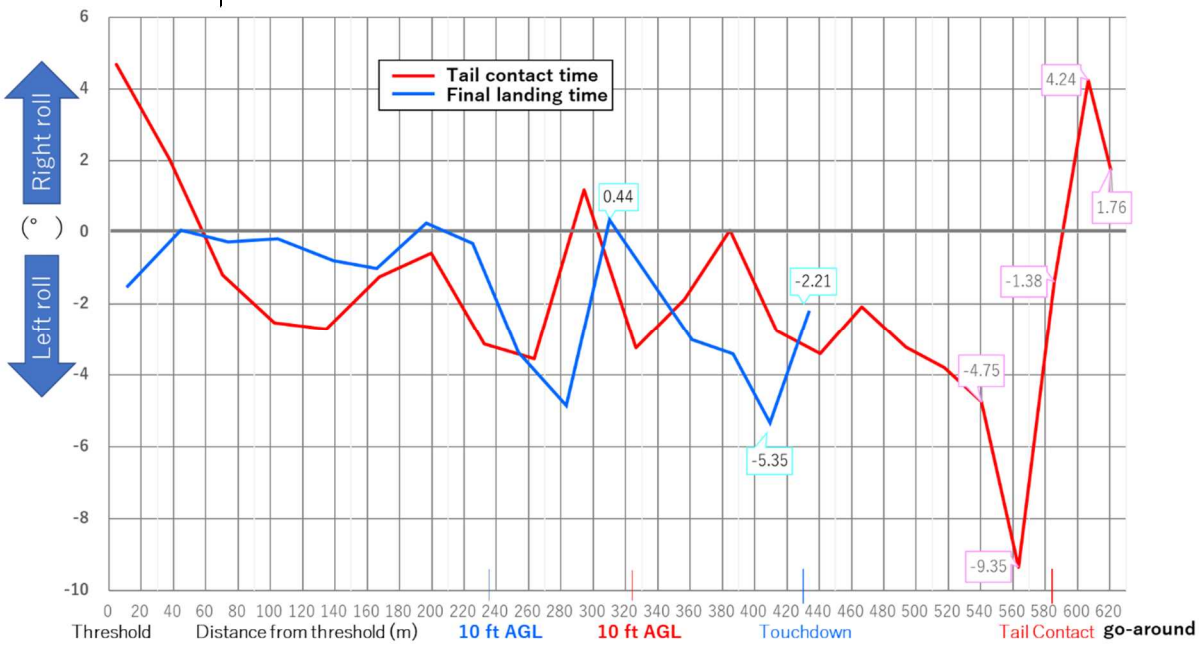

Figure 6 Comparative roll attitudes (°)

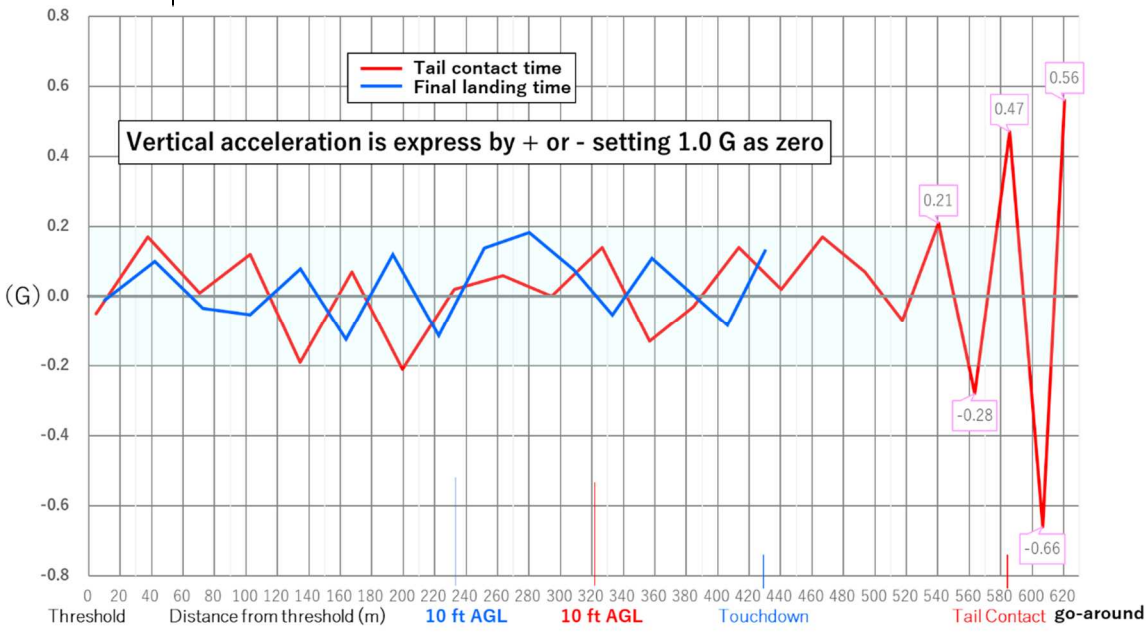

Figure 7　Comparative vertical acceleration (G)

(2) Regional characteristics of Kitakyushu Airport

(i)　The Center educated that when winds blew from the west or northwest, the winds blowing over or through buildings such as a terminal building and a hangar were disturbed because of the location of the buildings in the west of the runway and could cause the airstream on the runway to be disturbed.

(ii)　Conditions where aircraft were considered to shake before landing in the past

Focusing on the change in vertical acceleration before landing shown in Figure 7, the Final Landing Time within plus or minus 0.2G, but the Contact Time exceeded plus or minus 0.2G, with a maximum of 0.47G and a maximum rate of change was 0.75G per second.

Then, the data of previous 192 landings on runway 36 recorded in the Data (exclusive of go-around) were verified with the result that fluctuations of vertical acceleration exceeding plus or minus 0.2 G before landing were found in 34 cases.

Positions and relevant wind directions of these 34 cases with fluctuations of vertical acceleration exceeding plus or minus 0.2 G before landing are drawn in the aerodrome map (see Figure 8).

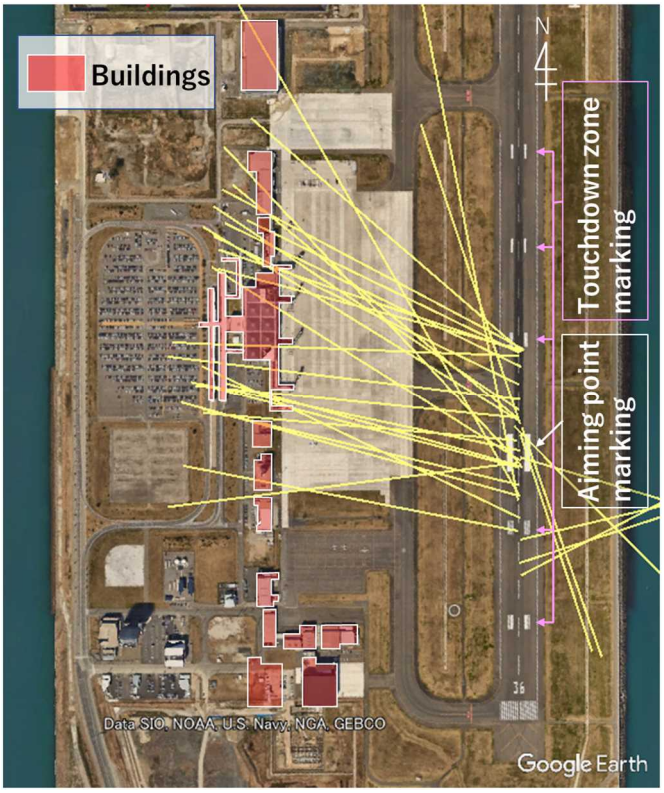

Figure 8　Positions and relevant wind directions of the cases of vertical acceleration exceeding plus or minus 0.2 G before landing

(3) Flight experience and other conditions before the Cross Country Solo Flight

The Trainee met all conditions including flight experience before the Cross Country Solo Flight the Center stipulated in the aircraft training procedures for the aircraft.

(4) Procedures stipulated by the Center

(i) Based on the Safety Standard (airplane) pertaining to solo flight issued by the Civil Aeronautics Bureau of the Ministry of Land, Infrastructure, Transport and Tourism on December 18, 1997, the safety criteria (hereinafter referred to as "the Safety Criteria") pertaining to solo flight in the education procedures were established in the Center. The Safety Criteria contain following descriptions (excerpt).

3　Establishment of the limited weather conditions

Solo flight training shall be conducted under following condition. When conducting cross country navigation, weather conditions shall be forecasted to be maintained until after two hours of expected time of completion.

Crosswind component of the runway: 10 kt or less

(partially omitted)

9　Instructors Guidance Procedures

(partially omitted)

	(3) Instructor in charge provides trainees in flight with instructions as needed. *(i) instructions such as suspension of flight, etc. associated with change in weather conditions* *(partially omitted)* *10 Knowledge, skill and experience required for trainees* *(2) Approval of skill* *(i) safe takeoff and landing can be performed* *(ii) safe go-around can be performed* *(partially omitted)* *(3) Experience verification* *(i) NO-FLAP and FULL-FLAP landings* *(ii) Landing in crosswind* *(omitted)* (ii) Solo flight supervising procedures of the Center contain following descriptions (excerpt). *Navigation training solo instructor supervising procedures and flight operation aid procedures (addressed to instructors)* *(partially omitted)* *2 Points* *(1) Instructor aircraft* *Instructor aircraft does not always fly ahead but flies randomly (partially omitted).* *(4) Interval between solo aircraft and instructor aircraft* *Instructor aircraft departs 10 minutes prior to solo aircraft as a standard and performs approach landing after solo aircraft for supervising.* *Instructor aircraft provides instructions as needed.* *(omitted)*

3. ANALYSIS

3.1 Involvement of Weather	Yes
3.2 Involvement of Pilots	Yes
3.3 Involvement of Aircraft	None
3.4 Analysis of Findings	(1) Crosswind component of the runway in solo flight The JTSB concludes that the judgement of conducting training flight was certainly appropriate since the weather forecast the Instructor and the Trainee confirmed prior to the flight was such that crosswind component of the runway (10 kt or less) stipulated in the Safety Criteria was maintained until two hours after the aircraft had been scheduled to be completed.

However, it is highly probable that crosswind component of the runway during the period of time the aircraft landed was continuously exceeding the Safety Criteria since wind velocity higher than forecasted was observed at Kitakyushu Airport after the aircraft commenced the flight, wind direction and wind velocity notified when the aircraft requested landing instruction to the Kitakyushu Tower at 11:24 were 270° at 12 kt, wind direction and wind velocity notified when the aircraft obtained landing clearance at 11:27 were 280° at 9 kt, and 270° at 12 kt were notified during subsequent approaching at 11:28:41 and 280° at 13 kt at 11:29:24, respectively.

(2) Analysis of flight data recorded in the integrated flight deck

(i) Analysis result of the data in Figures 4 through 7 from comparing the Contact Time with the Final Landing Time was as shown in the table below.

Figure 4 Comparative flight routes from runway threshold to the contact (touchdown)	1. From threshold to 10 ft AGL The aircraft passed threshold at approximately 16 ft higher AGL at the Contact Time than the Final Landing Time and approached along the path angle of approximately 3° at both times. 2. After 10 ft AGL At the Contact Time, the path angle temporarily became shallow after the aircraft had passed at approximately 10 ft AGL. It is highly probable that this is response of the aircraft to the nose-up control inputs since the Trainee stated that he or she confusedly performed nose-up maneuvering by pulling control column because the aircraft was shaken by the winds at approximately 10 ft AGL and sunk. Flying distance from 10 ft AGL to the contact (touchdown) was approximately 260 m at the Contact Time and approximately 200 m at the Final Landing Time, respectively. Besides, the path angle was instable with an altitude fluctuating up and down after approximately 520 m from threshold at the Contact Time.

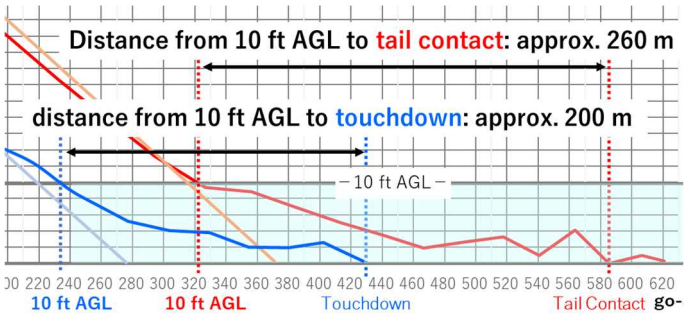

Figure 5
Pitch attitude, indicated air speed, and ground speed

1. Pitch attitude

Pitch attitude at the Contact Time suddenly turned to nose down from the previous nose up at the position of approximately 490 m from threshold, which was then followed by diverging the fluctuation of nose up and nose down repeatedly.

It is highly probable that the aircraft encountered the turbulence just before touchdown, and it is large nose up maneuver performed under the influence of the turbulence caused the pitch angle of the aircraft to diverge and the speed to decrease since the Trainee stated that he or she performed nose-up maneuvering by pulling control column as the aircraft was shaken by the winds and sunk, subsequently maneuvered further nose-up because the aircraft did not stop sinking. Besides, it is possible that the turbulence was induced by the effect of hangar wave (described later) that generated by the westerly winds passing over buildings such as the hangar, etc. located in the west side of the runway.

At the Final Landing Time, landing attitude since raising up was maintained until touchdown.

2. Air speed

While indicated air speed at the time of passing through at 10 ft AGL was approximately 65 kt at both times, ground speed was 60 kt at the Contact Time and 57 kt at the Final Landing Time. In the case of wind velocity of 13 kt notified by the Kitakyushu Tower, wind direction at 10 ft AGL computed by ground speed and wind velocity was 295° at the Contact Time and 310° at the Final Landing Time, which indicated that

	it is possible that wind direction at the Contact Time was more westerly than the Final Landing Time. Besides, indicated air speed at the Contact Time was 41 kt, less than indicated air speed (43 kt) at the Final Landing time, both of which, however, maintained stall speed or higher.
Figure 6 Roll attitude	At the Contact Time, left roll became large forming left roll angle of 9° immediately before contact. Then, rapid roll to the right occurred and contacted. Roll rate at that time was as high as 8° /second, which is probable to have been difficult to be corrected by instantly steering. The right roll is likely to have generated by relative increase of the ratio of crosswind component from the left against air speed as a result of the decreased air speed. At the Final Landing Time, approach was conducted with left wing-low method in response to left crosswind.
Figure 7 Vertical acceleration	At the Contact Time, vertical acceleration tends to diverge in conjunction with the pitch attitude and fluctuated from plus to minus. At the Final Landing Time, vertical acceleration was stable staying within 0.18 G.

(ii) From Figure 8, in the case of shaking by vertical acceleration exceeding plus or minus 0.2 G before landing in the touchdown zone of runway 36, northwesterly winds blowing from the west were dominant.

In the case of the winds from between west to northwest, it is possible that the touchdown zone that was on the leeward of the buildings was influenced by the hangar wave since the airport building and hangar were located in the said direction. Besides, the positions where aircraft shook varied even in the same wind direction. It is probable that this was due to the extent, which was influenced by the hangar wave, widely ranged from north to south since the buildings were also located widely ranging from north to south at the airport.

In addition, the aircraft had different contact locations, touchdown locations, and wind directions at the Contact Time and the Final Landing Time, and it is possible that the aircraft at the Contact Time was influenced by the hangar wave more severely than the Final Landing Time.

(3) Contact conditions of the lower part of the aft fuselage

	The aircraft executed go-around because of the instable attitude at a low altitude. The JTSB concludes that it is probable that the tie-down ring contacted on the runway surface and ruptured before turning to climb and the outer skin of the lower part of the aft fuselage subsequently contacted the runway surface that caused two abrasive marks to generate on the runway surface since the aircraft was performing nose-up steering to halt descent and because of the nose-up effect by maximized output during go-around. (4) Compliance with the Safety Criteria The JTSB concludes that the aircraft is probable not to have met the limitation for the crosswind component of the runway defined in the Safety Criteria in approaching at the time of the serious incident and in approaching for the subsequent final landing. It is probable that this was based on the Trainee's judgements that the safe landing was practicable this time as he or she had an expericence of safety landing in previous training with an instructor on board in similar level of crosswind, and the Instructor's judgment that there would be no problem in landing the aircraft based on the Trainee's previous experiences. However, it is probable that these decision lacked awareness of the importance of complying with the standard and criteria established to ensure safety. The aircraft should have executed go-around when it recognized that the crosswind component of the runway did not meet the Safety Criteria and should have received instructions from the Instructor aircraft. Besides, the Instructor aircraft should have instructed the aircraft to suspend approach and hold in the air when it recognized that the crosswind component of the runway did not meet the Safety Criteria of the aircraft and should have made decision with the Center whether to re-approach to the airport or to divert to another airport taking estimated weather conditions and the skill and experiences, etc. of the Trainee into consideration. In addition, it is probable that it is necessary for the Center to have the trainees experience such as by landing at alternative airports with an instructor before the Cross Country Solo Flight, so that they can make the right decision on landing at an airport other than their destination (divert) when necessary. (5) Grasping the regional characteristics The Center recorded and accumulated training flight data. The JTSB concludes that it is possible that criteria for judging whether to continue or discontinue training can be established based on the regional characteristics of the airport, which are easy to be affected by the hangar wave, by analyzing correlation between the occurrence of aircraft shaking and the wind direction and wind velocity since such data include landing data.

4. PROBABLE CAUSES

The JTSB concludes that the highly probable cause of this serious incident was that the aircraft executed go-around due to the instable attitude at a low altitude when performing landing approach, but the lower part of the aft fuselage contacted on the runway surface before turning to climb.

It is probable that the instable attitude of the aircraft at the low altitude was contributed by the turbulence the aircraft encountered immediately before touchdown and the significant nose up maneuvering performed under such an influence.

5. SAFETY ACTIONS

Kitakyushu Aviation Training Center of the Japan Coast Guard School Miyagi Branch has taken following measures as safety actions:

(1) Revision of the Solo flight supervising procedures

(i) Reviewing the procedures whether to conduct solo flight or not

In the case that forecasted wind direction is between 270° and 280° , crosswind component of the runway is computed by assuming that wind velocity with 20 % increment is a virtual wind velocity. Besides, a monitoring aircraft conducts weather conditions survey (including air current conditions in approach landing) beforehand as needed to decide to conduct training or not.

(ii) Modification of the Supervising procedures

Instructors supervise overall training at the Center, let a monitoring aircraft with other instructor on board to fly prior to a solo flight aircraft, report weather conditions and aircraft conditions to the Center, and provide necessary advice to the solo flight aircraft. When the monitoring aircraft judged that training is to be suspended due to aggravated weather conditions, etc., it reports the situations to the Center and instructs the solo flight aircraft to return to the airport.

(iii) Clarifying response at the time of aggravated weather conditions, etc.

When crosswind component of the runway is expected to exceed the Safety Criteria, a solo flight aircraft in approach landing executes go-around and a monitoring aircraft first performs approach landing to determine landing of the solo flight aircraft.

When crosswind component of the runway does not exceed the Safety Criteria and approach landing is determined to be practicable, the monitoring aircraft provides necessary advice (confirmation of go-around procedures and air stream conditions, etc.) with the solo flight aircraft.

When approach landing is judged to be impracticable, the monitoring aircraft instructs the solo flight aircraft to hold in the air or divert to an alternate aerodrome for landing.

(2) Wind direction and wind velocity in takeoff and landing are recorded in the training instruction sheet to grasp educational situations of crosswind takeoff and landing of trainees.

(3) Education on landing to all trainees

(i) Education on the ground

- Reeducated situations where go-around is to be executed and attention to be paid in executing go-around.
- Reeducated procedures for go-around using a simulator.

(ii) Training on board aircraft

- Additional training (continuous takeoff and landing training) was planned and conducted to evaluate skill for takeoff and landing and go-around.
- Takeoff and landing or go-around training was additionally conducted in navigation training after trainees, who had had a blank period, had resumed training although a syllabus of navigation training does not include a takeoff and landing course.

(4) Others

Reviewing suitable airports as alternatives for the Cross Country Solo Flights, and coordinating familiarization flight training using the same airports with an instructor on board before the Cross Country Solo Flights.