AIRCRAFT ACCIDENT INVESTIGATION REPORT DAMAGE FROM BELLY LANDING HONDA AIRWAYS CO., LTD. HAWKER BEECHCRAFT G58, JA51HA ON THE RUNWAY AT OITA AIRPORT

AT 10:27 JST, AUGUST 14, 2023

JANUARY 24, 2025

Adopted by the Japan Transport Safety BoardChairpersonTAKEDA NobuoMemberSHIMAMURA AtsushiMemberMARUI YuichiMemberSODA HisakoMemberNAKANISHI MiwaMemberTSUDA Hiroka

1. PROCESS AND PROGRESS OF THE AIRCRAFT ACCIDENT INVESTIGATION

1.1 Summary of the	On Monday 14 August 2023, a Hawker Beechcraft G58, JA51HA,					
Accident	operated by Honda Airways Co., Ltd., was conducting continuous touch-and-go					
	training with the captain, an instructor, when it made a belly landing on					
	Runway 01 at Oita Airport, resulting in damage to the airframe.					
	On board the aircraft were an instructor and two trainees, who were not					
	injured.					
	The aircraft was destroyed; however, no fire broke out.					
1.2 Outline of the	On August 14, 2023, the Japan Transport Safety Board (JTSB)					
Accident	designated an investigator-in-charge and another investigator to investigate					
Investigation	the accident.					
	An accredited representative of the United States of America, as a					
	Design and Manufacture of the aircraft involved in this accident, participated					
	in the investigation.					
	Comments on the draft Final Report were invited from the parties					
	relevant to the cause of the accident and the Relevant State.					

2. FACTUAL INFORMATION

2.1 History of the	According to the statements of the captain who was the instructor		
\mathbf{Flight}	(hereinafter referred to as "the Instructor"), Trainee A, Trainee B, and the air		
	traffic controller who was in charge of the aerodrome control position of Oita		
	Airport (hereinafter referred to as "Oita Tower") as well as the records of the		

flight data from the integrated flight control system (GARMIN G1000) (hereinafter referred to as "the flight data") and the ATC communication, the history of the flight is summarized as below:

At about 09:18 (JST: UTC+9hr, unless otherwise stated, all times are indicated in JST on a 24-hour clock), a Hawker Beechcraft G58, JA51HA, operated by Honda Airways Co., Ltd., took off from Oita Airport on a training flight course to change the class rating on the competence certification for the trainees who were commercial pilots, with the Instructor in the right front seat, Trainee A in the left front seat, and Trainee B in the right aft seat.

The training at the time of this accident was the last flight training with the instructor before Trainee A and Trainee B were due to take the competency assessment of designated airman training school and the flight to judge whether both of the trainees would have the skills enable to take the competency assessment (hereinafter referred to as "the Ready for Check"). In the competency assessment, if any advice or assistance were given by another person, the assessment would be interrupted (marked as fail), the Instructor was refraining from giving any advice or assistance so that the cockpit environment in the training could be the same as that in the competency assessment. In addition, Trainee A was nervous about the Ready for Check.

After the take-off, the aircraft conducted in mid-air operation in the training area to the east of the airport, including flight training in a simulated one engine inoperative condition by pulling the throttle of one

engine to the idle position (hereinafter referred to as "Single Engine Training"), and then at about 10:00, began training for a continuous touch-and-go landing (TGL: Touch and Go Landing, hereinafter referred to as "TGL") on Runway 01 at Oita Airport. It was planned to conduct six TGLs and for the 1st TGL, it was planned to perform a go-around with Single Engine Training.

Figure 1 shows the traffic pattern around the airport, and the implementation timing for performing a landing gear down and confirming the landing gear down status described in the company's training manual for G58 (see "2.7 (5) Landing Gear Down Operation and Confirmation of Landing Gear Down Status" later).



Figure 1: Traffic Pattern and Timing for Gear Down and Others

(1) 1st and 2nd TGLs At about 10:01, the aircraft requested the clearance for the 1st TGL from Oita Tower on the right downwind leg (see Figure 2). Oita Tower issued a TGL clearance to the aircraft instructed and the aircraft to report again at the time of entering the right downwind leg after TGL (CLEARED TOUCH AND GO. WIND 350 AT 10.



Figure 2: Flight Track of the Aircraft (1st and 2nd TGLs)

AFTER TOUCH AND GO, REPORT RIGHT DOWNWIND).

The aircraft executed a go-around on the final leg as instructed by the Instructor and reported to Oita Tower that it had completed a go-around on the upwind leg at about 10:05. Oita Tower revised the instruction to the aircraft to enter the left downwind leg and report instead of the previous instruction to enter the right downwind leg and report, as there were a departing aircraft and an arriving aircraft (REVISED REPORT LEFT DOWNWIND DUE TO DEPARTURE AND ARRIVAL).

At about 10:07, the aircraft reported to Oita Tower that it had entered the left downwind leg (2nd TGL), in doing so, the aircraft requested clearance from Oita Tower to conduct the TGL and to enter the downwind leg with a slight extension of the upwind leg after the TGL. Oita Tower instructed the aircraft to hold while turning right 360 ° on the left downwind leg until the next instruction, as there were a departing aircraft and an arriving aircraft. The aircraft read back the instruction and began to hold on the left downwind leg.

At about 10:11, Oita Tower instructed the aircraft to continue holding while turning right 360° until the next instruction as there was another departing aircraft.

At about 10:14, Oita Tower instructed the aircraft to continue approaching Runway 01, and the aircraft began to approach it.

At about 10:16, Oita Tower issued a TGL clearance to the aircraft, and instructed the aircraft to fly extending upwind leg after the TGL and report on the left downwind leg (CLEARED TOUCH AND GO, WIND 050 AT 10, AFTER TOUCH AND GO, SLIGHTLY EXTEN... CORRECTION, EXTEND UPWIND, THEN REPORT LEFT DOWNWIND). The reason Oita Tower instructed the aircraft to report on the left downwind leg was that an arriving scheduled flight (hereinafter referred to as "the preceding aircraft") was approaching following the approach procedure for flying the east side traffic pattern.

(2) TGL at the time of the Accident (3rd TGL) $\,$

At 10:19:35, on the upwind leg of the 3rd TGL, the Instructor pulled the right engine throttle to the idle position to begin Single Engine Training during take-off (Position at a in Figure 3). Trainee A started the initial action for Single Engine Training, but mistakenly applied the right rudder pedal that was opposite to the pedal that should have been applied, resulting in a large right yaw and nose-down attitude of the aircraft, forcing Trainee A to be occupied with the corrective operations. In addition, according to the flight data, at this time, the aircraft was flying with the maximum changes in aircraft attitude such as a heading of approximately 19° to the right, a roll angle of approximately 17° to the right, and a pitch angle of approximately 13° down.



with the corrections, was unable to listen to the call from Oita Tower, therefore the Instructor reported to Oita Tower that they were searching for the preceding aircraft for visual confirmation. At about 10:20:29, the Instructor reported to Oita Tower that they had visually confirmed the preceding aircraft.

At about 10:20:31, Oita Tower revised the ATC instruction to the aircraft to follow the preceding aircraft and caution against the wake turbulence (REVISED FOLLOW THE TRAFFIC, CAUTION WAKE TURBULENCE) (Position c in Figure 3). As the aircraft had been instructed to enter the left downwind leg, the Instructor and Trainee A had doubts about the ATC instruction change to follow the preceding aircraft that was entering the right downwind leg, and therefore, the Instructor confirmed with Oita Tower that they must really enter the right downwind leg (AH··FOLLOW THE TRAFFIC, CONFIRM RIGHT DOWNWIND?). Oita Tower revised the instruction to the aircraft to report on the right downwind leg (AFFIRM, REVISED REPORT RIGHT DOWNWIND), and the aircraft acknowledged. In addition, regarding the reason why Oita Tower revised the instruction to the aircraft to enter the right downwind leg instead of the left downwind leg, Oita Tower stated that the Air Traffic Control Services Rules established by the Oita Airport Office includes descriptions that it is better to avoid the west side traffic pattern as much as possible due to the noise and other reasons.

Trainee A was confused and upset due to the reasons as follows: Trainee A made a mistake about the initial action for Single Engine Training; along with this the instructor made a communication to Oita Tower that Trainee A should have made; and the instruction to enter the left downwind leg was revised to follow the preceding aircraft entering the right downwind leg. In addition to these, although the aircraft was instructed to report to Oita Tower if it entered the right downwind leg, Trainee A forgot it. Therefore, the instructor urged Trainee A to do so, and Trainee A reported to Oita Tower that they had entered the right downwind leg at about 10:23 and requested a TGL clearance. Oita Tower instructed the aircraft to continue onto Runway 01. (Position d in Figure 3).

Trainee A chose the outer downwind leg (wider) than the preceding aircraft to avoid the wake turbulence of the preceding aircraft. In addition, Trainee A extended the downwind leg to achieve sufficient separation from the preceding aircraft (Position e in Figure 3). For this reason, Trainee A did not extend the landing gears, believing that since Trainee A had extended the downwind leg, it would be better to wait for the landing gear down operation, although normally the landing gear down operation would be performed approximately 30 seconds after passing abeam of the runway threshold. The instructor confirmed that Trainee A had not performed the landing gear down operation at the due gear down position but thought that Trainee A had delayed the landing gear down operation deliberately, as Trainee A had extended the downwind leg. The aircraft began the base turn when the preceding aircraft, flying on the final leg, passed to the right of the aircraft.

At about 10:24:41, as the aircraft began its base turn, Oita Tower informed the aircraft that it would be unable to TGL due to wake turbulence from the preceding aircraft, but that a low approach (to fly over a runway at low altitude) was available, and asked for its intention (THIS TIME UNABLE TOUCH AND GO DUE TO WAKE TURBULENCE FROM ARRIVAL TRAFFIC, LOW APPROACH IS AVAILABLE, REQUEST INTENTION.) (Position f in Figure 3) This was the first time Trainee A had received this type of instruction, and Trainee A had ever been instructed to "CONTINUE APPROACH" but did not know what to do with his head going blank when Trainee A heard the instruction to "UNABLE TOUCH AND GO DUE TO WAKE TURBULENCE". The instructor advised Trainee A that a low approach would be good, as Trainee A did not seem to understand how to respond to the notification that a low approach would be available at this timing. At 10:24:52, Trainee A reported to Oita Tower that the aircraft would continue its approach (Position g in Figure 3).

Trainee A performed the landing check during the base turn, but in implementing the "Landing Gear" item to confirm the landing gear down status, Trainee A only made a callout "Down And Three Green" implementing the checklist, but did not confirm that all three "GEAR DOWN AND LOCKED" lights (green) (hereinafter referred to as "3GREEN"), which indicate that the landing gear control switch is in the "Down" position and that the nose gear and both main landing gears of the aircraft are extended down, were lit. According to Trainee A, the landing gears were usually extended prior to the base turn, therefore Trainee A believed that the landing gears should be extended when implementing the landing check. During the base turn, the Instructor was in the process of confirming with Trainee A the notification from Oita Tower that TGL would not be available and was paying attention to the separation from the preceding aircraft, and therefore did not recall that Trainee A had implemented the landing check during this period.

At 10:25:23, Oita Tower corrected the previous notification that TGL would not be available and informed that TGL would be available (CORRECTION, AH··TOUCH AND GO IS AVAILABLE, EXPECT TOUCH AND GO) (Position h in Figure 3). Regarding the reason Oita Tower judged "UNABLE TOUCH AND GO", Oita Tower stated that Oita Tower mistook the preceding aircraft for the touch-and-go aircraft (take-off again after landing) and therefore applied the separation pertaining to the wake turbulence control rules. As for the reason why, Oita Tower canceled the previous notification, Oita Tower stated that Oita Tower recalled that the preceding aircraft was the arriving aircraft (would not take off again) and judged that the TGL would be available for the aircraft.

The Instructor and Trainee A did not understand why the unavailable TGL became available, but Trainee A decided to land the aircraft in Single Engine Training. In accordance with the Single Engine Training procedures, as in the actual flight, the final landing configuration (Flap: Down, Propeller Rotation: Maximum) shall be taken after calling out "Landing Assured" if it is judged that a landing would be possible on the final leg. Trainee A made a callout "Landing Assured" at a pressure altitude of about 600 ft, but the Instructor instructed Trainee A to do it when passing a pressure altitude of about 500 ft because it was too early.

At 10:26:03, Oita Tower issued a TGL clearance (CLEARED TOUCH AND GO, AFTER TOUCH AND GO, REPORT RIGHT DOWNWIND RUNWAY 01) (Position i in Figure 3). After reading back to Oita Tower, "Runway 01 Cleared Touch and Go" Trainee A said to the Instructor that "Runway 01 Cleared Touch and Go", and the Instructor also returned to Trainee A with confirmation "Runway 01 Cleared Touch and Go".

Trainee A erroneously assumed the "Cleared Touch and Go" called during this time was the "Cleared Touch and Go" to be called at the end of the standard callout (see "2.7(5) 2 b Standard Callouts" later).

After receiving the TGL clearance from Oita Tower, the Instructor made a safe confirmation by ensuring that the preceding aircraft had left the runway and checked the status of the upwind leg to resume Single Engine Training after the TGL.

The Instructor stated that the Instructor made a callout "Runway 01 Cleared Touch and Go" to make a mutual confirmation of the TGL clearance from Oita Tower in the cockpit but also might have mistaken this callout for a standard callout.

After calling out "Landing Assured" at a pressure attitude of about 500 ft and confirming the approach speed, Trainee A set the flaps to landing position and the number of propeller rotations to the maximum position to achieve the final landing position. At this point, the drag of the aircraft was reduced with the landing gears not extended, and specific flight settings were balanced with less power than with the landing gears extended. Although it was somewhat doubtful that specific flight settings such as airspeed and descent rate of the aircraft were balanced despite less power than usual, Trainee A continued its approach.

On the verge of the touchdown, when the Instructor felt that the aircraft was not touching down at normal landing altitude and thought that the landing gears might not be extended, the Instructor noticed the retracted landing gear warning horn had sounded, but thought it would be impossible to complete a go-around in time. Trainee A and Trainee B did not recall that the horn sounding.

At 10:27:22, the aircraft made a belly landing (see Figure 4).

	HE Honda Airways
	Figure 4: The Aircraft after its Belly Landing
	This accident occurred at 10:27, on August 14, 2023, on Runway 01 at Oita Airport (33° 28' 14" N, 131° 44' 14" E).
2.2 Injuries to	None
Persons	
2.3 Damage to the	(1) Extent of damage: Destroyed
Aircraft	(2) Damage to the Aircraft (see Figure 5 and Figure 6)
	Lower fuselage: Scratch marks on the outer skin from near the nose
	landing gear door to near the bottom of both flaps,
	and damage to the keel
	Step bottom: Scratch marks
	Right and left flaps: Damaged and scratch marks
	Right and left propellers. Tips of both blades were broken and bent.
A	FWD FWD
FWD Nose landing gea	r door Lower fuselage
	Figure 5: Damage to the Lower Fuselage
	Figure 6: Damage to the Propellars
	rigure o. Damage to the riopeners
	(3) Condition of Runway Surface
	Near the center line, approximately 520 m north of the threshold of
	Runway 01, there were impact marks from the propellers at the time of the
	aircraft's first touchdown. From there to the point where the aircraft came to

	a stop was approximately		
	310 m, and on the runway		
	surface between these two		
	points it was confirmed that		
	there were impact marks		
	from the left and right	fuselage (Estimation	step (Estimation)
	propellers, scratches from	//	11
	the lower fuselage of the		
	aircraft, and scratch marks		
	from the step under the	scratch r step (Es	narks from stimation)
	entrance door on the right		
	side of the aircraft. The		
	aircraft came to a stop		
	approximately 5 m to the left	left propeller	Right propeller
	of the centerline of the	Figure 7: Cond	lition of Runway Surface
	runway (see Figure 7).	-	
2.4 Personnel	(1) Instructor: Age 38		
Information	Commercial Pilot Certifica	July 15, 2009	
	Rating for Multiple-engi	ine (land)	January 6, 2009
	Flight Instructor Certifica	April 22, 2014	
	Class 1 aviation medical ce	Validity: September 2, 2023	
	Total flight time	4,507 hours 01 minutes	
	Total flight time on the typ	118 hours 51 minutes	
	Flight time in the last 30	0 days	24 hours 41 minutes
	(2) Trainee A: Age 27		
	Commercial Pilot Certifica	ate (Airplane)	November 30, 2022
	Rating for Multiple-engi	ine (land)	November 30, 2022
	Class 1 aviation medical ce	ertificate	Validity: December 19, 2023
	Total flight time		190 hours 20 minutes
	Total flight time on the typ	pe of the aircraft	17 hours 31 minutes
	Flight time in the last 30) days	6 hours 32 minutes
2.5 Aircraft	Aircraft type:		Hawker Beechcraft G58
Information	Serial number:		TH-2289
	Date of manufacture:		September 21, 2010
	Certificate of airworthiness:		No. Toh-2022-455
	Validity:		March 10, 2024
	Total flight time: 5,970 hours 33		
	When the accident occurre	ed, the weight an	d the position of the center
	of gravity of the aircraft were w	vithin the allowal	ole range.

2.6 Meteorological	The observation	values (exce	ernts) of the aer	odrome routine
Information	meteorological reports (METAR) for Oita Airport around the time of the			
111011111101011	accident were as follows:			
	Observation time			
	(Hour: Minute)	09:00	10:00	11:00
	Wind direction (°)	020	350	030
	Wind velocity (kt)	9	10	13
	Prevailing visibility		10 or more	
	(km)		10 01 11010	
2.7 Additional	(1) Landing Gear Opera	ation		
Information	Photographs of th	o aircraft tako	n after this accident	showed that the
mormation	Photographs of the aircraft taken after this accident showed that the			wag in the "UD"
	national gear control so	viten, which m	loves up and down,	was in the OI
	position. And in the na	anger where th	ne aircrait was brou	ignt in after the
	accident, it was confirm	ned that when	the landing gear co	ntrol switch was
	moved to the "DOWN" v	with the aircraft	t jacked up, the nose	landing gear and
	both main landing gear	s were lowered	and locked in the ge	ar-down position
	after the landing gear co	ontrol switch wa	as moved to the "DOV	VN" position, and
	that all 3GREEN were l	it (see Figure 8	3).	
				William Street
	Landing gear contro "UP" position The aircraft: photogra runway after the accid	UP DWN LANDING GEAR	Landing gear co "DOWN" The aircraft: at the time the operation.	Ill 3GREEN ghts are on min position e of confirming
	Fig	ure 8: Landing	Gear Operation	
	(2) Retracted Landing Gear Warnings			
	The aircraft is equipped with three types of the retracted landing gear warning systems: a warning horn, a warning label, and an alert soft key (hereinafter referred to as "Landing Gear Warning Systems").			
	a. Uutline of Landing Gear Warning Systems			
	The outline of Landing Gear Warning Systems is as follows:			
	(a) Warning horn: Continuous audio alarm (poo-poo-poo) emitted from			oo) emitted from
	t	the in-flight spe	eaker and each heads	set, which cannot
	be stopped while under operating conditions.			nditions.
	(b) Warning label: A	A red "GEAR U	P" warning displayed	l in the
	6	annunciator wi	indow of the PFD	(Primary Flight
	1	Display) locate	d in front of the lef	ft pilot seat (see
]	Figure 9. a).		-

(c) Alert soft key: A flashing red "WARNING" alert displayed on the alert soft key of the PFD (see Figure 9, b).



Figure 9: Indication Status of Landing Gear Warning Systems at the time of confirming the operation (the Aircraft)

b. Landing Gear Warning Systems Operating Conditions

All three types of Landing Gear Warning Systems are activated (display a warning) when one of the following conditions is met.

- (a) the case where a throttle is at the position where the manifold pressure (hereinafter referred to as "MAP") is less than or equal to 13 inHg-with the landing gears not extended.
- (b) the case where the flaps are extended to the FULL DOWN position with the landing gears not extended.
- c. Confirmation of Landing Gear Warning Systems

Examination of the Landing Gear Warning Systems conducted in the hanger where the aircraft was brought in after the accident revealed that all the Landing Gear Warning Systems were normally activated (displayed).

(3) Landing Gear Warning Systems during Single Engine Training

During Single Engine Training, the Instructor pulls the throttle of the engine to the idle position to simulate an inoperative engine, therefore Landing Gear Warning Systems are activated when the MAP of this relevant engine falls below the equivalent of 13 inHg and then remain activated until a landing gear down operation is performed.

(4) Frequency Analysis of ATC Communications Transmitted by the Aircraft

Of the three types of Landing Gear Warning Systems, the warning horn is also output through the aircraft's in-flight speaker. Therefore, when the aircraft transmits by radio, the pilot's microphone may pick up the sound of the warning horn output from the speaker and transmit it along with the pilot's ATC communications.

In this analysis, the audio data of ATC communication recording was visualized as a frequency spectrum using a frequency analysis tool, whose characteristics were compared with those of the frequency spectrum (sample audio source) of the warning horn recorded during the examination in the hanger after the accident.

As a result, it was analyzed that in all the ten positions (Positions marked with " \bullet " in Figure 10) where the aircraft had transmitted communications while flying on the traffic pattern at the time of the accident, the frequency matched some of the characteristics of the sample audio source of the Landing Gear Warning Systems' horn.

(5) Landing Gear Down Operation and Confirmation of Landing Gear Down Status

The company's training manual for the G58 describes the landing gear down operation and confirmation of the landing geardown status as follows:

a. Landing Gear Down Operation

The landing gears shall be extended on the downwind leg approximately 30 seconds (to be adjusted according to wind velocity) after passing abeam of the runway threshold.

b. Confirmation of Landing Gear Down Status

(a) Landing checklist

It is stated that the landing checklist shall be implemented during the base turn. And in the "Gear" item of the landing checklist, it states that the landing gear control switch shall be visually confirmed to ensure that it is in the "Down" position and 3GREEN, and that "DOWN AND 3GREEN" shall be called out. In addition, the checklist states that callout shall be made at the start and end of the procedure. Standard collouts

(b) Standard callouts

Standard callouts are the standard phrases used for the items to be confirmed in each phase of the flight. On the final leg, in order to ensure that the aircraft is ready to continue landing (stabilized) to the altitude specified in the Go Around Policy (200 ft AGL), the flight crew shall confirm each situation for the four items listed in Table 1, making callouts for them in the order shown in Table 1. The 3rd item contains the confirmation of Landing Gear Down status, which would



Figure 10: Sounding Status of Landing Gear Warning Systems' Horn

be completed with the callout "Cleared Touch and Go "(in case of TGL) in the 4th item.

	Callout items	Confirmation items		
1	Stabilized	Aircraft shall be in stabilized state		
2	Heels Down	The heels shall be down on the floor and the brake pedals shall not be applied.		
3	Gear Down	The landing gears shall be extended.		
4	Cleared Touch and Go (In case of TGL)	A TGL clearance shall be issued.		

Table 1: Standard Callouts (Stabilized Check)

(6) Air Traffic Control Services Rules established by the Oita Airport Office

The Oita Airport Office's Air Traffic Control Services Rules No. 02-05 (last revised on October 3, 2019), "Handling of Training Aircraft" describes the following in "2. Training in the Traffic Pattern" (Excerpts): "(2) In principle, training aircraft shall be instructed to use the east side traffic pattern".

The Oita Airport Office states that the reason for its instruction to use the east side traffic pattern in principle is to avoid the noise caused by aircraft flying over the land area of the west side traffic pattern.

(7) Traffic Pattern Specified by the Company

The Flight Training Philosophy Unification (Multi Classification Rating Change Course (Version 2021.3.31)) established by the company, Appendix 3 (Oita Airport Traffic Patterns) contains the descriptions as follows (Excerpts): "For continuous touch-and-go training, use of the east side traffic pattern shall be the standard, and the west side traffic pattern shall be used only when instructed to do so by an air traffic controller".

In addition, the east side traffic pattern at the airport has aircraft flying over the sea, but most of the west side traffic pattern is over the land, and there are residential areas about 1.4 nm west of the runway. Therefore, the west side traffic pattern is wider, and its flight altitude is higher than the east side traffic pattern (see Table 2 and Figure 1).

Table 2: Characteristics of Traffic Patterns			
Traffic Patterns	West side	East side	
Upwind leg	The west side is lo	traffic pattern nger.	
Altitude of the downwind leg	1,400 ft	1,200 ft	
Downwind leg and runway width	1.7 nm	1.5 nm	

		I	Final leg	The west side traffic pattern is longer.
((8)	Changes and C	others of ATC Instructio	ns
		While the air	craft was flying on the	traffic pattern at the time of the
1	acc	ident (3rd TGL), the changes and othe	ers of ATC instructions from Oita
r	Tov	wer were as follo	ows:	
		About 10:21	JA51HA, ROGER, RE	VISED FOLLOW THE TRAFFIC,
			CAUTION WAKE TU	RBULENCE.
		About 10:21	JA51HA, AFFIRM, RI	EVISED REPORT RIGHT
			DOWNWIND.	
		About 10:25	JA51HA, THIS TIME	UNABLE TOUCH AND GO DUE
			TO WAKE TURBULE	NCE FROM ARRIVAL TRAFFIC,
			LOW APPROACH IS	AVAILABLE, REQUEST
			INTENTION.	
		About 10:25	JA51HA, CORRECTIO	ON, AHTOUCH AND GO IS
			AVAILABLE, EXPECT	T TOUCH AND GO.
	(9) Timing of Landing Clearance			
		In the three 7	IGLs conducted by the	aircraft on the day of the accident,
t	the TGL clearances were issued at the following timing:			
	1st :Downwind leg			
		2nd : Downwi	ind leg	
		3rd : Final le	g	

3. ANALYSIS

(1) Belly Landing

The JTSB concludes that based on the statements of the Instructor, Trainee A and Trainee B as well as the investigation after the accident, it is certain that the aircraft's landing gear control switch was in the "UP" position immediately after the landing and no anomalies in the operations of landing gears were confirmed, therefore, the aircraft made a belly landing and sustained damage to the fuselage because it touched down with the landing gears not extended.

(2) Reason the Landing Gear Down Operation was not Performed

The JTSB concludes that it is highly probable that as extending the downwind leg to ensure separation from the preceding aircraft as well as delaying the landing gear down operation, Trainee A intended to perform the landing gear down operation after the start of the base turn. Although Trainee A had not expressed an intention to delay the landing gear down operation, the Instructor was most likely to have been able to read the intention that Trainee A deliberately delayed the timing of the landing gear down operation by considering the aircraft's flight route and the position relations with the preceding aircraft.

As the unexpected ATC instruction by the pilots from Oita Tower came at the time when the landing gear down operation was about to be performed, which had been delayed, it is more likely that Trainee A was forced to concentrate the attention on dealing with the instruction, which caused Trainee A to forget about the landing gear down operation. As contributing factors, the following unusual events were more likely to have had a threatening effect on Trainee A's psychological states.

- a. Trainee A was nervous about the Ready for Check.
- b. Trainee A made a mistake about the initial action for Single Engine Training.

c. The aircraft was flying a route different from the normal traffic pattern to ensure sufficient separation from the preceding aircraft.

It is probable that the Instructor thought that Trainee A had deliberately delayed the landing gear down operation, but because of Ready for Check, the Instructor refrained from giving any advice and did not confirm with Trainee A the reason Trainee A had not extended the landing gears at the time specified in the procedure. However, the Instructor should have confirmed with Trainee A, without hesitation, the necessary safety items, even in the Ready for Check. It is more likely that in instructing Trainee A, who was confused by the unexpected ATC instruction by the pilots from Oita Tower and concentrating the attention on the mutual checks on board, the Instructor came to share the same point of view with Trainee A and was unable to check objectively that the landing gear down operation had not yet been performed.

It is required for instructors to objectively understand, supervise, and evaluate the situation in which trainees are placed. On the other hand, it is required for instructors to have a prominent level of professional insight as a captain and to maintain a safe and effective training environment. (3) Confirmation of the Landing Gear Down Status during Landing Check

The JTSB concludes that it is highly probable that Trainee A implemented the landing check to be implemented while flying on the base leg as usual, but it became a mere pro forma check as the procedure was simply followed due to the threat effect mentioned above, and Trainee A made a callout "DOWN AND 3GREEN" in the "Gear" item of the landing check, although the landing gear control switch was in the "Up" position and 3GREEN were not lit. In the normal procedure, the landing check shall be implemented after the landing gears has been extended, however, it is more likely that Trainee A mistakenly assumed the landing gear down operation which should have been performed before the landing check, had already been completed when Trainee A implemented the landing check and made a callout "Down."

The Instructor was probably unable to double-check the landing check implemented by Trainee A because the Instructor was in the process of confirming with Trainee A regarding the notification from Oita Tower that TGL would not be available and was concentrating on separation from the preceding aircraft.

These suggest that even in the landing check, the confirmation of the landing gear down status was not probably made appropriately.

The purpose of the landing checklist is to ensure that the necessary operations are implemented in any change of situation. It is important that the instructor and trainee thoroughly check the basic operations such that the trainee should reaffirm this purpose and implement the checklist as specified in the company's training manual and the instructor should ensure that the trainee implements the checklist correctly.

(4) Confirmation of the Landing Gear Down Status during Standard Callout

The JTSB concludes that it is probable that when Trainee A and the Instructor was mutually checking the 3rd TGL clearance, Trainee A assumed the "Runway 01 Cleared Touch and Go" made during this time was the "Cleared Touch and Go" to be made as the last item of the standard callout made on the final leg, and continued the approach without making the standard callout. Therefore, Trainee A more likely missed the opportunity to confirm the landing gear down status to be performed during the standard callout. In addition, it is probable that the instructor also mistakenly assumed that the standard callout had been completed as the instructor had made a

callout "Runway 01 cleared touch and go" and overlooked the fact that Trainee A had not made a standard callout.

It is probable that the following factors contributed to Trainee A's failure to make the standard callout.

a. After receiving notification from Oita Tower that the TGL would not be available, the aircraft was due to make a low approach, but as the aircraft received a corrective instruction that the TGL would be available during a turn to the final leg, Trainee A was more likely concentrating on switching the flight operation from the planned low approach to the TGL.

b. It was on the final leg that the aircraft received a TGL clearance from Oita Tower, which was later than usual, so the timing most likely overlapped with the time for Trainee A to make the standard callout.

As a contributing factor to the reason why the instructor overlooked the fact that Trainee A had not made a standard callout, it is probable that when the aircraft received a TGL clearance from Oita Tower, the Instructor was focused on confirming the safety of the preceding aircraft had vacated the runway and confirming the upwind conditions in order to conduct another Single Engine Training after TGL.

(5) Landing Gear Warning Systems

The JTSB concludes that based on the following factors, the aircraft's Landing Gear Warning Systems were most likely operating during the 3rd TGL from the start of Single Engine Training until the belly landing.

a. No anomalies were found during the investigation after the accident.

b. It is certain that the Instructor noticed that the horn of the Landing Gear Warning System was sounding just before landing.

c. Based on frequency analysis of ATC communications transmitted by the aircraft, after Single Engine Training commenced during the 3rd TGL, the aircraft transmitted ATC communications, whose all frequency most likely matched some of the characteristics of the horn of the Landing Gear Warning System output through the aircraft's in-flight speaker.

However, it is highly probable that the Landing Gear Warning Systems had continued to operate (displayed) immediately after the start of Single Engine Training therefore, the captain and Trainee A had got used to receiving the warnings, the Landing Gear Warning Systems did not serve as a retracted landing gear warning horn. Especially, during the training at the time of the accident, the aircraft was also conducting Single Engine Training in mid-air operation in the training area and during the 1st TGL, which is likely to have reduced their alertness to the Landing Gear Warning Systems.

During Single Engine Training, Landing Gear Warning Systems continued to operate-(displayed), therefore, pilots got used to receiving the warnings, making it difficult to notice the failure to extend the landing gears, thus instructors must be particularly careful. In addition, instructors and trainees should confirm that any warnings are not displayed on the PFD screen until landing.

(6) ATC Instructions

The JTSB concludes that it is highly probable that among the ATC instructions sent by Oita Tower to aircraft flying on the traffic pattern at the time of the accident (3rd TGL), the Instructor and Trainee did not expect those two ATC instructions: one is the ATC instruction revised to follow the preceding aircraft entering the right downwind leg instead of the previous instruction to enter left downwind leg, which was given to the aircraft on the upwind leg; the other is the ATC instruction that the TGL would not be available, which was given to the aircraft during its base turn.

In addition, regarding the ATC instruction that the TGL had become available, which was sent from Oita Tower to the aircraft flying the final leg, the Instructor and Trainee A most likely did not understand the reason for the revision.

It is more likely that the time at which these unexpected ATC instructions by the pilots and the revised reasons for ATC instructions were not known, were sent to the aircraft flying in the traffic pattern during the 3rd TGL overlapped with the time at which the aircraft would extend the landing gears and confirm the landing gear down status, which further increased Trainee A's workload for the landing operation, resulting in a failure to perform a landing gear down operation and confirm the landing gear down status appropriately.

Most of information provided by air traffic controllers is useful for reducing pilot workload and for decision-making in the air. In addition, as pilots would anticipate the instructions or clearances provided by air traffic controllers in the each flight phase and timing, regarding those instructions as pilots anticipated, they are able to understand without any influence on their flight operation and other judgement. On the other hand, regarding those instruction pilots did not anticipate, their workload would possibly be temporarily increased as pilots judge and make decisions to accurately understand the intentions of air traffic controllers.

The exchange meetings held between the company and the Oita Airport Traffic Control Tower are beneficial for deepening mutual understanding between air traffic controllers and pilots, and it is desirable to continue the meetings.

4. PROBABLE CAUSES

The JTSB concludes that the probable cause of this accident was certainly that the aircraft made a belly landing and sustained damage to the fuselage because it touched down with the landing gears not extended while conducting continuous touch-and-go training during Single Engine Training.

The reason the landing gear down operation was not performed was because as it was the Ready for Check before the competency assessment, Trainee A was nervous, the Instructor refrained from giving any advice and the timing of the unexpected ATC instructions to the pilots overlapped with the time at which the aircraft was to extend the landing gears, which was deliberately delayed to ensure separation from the preceding aircraft and they had had to respond to it, which more likely contributed to it.

In addition, the reason for not confirming the landing gear down status was that the checklist and callouts to check the landing gear down status were not properly performed, and the timing of the unexpected ATC instructions to the pilots overlapped with the time at confirming the landing gear down status, which more likely contributed to it.

5. SAFETY ACTIONS

5.1 Safety Actions	As described in ANALYSIS, it is necessary for the company to consider			
Required	safety actions to prevent the recurrence of failures to perform the landing			
	gear down operation and check the landing gear down status as follows:			
	confirm the necessary safety items without hesitation even in the Ready for			
	Check; perform basic operations thoroughly to ensure that the checklist is			
	implemented correctly and callouts are made properly; be careful not to get			
	used to receiving the warnings during Single Engine Training.			
5.2 Actions for	Measures Taken by the Company after the Accident			
Accident	(1) To prevent recurrence, the company provided training to all pilots on the			
Prevention	importance of the checklist and callouts. (August 21, 2023)			
Taken after the	(2) The company added the check procedures for the landing gear down status			
Accident	in the training manual such as confirmation clarification and additional			
	callouts during landing gear down operation and confirmation of no			
	warnings during stabilized check. (August 21, 2023)			
	(3) The company added a new syllabus for practical training under air traffic			
	control conversation (communication) congestion occurred in the phase			
	from the base turn to the final leg. (August 19, 2023)			
	(4) The company added a new syllabus for the instructor pilot training and			
	recurrent training for responses to the situation where a trainee fails to			
	perform the landing gear down operation. (August 19, 2023)			
	(5) The company decided to set a reminder to display the landing gear status			
	on upper right of the instrument panel (where it is easily operated by the			
	instructor in full view of trainees and others in the aft seat) prior to the			
	training to prevent failure to perform the landing gear down operation			
	due to habituation to the warnings. (August 29, 2023)			