

AA2017-3

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**HONDA AIRWAYS CO., LTD.
J A 3 1 H A**

May 25, 2017

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 determine the causes of an accident and damage incidental to such an accident, thereby preventing future accidents and reducing damage. It is not the purpose of the investigation to apportion blame or liability.

Kazuhiro Nakahashi

Chairman

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.

AIRCRAFT ACCIDENT INVESTIGATION REPORT

**FUSELAGE DAMAGE DURING LANDING
HONDA AIRWAYS CO., LTD.
CESSNA 172S, JA31HA
HONDA AIRPORT
OKEGAWA CITY, SAITAMA PREFECTURE, JAPAN
AT AROUND 11:09 JST, SEPTEMBER 22, 2015**

April 21, 2017

Adopted by the Japan Transport Safety Board

Chairman	Kazuhiro Nakahashi
Member	Toru Miyashita
Member	Toshiyuki Ishikawa
Member	Yuichi Marui
Member	Keiji Tanaka
Member	Miwa Nakanishi

SYNOPSIS

<Summary of the Accident>

On Tuesday September 22, 2015, at around 11:09 Japan Standard Time (JST: UTC +9 hours, unless otherwise stated, all times are indicated in JST on a 24-hour clock), a Cessna 172S, registered JA31HA, operated by Honda Airways Co., LTD., suffered damage to its airframe upon landing on the Runway 32 of Honda Airport, for a solo flight training.

A trainee who was the only person onboard the aircraft, was not injured.

The aircraft sustained substantial damage, but no fire broke out.

<Probable Causes>

In this accident, when the aircraft landed, it is probable that it made a dropped landing and bounced; subsequently, it strongly grounded again from the nose landing gear, the empennage struck the runway due to its reaction and the go-around operation, and then the airframe was damaged.

Regarding the reason why the aircraft made a dropped landing at its landing, it is probable that the Trainee continued a flare operation without executing a go-around to prevent a dropped landing, even though he felt that the altitude to commence a flare operation was slightly higher more than usual.

Regarding the reason why the Trainee continued the flare operation without executing a go-around to prevent the drop-landing, it is somewhat likely that his maneuvering skill was not the level to operate a safe and stable landing including a flare operation. Moreover, the Company did not have a proper skill management system for flight trainees and it allowed the solo flight training even though the Trainee's skill did not fulfill the Safety Criteria for Solo Flight established by it; besides, the methods for a supervision to monitor and an instruction for a solo flight training were inadequate; accordingly, it is somewhat likely that they contributed to the occurrence of the accident.

Abbreviations used in this report are as follows:

N: Normal
PFD: Primary Flight Display
U: Utility
VFR: Visual Flight Rules

Unit Conversion Table

1 ft: 0.3048 m
1 in: 25.40 mm
1 lb: 0.4536 kg
1 kt: 1.852 km/h (0.5144 m/s)

1. PROCESS AND PROGRESS OF THE AIRCRAFT ACCIDENT INVESTIGATION

1.1 Summary of the Accident

On Tuesday September 22, 2015, at around 11:09 Japan Standard Time (JST: UTC +9 hours, unless otherwise stated, all times are indicated in JST on a 24-hour clock), a Cessna 172S, registered JA31HA, operated by Honda Airways Co., LTD., suffered damage to its airframe upon landing on the Runway 32 of Honda Airport, for a solo flight training.

A trainee who was the only person onboard the aircraft, was not injured.

The aircraft sustained substantial damage, but no fire broke out.

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

On September 28, 2015, upon receiving the report of the accident, the Japan Transport Safety Board designated an investigator-in-charge and an investigator to investigate this accident.

1.2.2 Representative of the Relevant State

An accredited representative of the United States of America, as the State of Design and Manufacture of the aircraft involved in this accident, participated the investigation.

1.2.3 Implementation of the Investigation

September 28, 2015	Site investigation, airframe examination and interviews
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October 15, 2015	Interviews
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1.2.4 Comments from Parties Relevant to the Cause

Comments were invited from parties relevant to the cause of the accident.

1.2.5 Comments from the Relevant State

Comments were invited from the relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight

On Tuesday September 22, 2015, at around 11:09, a Cessna 172S, registered JA31HA, operated by Honda Airways Co., LTD. (hereinafter referred to as “the Company”), took off from Honda Airport at 10:53 for a solo flight training (hereinafter referred to as “the Training”) as the flight trainee (hereinafter referred to as “the Trainee”) sat on a left seat.

Flight plan of the aircraft submitted to an operation controller of the Company is outlined below:

Flight rules:	VFR
Departure aerodrome:	Honda Airport
Estimated off-block time:	10:46
Cruising speed:	95 kt
Cruising altitude:	VFR
Route:	traffic pattern
Destination aerodrome:	Honda Airport
Total estimated elapsed time:	one hour 0 minute
Fuel load expressed in endurance:	four hours
Persons on board:	one person

The history of the flight up to the time of the accident was summarized below, based on the statements of a flight instructor in charge of the solo flight training at the accident date (hereinafter referred to as “the Instructor A”, and for the flight instructor without any particular descriptions, referred to as “the instructor”) and the air traffic control trailer^{*1} (hereinafter referred to as “the Tower”) personnel.

(1) The Trainee

After confirming no abnormality through a visual pre-flight inspection of the aircraft, the Trainee, started the training of take-off and landing including go-arounds^{*2} with the Instructor A on board for seven times since 09:45, and then the Instructor A allowed the first solo flight. After the Instructor A disembarked, for the first solo flight training, the Trainee took off from the airport at 10:53 and entered an airfield traffic pattern. The first landing went smoothly without any

^{*1} “The air traffic control trailer” is the facility at the airport to communicate information and the advice for taking off and landing for an aircraft via radio.

^{*2} “Go-around” is an operation to give up a landing, climb and restart a landing again.

problem for approach angle, speed, flare operation^{*3} and others, as he aimed on a designation marking of the Runway 37.

At the second landing, up to the final approach, there was no problem to fly the traffic pattern. A flare operation was done over the designation marking of the Runway 32. The Trainee felt the altitude to start the flare operation was slightly higher, but since the Trainee had landed in the past training with a high flare operation^{*4}, he did not feel any danger; therefore, he continued to operate a flare without a go-around.

The aircraft was in the attitude of approximately 10 degree nose-up, sank greatly, touched down and bounced. As the Trainee had never felt such a strong impact, immediately he set a full throttle and executed a go-around. At the same time, the Instructor A instructed “power, power, power,” via radio communication. He did not remember the re-touchdown after the bounce.

After the go-around, it climbed as usual. As the Trainee checked the instrument at the up-wind leg and found PDF^{*5} at the left seat displayed red X mark which was indicating poor condition, he reported to the Instructor A via radio on this. The Instructor A instructed him to press the red button at a center of the instrument, and then he did as instructed but nothing was changed. The Instructor A told him to check a standby instrument for a speed indicator and altimeter located below PDF which were functioning normal; therefore, he continued to fly on the traffic pattern and landed.

The Trainee did landed with the flare at slightly higher position for third landing, but he landed without any problem.

(2) Instructor A

The Instructor A was supervising the training from the Tower after completing onboard trainings and granting the solo flight. The aircraft took off at 10:53 as usual.

The first solo landing went without any significant problem. The touchdown was on left side of the centerline; however, it was not far from the centerline; accordingly, the Instructor A saw no danger and did not radio him any instructions.

The second flight had no problem up to the final approach. When he was watching the flare operation, he felt that it sank greatly right before the touchdown;

^{*3} “A flare operation” is an operation to change a flight attitude from an approach attitude to a landing attitude, and up to a touchdown.

^{*4} “A high flare operation” is the operation to start a flare at higher altitude than normal.

^{*5} “PDF (Primary Flight Display)” – A display which provides information on pitch, roll, heading and course as well as altitude, airspeed and rate of climb/descent.

therefore, he radioed the Trainee, “power, power, power,” meaning a go-around, but it had landed before he finished the sentence. The touchdown did not look like a dropped^{*6} landing from a height or in excessive pitch-up attitude, but the nose was up at the time of the touchdown, after the bounce, it resulted in a movement like “Porpoising^{*7}” and touched down again from the nose landing gear first in a slightly nose-down attitude.

The Instructor A thought that it could be dangerous, as he recalled the past accident case at Kumamoto Airport owned by the Company. Since the engine output began to effectiveness at the time of the main landing gears touching down again, he instructed the Trainee to make sure to execute the go-around procedure.

There was a radio contact that a red X mark was displayed on PDF from the Trainee; accordingly, he reported to the flight management from the Tower to terminate the training with the next landing due to the malfunction of PDF.

As the Instructor A instructed to read the readings of speed indicator and the altimeter that the Trainee read back were abnormal, the Instructor A found that he mistook speed for altitude on his request to reconfirm and the Instructor A thought that he was panicked; therefore, the Instructor A directed him to land the aircraft calmly. At that moment, the Instructor A did not know that the airframe had suffered major damage.

After that, the Instructor A did not instruct anything special, and the aircraft landed normally. The Instructor A went to the apron and received the report that the airframe had no abnormalities from the Trainee who had already disembarked.

(3) The Tower personnel

At the Tower, the Instructor A sat on a right seat where he could see the landing and the tower personnel sat on the left seat to monitor the Training. The Instructor A was in charge of the communication with the aircraft, and the Tower personnel monitored the landing with binoculars.

Regarding the second landing, because the altitude to start a flare to level out from the approach attitude prior to the touchdown was higher than other aircraft which he had seen till then, he felt that it would result in a high flare.

The aircraft suddenly dropped from the high altitude and touched down on

^{*6} “A dropped landing” is a landing/touchdown like almost slammed down, as an aircraft rapidly descends at a larger descending rate than normal.

^{*7} “Porpoising” is a state in which, due to an improper recovery operation, the nose landing gear of an aircraft touches down before the main landing gear, causing the aircraft to perform a successive undulating motion similar to that of a “porpoise” leaping into the air then diving back into the sea head first.

three points landing. Following the touchdown, it largely bounced and touched down again on the nose gear first in a slightly nose-down attitude. It seemed that as the main landing gears grounded, almost simultaneously the nose landing gear was bounced due to the reaction and the empennage touched ground; accordingly, he instinctively raised voice.

Later, the aircraft established an en route climb normally. He did know the fact that a red X mark was displayed on PDF during its climb from the radio communication between the Trainee and the Instructor A. For the third landing, there was no particular problem.

This accident occurred on the runway of the Honda Airport (N 35°58'1", E 139°31'33") at around 11:00, on September 22, 2015.

(See Figure 1 Estimated Flight Route)

2.2 Injuries to Persons

No one was injured.

2.3 Damage to the Aircraft

2.3.1 Extent of Damage

Substantial Damage

2.3.2 Damage to the Aircraft Components

- (1) Nose portion (near the nose strut attachment onto firewall aft of engine):
Buckled (photo 1-①)
- (2) Empennage (lower skin): Worn (photo 2-②)
- (3) Empennage (bottom part of rudder): Scratch marks (photo 2-③)
- (4) Tie-down ring: Detached (photo 2-④)
- (5) Vertical stabilizer (lower skins on left and right): Buckled (photo 2-⑤)
- (6) Horizontal stabilizer (left and right hinge sections): Buckled (photo2-⑥)

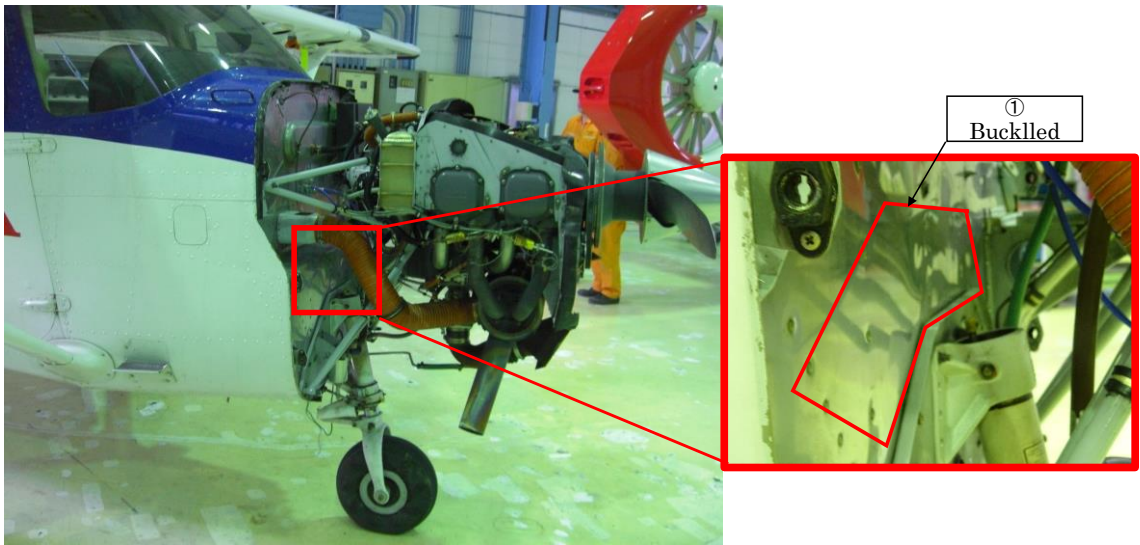


Photo 1 Damage to the Airframe (# 1)

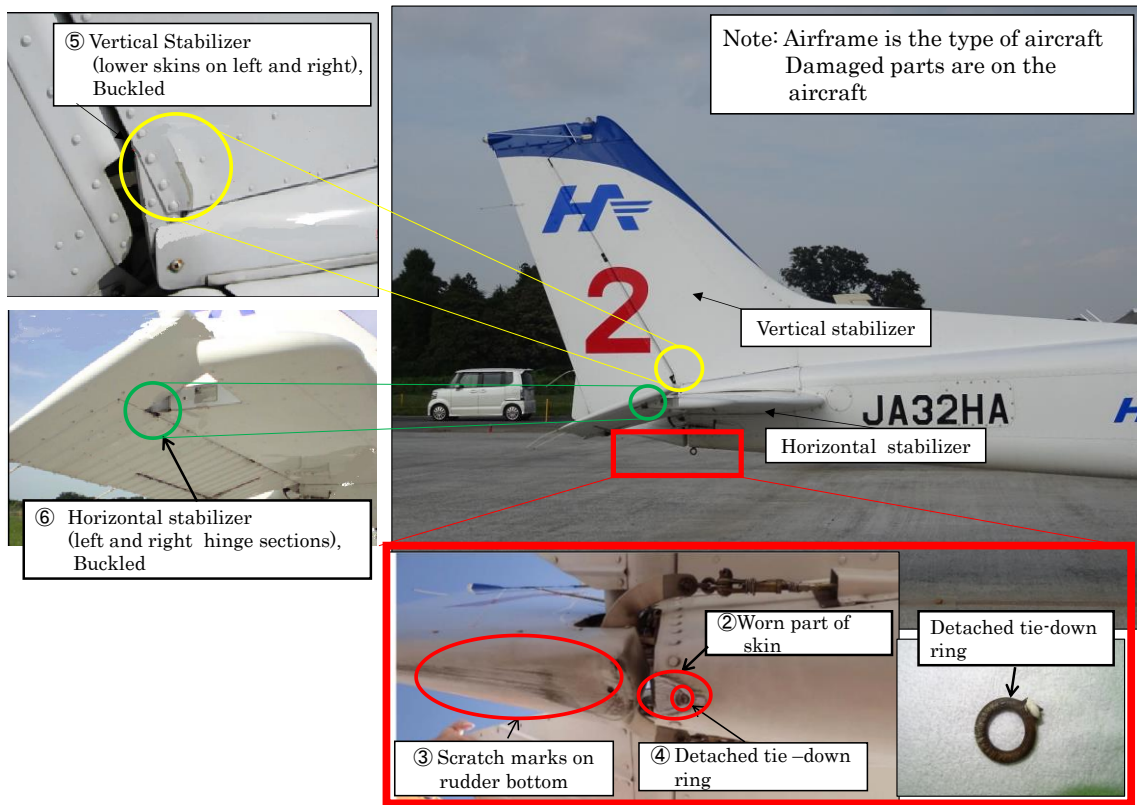


Photo 2 Damage to the Airframe (# 2)

2.4 Personnel Information

(1) The Trainee

Male, age 52

Student pilot permit

Validity

April 14, 2016

Total flight time	46 hours 32 minutes
Flight time in the last 30 days	7 hours 13 minutes
Total flight time on the type of aircraft	46 hours 32 minutes
Flight time in the last 30 days	7 hours 13 minutes

(2) The Instructor A	Male, age 57
Commercial pilot certificate (airplane)	
Type rating for single-engine (land)	November 14, 1983
Multi-engine (land)	July 29, 2010
Instrument flight certificate	March 26, 2015
Flight instructor certificate	October 9, 2003
Class 1 aviation medical certificate Validity	March 13, 2016
Pilot competency assessment	
Expiration date of piloting capable period	March 6, 2016
Total flight time	4,681 hours 49 minutes
Flight time in the last 30 days	20 hours 08 minutes
Total flight time on the type of aircraft	427 hours 16 minutes
Flight time in the last 30 days	20 hours 08 minutes
Flight instructing time in the last one year	149 hours 20 minutes

2.5 Aircraft Information

2.5.1 Aircraft

Type	Cessna 172S
Serial Number	172S11014
Date of Manufacture	November 19, 2009
Certificate of Airworthiness	No. To-26-493
Validity	January 12, 2016
Category of Airworthiness	Aircraft Normal or Utility
Total flight time	3,219 hours 13 minutes
Flight time since last periodical check (100-hour check on August 20, 2015)	32 hours 20 minutes

(See Figure 2 Three Angle View of Cessna 172S)

2.5.2 Weight and Balance

When the accident occurred, the weight of the aircraft is estimated to have been approximately 2,037 lb and the center of gravity (CG) was estimated to have been 41.15

in aft of the reference line, both of which are estimated to have been within the allowable range (the maximum landing weight 2,550 lb and the CG range of 35.7 to 47.3 in corresponding to the weight at the time of the accident).

2.6 Meteorological Information

The weather around the time of the accident, according to an aeronautical weather observations and the statement of the Instructor A, was as follows:

11:00 Wind direction: 360°, Wind velocity: 2 to 5 kt, Weather: fair,
 Prevailing visibility: 10 km or more

2.7 Airport and Accident Site Information

2.7.1 Airport Information

The elevation of the airport was 37 ft. The runway is 14/32 in its direction, 600 m in length and 25 m in width.

The Tower locates near Taxiway W2 at the south-side of the runway, it is easy to see an approach of an aircraft from the Runway 14, but for an approach of aircrafts from the Runway 32, it was difficult for naked eyes to see detailed approach situations like an approach angle, a flight attitude, a touchdown attitude, sink rates and others because the distance was approximately 450 m from the Tower up to the point where the scratch marks were and the touch-down point was further away.

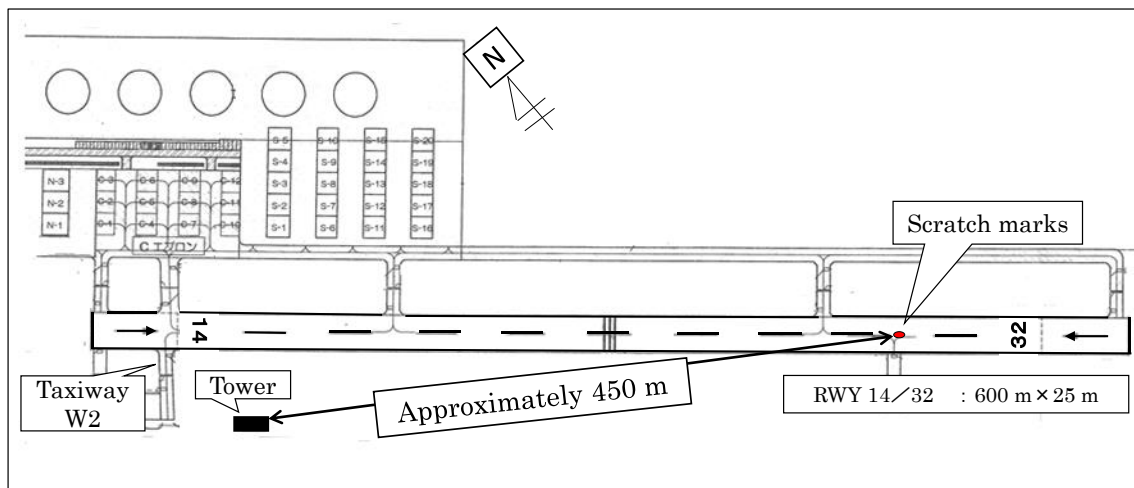


Figure Plan of the Airport

2.7.2 Accident Site

The scratch marks of 8 cm in length, 2 cm in width and 100 cm in length, 3 cm in width, respectively, were left near the centerline of the runway at approximately 100 m from the threshold of the Runway 32.

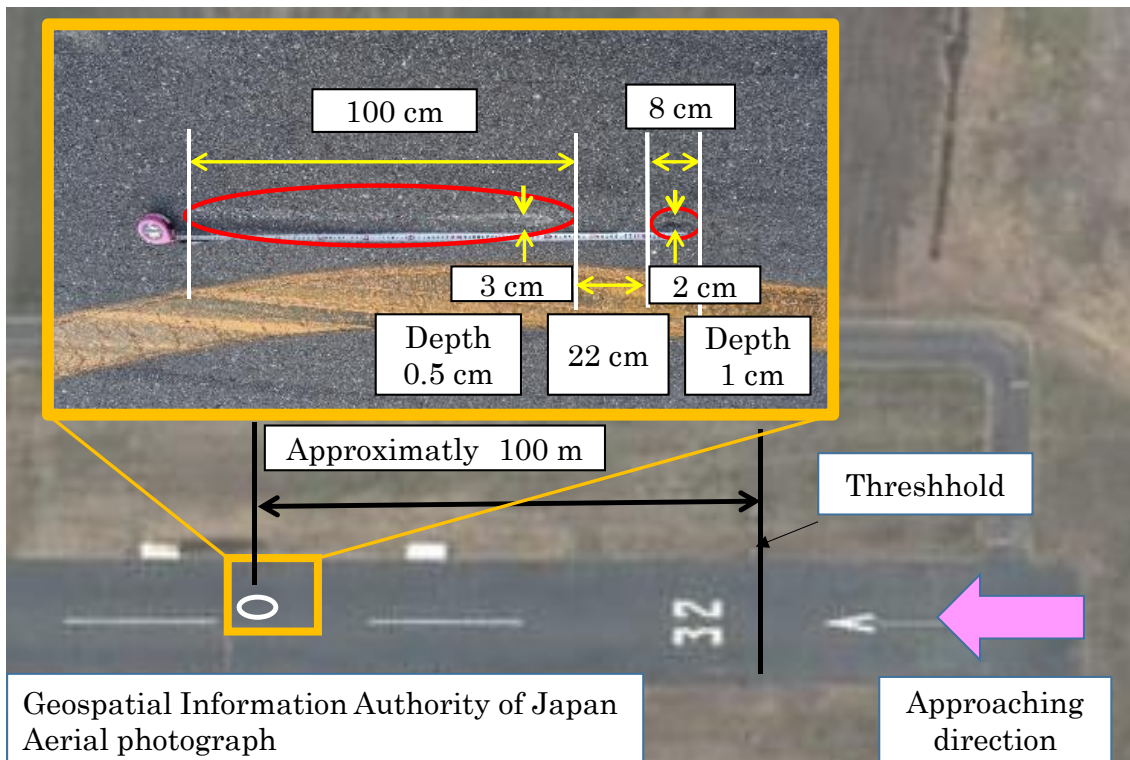


Photo 3 Scratch Marks on the Runway

2.8 Examination Implementation Guidelines and Others for a Solo Flight

2.8.1 Examining Target of Pre-Solo Flight Examination

Targets of examination in Lesson Plan for Pre-solo flight examination set by the Company (L-19: Pre-first solo flight examination by instructors other than the instructor in charge, L-20: Pre-first solo flight by the instructor in charge) include “to execute safe landing and taking off” and “to decide and operate a go-around safely,” and the achievement criteria for these describes “to execute three successive landings safely” and “to execute a go-around safely at the normal landing mode.”

2.8.2 Check List to Approve a Solo Flight Competence (a First Solo “Traffic Pattern” flight)

Solo Flight Skill Checklist (a first solo “Traffic Pattern” flight of the Company) has description as follows: (Excerpts)

It is necessary to confirm a fulfillment of conditions for Safety Criteria for Solo-Flight (issued on December 18, 1997, Kujo No. 2013) and at the same time reconfirm contents of following items to make sure to approve a competence of a trainee.

1 Items relating to safe criteria for a solo flight

Check Box

- *Perform skill certification by more than two instructors (preferably the instructor-in-charge inclusive)*
- *A trainee has experience of:*
 - *NO-FLAP and FULL-FLAP landings;*
 - *Crosswind landing;*
 - *POWER-OFF landing and simulated forced landing; and*
 - *Recovery from a stall*

2 Items relating to the competence of a trainee

- *to grasp the position of other aircraft in the traffic pattern and maintain or make a proper separation.*
- *to execute three safe landings with following items at a skill certification flight*
 - *to fly a traffic pattern route for sure without any altitude deviation over 200 ft;*
 - *to fly with stable approach angle and speed, and appropriate modifying operation;*
 - *to align an axis of an aircraft with a center line of a runway, touch down with an appropriate attitude;*
 - *to execute a go-around on own decision for sure and cope properly with an instructor's instruction.*

3 Item relating to knowledge of a trainee

- *to have firm understanding about excess round out (a high flare), floating, ballooning, porpoising and their countermeasures;*
- *to check the tail strike attitude (about 13° pitch) as sitting on a pilot seat of an actual aircraft and understand a procedure. (using an aircraft parked at an apron)*
- *to understand the handling procedures for the time of radio malfunction*
- *to understand the handling procedures for the time of being lost position.*

2.9 Supervision Procedure at the Time of a Solo Flight

“Supervision procedure at the time of a solo flight” of Flight Training Standardization Manual of the Company stipulates as follows: (Excerpts)

Supervisors (flight instructors) and the Company, during a solo flight of a trainee, using following manuals as standards, shall supervise and secure the safety of trainings.

Liability of supervisors and the Company

Supervisor shall bear the responsibility for supervising the next 1-3 on the

implementation of safe operation between departure and arrival of a solo flight.

The Company (Honda Airways) is responsible for safety operation of a solo flight aircraft by creating and maintaining a system that allows the supervisor to implement its supervision without trouble.

1 Placement of the Supervisor (flight instructor)

Supervisor shall be placed in the tower of the airport between departure and arrival of a solo flight.

2 Listening obligation of the radio frequency

A solo flight aircraft (trainee) should check the frequency of (1) or (2) and carry out position reporting depending on the situation during the flight, in principle.

(1) Flight Service: OKEGAWA ADVISORY

(2) Company Radio: Honda-Airways OKEGAWA

3 Supervision Procedure of Supervisor (flight instructor)

(1) General

a. One supervisor (flight instructor) shall supervise only one solo flight aircraft (trainee) and shall be prohibited to supervise multiple solo flights at once.

(Omitted)

(3) During take-off and landing of a solo flight training

During the approach of a solo flight aircraft, establish the service to provide necessary information with due consideration to approach angle and path, flight attitude, ground speed, touchdown attitude, sinking rate and others via OKEGAWA ADVISORY without delay by visual observation. When a solo flight aircraft has a risk to land poorly or landed poorly, immediately instruct to execute a go-around via OKEGAWA ADVISORY.

2.10 Evaluation of Training

2.10.1 Management of the Skills

Since trainees receive instructions from multiple instructors, the skills were recorded by an instructor in charge of a training, using daily training evaluation sheet for each training subject in a four-level scale as “excellence, good, passing, and failing” and with an entry of observations; however, contents of entry were differed by each instructor and there were sheets that did not filled the concrete contents such as altitude, speed, fluctuation of flight data.

2.10.2 Evaluation of the Trainee's Skill

(1) Evaluation up to one Day before the Accident

The Trainee had taken L-19 examination by different instructors from August 19, 2015 for five times in total; however, he failed these by assessments such as “he did not grasp the altitude to commence a flare operation”, “he was apt to start a flare at high altitude because he operated a flare automatically without his grasp of feeling a sinking sensation”. Later on, he took the sixth L-19 examination on September 13 by the instructor not in charge and passed it.

After that, he took the first L-20 examination on September 20, 2015 it resulted in unfinished due to a wind speed limitation. According to the instructor (hereinafter, referred to as “the Instructor B”) who was in charge of the second examination on 21th, the following day. The Trainee had a tendency to increase an approach angle on the final approach just before a touchdown, as a result, he continued the approach as it was, it approached like a plunge, and several of his operations following flare were inadequate; accordingly, the Instructor B did not grant him a solo flight.

(2) Evaluation when He was granted a Solo Flight

The Instructor A had been handed over the reason that the instructor B did not grant a solo flight at L-20 examination on September 21, 2015.

The Instructor A, at the pre-flight briefing on the day, based on the handed over information from the instructor B, advised the Trainee, to aim at around the threshold of the runway to approach because his keeping an approach with high angle would be resulting plunge in like approach. And also the Instructor A told the Trainee that he should not push himself to continue but he should execute a go-around. After checking the exterior of the aircraft, as the Trainee sat on a left seat and the Instructor A on a right seat, they started the take-off and landing trainings for seven times.

On the first and second flights, the approach angles were high as the observation handed over information from the instructor B. Moreover, flying on the final approach on the second flight, because the Trainee got close to other aircraft flying on the traffic pattern, the Instructor A took over the maneuvering took turn, after he had made a separation, he returned it over to the Trainee.

On the third and fourth flights, the altitude of approach angles were corrected. He had tendencies to decrease the speed after the midpoints of the final approaches, but the Trainee showed an attitude to keep up the flight specifications, the flights were good in overall.

On the fifth flight, again the approach angle was getting high at the end, and then it looked like it was going to plunge in; therefore, the Instructor A instructed him to execute a go-around and told him that he was plunging in because he was excessively aware of the landing. There was no problem with the go-around operation itself.

At the start of the examination, the Instructor A thought to grant a solo flight if there was no problem after checking situations for four times including go-around operations, but with the situation he could not grant it, he decided to require monitoring more Trainee's flights.

On the sixth and seventh flights, the approach angles and approach speeds were corrected. The Trainee had tendencies to deviate the aircraft axis to left at the time of a flare operation, but he landed on the centerline of the runway; therefore, at this point, the Instructor A made his mind to grant a solo flight. Wind was calm right cross wind and stable. When the Instructor A asked the Trainee how he felt, he replied that he felt OK.

2.11 Handling of a Dropped Landing Following a High Flare Operation

Regarding how to cope with a dropped landing following a high flare operation, it is described as follows in "Aircraft maneuvering, Advanced Operation Version (Masaaki Tsuchiya, 2010, Hobun Shorin Co., Ltd., pp.56)." (Excerpts)

Like a beginner does, automatically operating a nose-up control without feeling any sinking sensation after the flare operation results in lifting and getting the nose too high to see the front causes a stall to drop and touch down. (Omitted)

In order to prevent a dropped landing, refine a landing skill and try to operate a flare (round-out) at proper height. (Omitted) When sensing a risk of a dropped landing, a pilot should immediately execute a go-around with full power.

2.12 Lessons Learned from the Similar Accidents

The Company took the following actions as measures after the accident occurred on March 24, 2011 at Kumamoto Airport where the Company owned aircraft was bounced upon landing during a solo flight training and suffered damage to the airframe;

- (1) Establishment of the policy to go-around (re-enforcement)

Make sure not to lose timing to decide to execute a go-around if one feels insecure at an approach or touchdown, or facing following cases, regardless of being a captain (an instructor), a Trainee, passenger on board, ground supervisor or others.

- When bounced, floated and flared at higher altitude;
- Likely to bounce, float and flare at higher altitude;
- (2) Reconfirmation of differences between a proper touchdown attitude and a tail strike attitude
- (3) Enforcement of safety criteria during a solo flight training
- (4) Enforcement of Supervision Procedure during a solo flight training, and the documentation
- (5) Designate the placement where a supervisor should be
- (6) Implementation of education for instructors
- (7) Implementation of special training for trainees
- (8) Revision of Lesson Plans

Specify and add the recovery procedure from a poor landing and others to the subjects and lesson plans of a flight training. Add the educating program of how to do when PFD failed. Add a poor touchdown and its recovery program to lesson plans at pre-flight checks for all of a solo flight training.

- Revision of Training Evaluation Table

Insert the evaluation items regarding the action taken for a poor touchdown and likes.

3. ANALYSIS

3.1 Qualification of Personnel

The Trainee had a valid student pilot permit. The Instructor A held both valid airman competence certificate and valid aviation medical certificate.

3.2 Airworthiness Certificate of the Aircraft

The aircraft had a valid airworthiness certificate and had been maintained and inspected as prescribed.

3.3 Relation to Meteorological Conditions

As described in 2.6, it was fair weather and wind was light breeze at 11:00 at the airport; accordingly, it is probable that the weather did not cause any troubles to the solo flight.

3.4 Pre-Solo Flight Examination and the Situation of the Solo Flight

3.4.1 Pre-Solo Flight Examination

As described in 2.10.2 (2), at the start of the examination, the Instructor A thought to grant a solo flight if there was no problem after checking situations for four times including go-around operations. The approach angles on the first and the second flights were too high, and then they were corrected on the third and fourth flights; however, as the approach on the fifth was like plunge in at the end of approach required to a go-around, he thought that the Trainee needed more trainings before a solo flight. Nevertheless the landing operations on the sixth and the seventh were proper for its speeds and approach angles; accordingly, the Instructor A judged that the Trainee could fly a solo.

The Instructor A, as correcting the tendencies of the Trainee to approach with high angle, confirmed the correctness of approaches on the sixth and the seventh flights, it is probable that he changed his original mind that granting a solo flight for the Trainee to require four correct landings including a go-around operation and granted him.

3.4.2 Development of Flight Training as a Solo Flight

As described in 2.1 (1), it is probable that the first touchdown had almost no problem, but for the second approach, the aircraft resulted in a high flare, dropped landing and bounced. Besides, it is probable that the aircraft strongly grounded again from the nose landing gear, the empennage struck the runway due to its reaction and

the go-around operation, and then the airframe was damaged. Regarding the fact that the aircraft resulted in a dropped landing following a high flare, it is probable that the Trainee had experienced landings with slightly high flares before and felt no enough danger; therefore, he continued the flare operation without a go-around to prevent the dropped landing as described in 2.11. The Trainee upon the second touchdown did not recognize the re-touchdown after the bounce of the airframe. About this, it is somewhat likely that after the touchdown by a large drop of the airframe, the bounce caused the strong impact that he had never experienced before; accordingly, he could not recognize the second touchdown due to his strong psychological disturbance.

3.5 Damages to the Airframe

Based on the description in 2.1 (1), it is probable that the aircraft had no abnormality up to the accident occurred. It is highly probable that the damage of the nose portion (near the nose strut attachment onto firewall aft of engine) described in 2.3.2 (1) was caused by receiving an overload acting upward at the nose landing gear section. It is highly probable that the damage to the empennage of the airframe described in 2.3.2 (2) was caused because its bottom surface hit and scratched the runway, and received the impact by the upward load.

3.6 Trainee's Skill Management

3.6.1 Trainee's Skill

As described in 2.10.2, regarding the Trainee's skill, the instructors in charge of L-19 and L-20 examinations evaluated as "he did not grasp the altitude to commence a flare operation", "he was apt to start a flare at high altitude because he operated a flare automatically without his grasp of feeling a sinking sensation" and "he had a tendency to increase an approach angle on the final approach just before a touchdown, as a result, it approached like a plunge." And at the take-off and landing training on the day with the Instructor A onboard, showed the tendency to keep the approach angle to be high. The Trainee had tendency to start a flare at high altitude, and from the state he repeated to approach like plunges; accordingly, it is probable that the Trainee had no sense of the flare operation sensuously. Therefore, it is somewhat likely that he did not have the skill to meet the level to execute a safe and stable landing operation for a solo flight.

3.6.2 Skill Management

As described in 2.10.1, since trainees receive instructions from multiple instructors, the skills of trainees were recorded by the instructor in charge of the training, using daily

training evaluation sheet for each training subject and an entry of observations; however, contents of entry were differed by each instructor and there were sheets that did not filled concrete contents such as altitude, speed, fluctuation of flight data.

Since daily training evaluation sheets meant to be for multiple instructors to understand objectively the skill of trainees, it is favorable to develop the entry guideline for the observations to enable to evaluate objectively with a unified viewpoint used by multiple instructors. Moreover, it is favorable to have a place for instructors to share the information about the skill of trainees and to promote a proper skill management.

3.7 Skill of Competence Prior to a Solo Flight

As described in 2.10.2 (2), from the situation of the take-off and landing training with the Instructor A onboard, the Trainee's Skill did not meet levels "to grasp the position of other aircraft in the traffic pattern and maintain or make a proper separation" and "*to execute a go-around on own decision for sure and cope properly with an instructor's instruction*" in "Items relating to the competence of a trainee" of "Check list to approve a solo flight competence" described in 2.8.2 and "to execute three successive landings safely" within an Achievement criteria of examining target of a pre-initial solo flight as described in 2.8.1.

The Instructor A assessed, when executing the onboard take-off and landing training, that it would require more time to grant a solo flight, but after checking the sixth and the seventh landing operations, he decided to grant it.

It is somewhat likely that the Instructor A granted a solo flight even though the Trainee did not fulfill the skill accreditation criteria set by the Company.

3.8 Monitoring and Instruction Methods for Supervisor during a Flight Training for a Solo Flight

As described in 2.9, the Company provides for a placement of a supervisor and the Supervision Procedure; however, as described in 2.7.1, when entering the Runway 32, being far from the tower, it is difficult to see and judge an approach angle, a flying attitude, a touchdown attitude, a sink rate and others; therefore, it is probable that the monitoring and instruction methods for supervisor were not sufficient to provide an instruction required for the Trainee without delay; accordingly, it is somewhat likely that this situation involved in the delay for the Instructor A to instruct the Trainee for a go-around. Moreover, as described in 2.1 (2), the Instructor used the term, "Power, power, power," as a go-around, but he should specifically use the term "Go-around" for an instantaneous communication as requirement.

4. PROBABLE CAUSES

In this accident, when the aircraft landed, it is probable that it made a dropped landing and bounced; subsequently, it strongly grounded again from the nose landing gear, the empennage struck the runway due to its reaction and the go-around operation, and then the airframe was damaged.

Regarding the reason why the aircraft made a dropped landing at its landing, it is probable that the Trainee continued a flare operation without executing a go-around to prevent a dropped landing, even though he felt that the altitude to commence a flare operation was slightly higher more than usual.

Regarding the reason why the Trainee continued the flare operation without executing a go-around to prevent the drop-landing, it is somewhat likely that his maneuvering skill was not the level to operate a safe and stable landing including a flare operation. Moreover, the Company did not have a proper skill management system for flight trainees and it allowed the solo flight training even though the Trainee's skill did not fulfill the Safety Criteria for Solo Flight established by it; besides, the methods for a supervision to monitor and an instruction for a solo flight training were inadequate; accordingly, it is somewhat likely that they contributed to the occurrence of the accident.

5. SAFETY ACTIONS

5.1 Safety Actions Taken by the Company after the Accident

- (1) Awareness building and provision of on go-around policy
 - Creating a new checklist to check the understanding degree of trainees on the go-around policy and promoting practical use of it.
- (2) Revising Supervision Procedure (Training Standard) at the time of a solo flight
 - Stipulate the execution to check an understanding degree regarding the go-around policy.
 - Stipulate an use of term “go-around” to instruct a go-around.
 - Stipulate a new installation of binoculars to monitor the Runway 32 and a regulation for its usage.
 - Add a flight experience for the instructor in charge of an initial examination to grant a solo flight permission (1000 hours or more for the aircraft type).
 - Stipulate a checklist to check the conditions to grant a solo flight permission.
- (3) Revision of the instructor appointment training and examination regulations
 - Add “Outlines of accident occurrence cases in the past in the Company and the lessons from the cases” and “the cases of the latest accidents and incidents and points to revise the regulations and likes” to a periodic training for instructors.
- (4) Enrichment teaching materials to grasp an approach angle
- (5) Create a new procedure how to use a daily evaluation sheet
 - Provide the entry guides for an evaluation criteria and an observation column.
 - Chief instructor of the course shall check the contents entered by the instructor in charge.
 - When low ratings continue, it should be executed to write the process, to share the information within a course and to reflect in the educational policy.

Figure 1 Estimated Flight Route

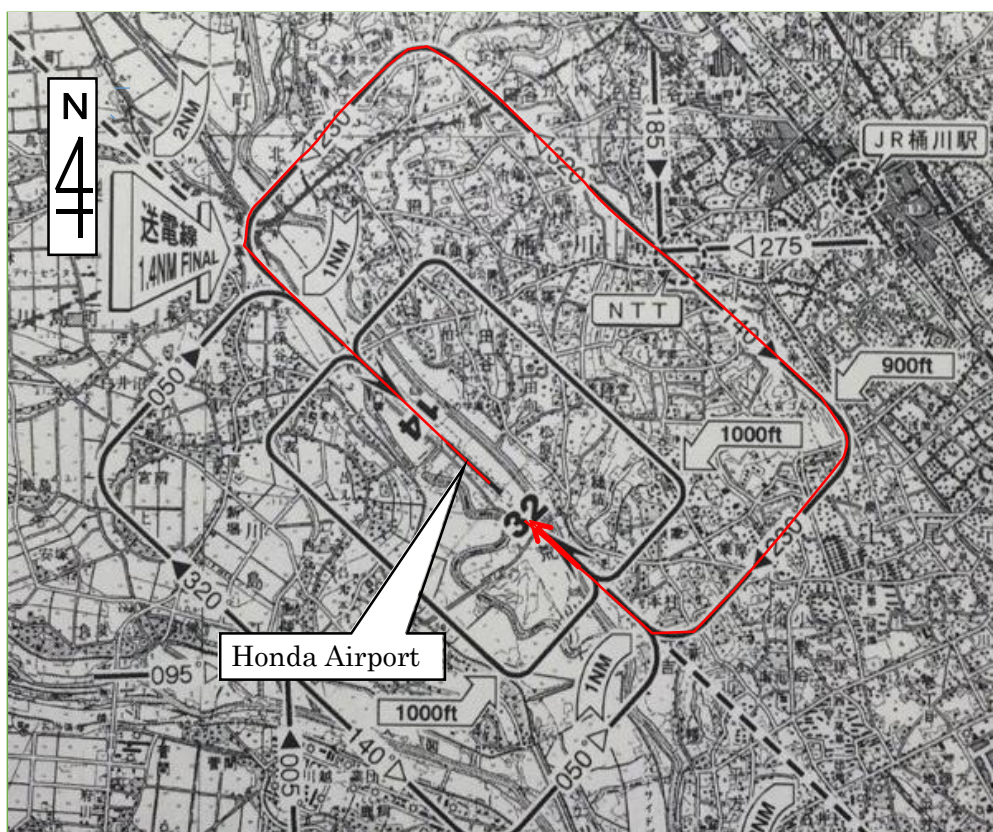
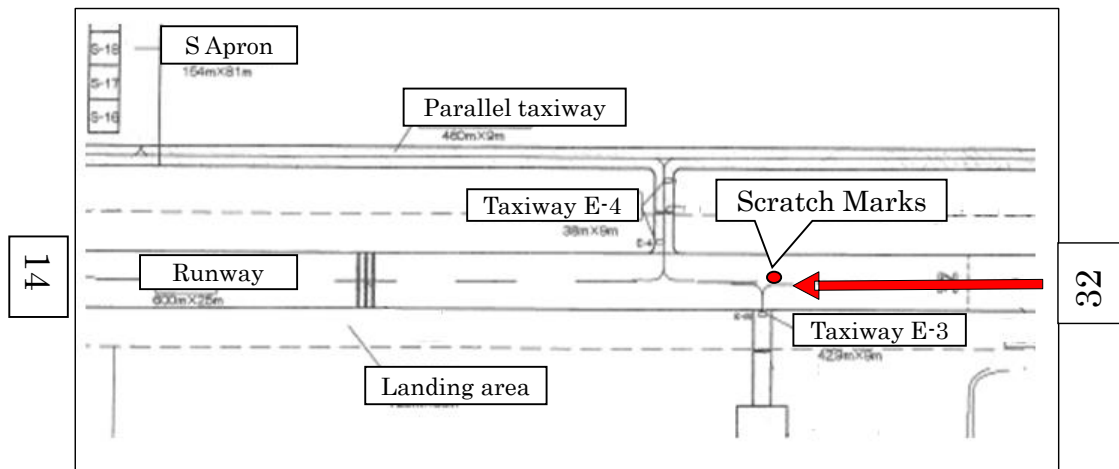


Figure 2 Three Angle View of Cessna 172S

Unit : m

