

AA2016-2

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**PRIVATELY OWNED
J A 3 8 5 7**

March 31, 2016



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

PRIVATELY OWNED CESSNA 172RG, JA3857 BELLY-LANDING AT KAGOSHIMA AIRPORT AT ABOUT 17:24 APRIL 26, 2015

February 26, 2016

Adopted by the Japan Transport Safety Board

Chairman	Norihiro Goto
Member	Shinsuke Endoh
Member	Toshiyuki Ishikawa
Member	Sadao Tamura
Member	Yuki Shuto
Member	Keiji Tanaka

1 PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident	<p>A privately owned Cessna 172RG, registered JA3857, took off from Iwami airport for an familiarization flight, and made a belly-landing when landing on Kagoshima Airport on Sunday, April 26, 2015. The Aircraft sustained damage.</p>
1.2 Outline of the Accident Investigation	<p>On April 27, 2015, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and other two investigators to investigate this accident.</p> <p>On May 1, 2015, the fact “the ground line of the switch to send signals to the gear warning depending on the status of the throttle was came off and the gear warning was not activated.” was sent to the Japan Civil Aviation Bureau as information obtained in the investigation.</p> <p>An accredited representative and adviser of the United States of America, as the State of design and manufacture of the aircraft involved in this accident, participated in the investigation. Comments were invited from parties relevant to the cause of the accident. Comments on the draft report were invited from the relevant States.</p>

2 FACTUAL INFORMATION

2.1 History of the Flight

A privately owned Cessna 172RG, registered JA3857 (hereinafter referred to as “the Aircraft”), two people onboard, consisting of the captain and a passenger, was planned to make a round trip for an familiarization flight between Kagoshima Airport and Iwami Airport on April 26, 2015. In the return flight, when landing on



Aircraft involved in the accident

Kagoshima Airport (hereinafter referred to as “the Airport”), the landing gear was not deployed and the Aircraft made a belly-landing. According to the statement of the captain, record of portable GPS receiver, and ATC communication record, the history of the flight was summarized as follows:

Before returning from Iwami Airport to the Airport, it was confirmed that there was no problem with weather. The Aircraft took off Iwami Airport at 15:39 JST (Japan Standard Time: UTC +9hrs).

During the flight, the front visibility decreased at the altitude of about 8,500ft on the east of Mt.Aso. The captain considered the visibility was reduced by volcanic smoke because volcanic smoke of Mt.Aso was observed. The Aircraft veered to north-west and climbed. During the climb, the surface of the earth was seen, however, the field of front vision became poor and the Aircraft almost plunged into the volcanic smoke. The captain was aware of risk of engine stop. Therefore made a flight from north to west of Mt.Aso and continued climb. The field of front vision was recovered at the altitude of about 12,500ft. Then, the captain made a flight to the Airport again.

The Aircraft started to descend to land at the Airport. However, the descent rate was not sufficient. Therefore, the captain extended the landing gear at about 8,500ft and the descent rate increased. After that, the captain planned approach to the Airport with the landing gear down. When the Aircraft descended to the altitude about 3,500ft, he retracted the landing gear in order to increase airspeed for landing on earlier because there was no traffic approaching to the Airport. He contacted the Kagoshima airport traffic control tower (hereinafter referred to as “Kagoshima tower”). Then Kagoshima tower told that using runway was 34, but runway 16 was also available due to the wind condition (runway 16 side: 230° 9kt and runway 34 side: 250° 9kt). The captain requested landing on the runway 16 that allowed earlier landing.

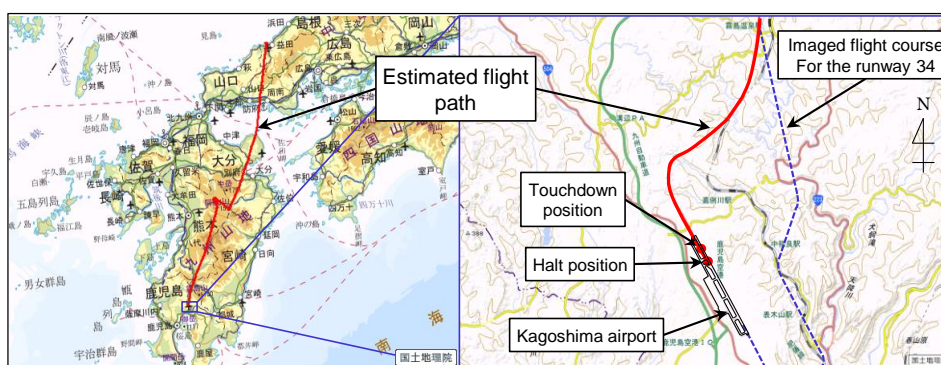
Before entering the base-leg, the captain monitored another aircraft requested the Kagoshima tower to land on the runway 34 and Kagoshima tower instructed to hold. The captain entered the final from left-base in a rather shortcut move in order to land on as early as possible. During this,

he extended flap to 20°. The condition of wind was 230° 9kt when the Kagoshima tower gave landing clearance with wind condition.

According to the wind condition, the crosswind component was about 8kt. Therefore, the captain did not extend the flap any more. Meanwhile, the captain always land with flap 20° in the case headwind more than 10kt or crosswind more than 5kt.

The captain thought something was wrong because the aircraft did not touch down at the usual altitude of touchdown. Immediately after that, the altitude became smaller than usual and he heard grazing sound of metal. He checked lower outside of the Aircraft and noticed that the landing gear was not extended.

After the Aircraft stopped, he reported the Kagoshima tower of landing without the gear down.



Estimated flight course

The captain once extended the landing gear to increase the descent rate for landing and retracted the gear to increase the airspeed. He planned to extend the gear on downwind before entering the base-leg. However, he directly entered the base-leg because he changed runway to land on, and worried about other traffic landing, he forgot that he retracted the gear once extended.

Usually, the captain makes operations before landing on downwind using a checklist. At that time, he also used a checklist to make operations before landing. However, he missed the item of gear down because he had no mental and temporal capacity. He also forgot visual check of the gear down that was normally performed in final. He idled the engine before touchdown. However, the warning horn for the landing gear not extended was not sounded. The captain experienced the gear warning horn before. He said he would notice it if the warning horn sounded.

This accident occurred about 17:24, on April 26, 2015, on the runway 16 of the Airport (Latitude 31° 48' 33" N and Longitude 130° 42' 56" E).

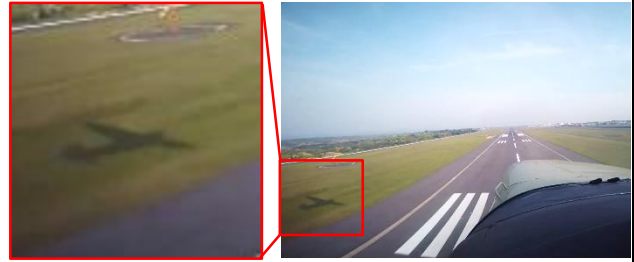
2.2 Injuries to persons	None
2.3 Damage to Aircraft	<p>(1) Extent of Damage: Substantially damaged</p> <p>(2) Damage to parts of the Aircraft</p> <ul style="list-style-type: none"> • Scratch marks on the lower part of the fuselage • Deformation and damage of propeller

<p>2.4 Personal information, etc</p>	<p>Captain Male, Age 48</p> <p>Private pilot certificate (Airplane) June 21, 2010</p> <p>Pilot Competency Assessment Expiration Date: August 11, 2016</p> <p>Class 2 aviation medical certificate Validity: June 24, 2016</p> <p>Total flight time 378 hr 37 min</p> <p>Flight time in the last 30 days 30 hr 46min</p> <p>Total flight time on the type of aircraft 260 hr 46 min</p> <p>Flight time in the last 30 days 28 hr 46 min</p>
<p>2.5 Aircraft information</p>	<p>(1) Type: Cessna 172RG</p> <p>Serial number:172RG 0123, Date of manufacture: October 5, 1979</p> <p>Airworthiness certificate: DAI – 2014 – 214 Validity: July 21, 2015</p> <p>Total flight hours 3,177 hr 05 min</p> <p>Flight time after last periodic inspection (200hr inspection on April 20, 2015) 7 hr 45min</p> <p>(2) It is estimated that the weight and the position of the center of gravity (CG) of the Aircraft were within the allowable range at the time of the accident.</p> <p>(3) Gear system</p> <p>Extension and retraction function of the gear system were normal.</p> <p>(4) Gear warning system</p> <p>The gear warning is sounded when any one of the following conditions is met without extending the gear.</p> <ul style="list-style-type: none"> • Throttle is almost at the idle position (Manifold pressure is about 12inHg or less). • Flap is extended more than 20°. <p>The gear warning was not sounded when the throttle was set to the idle position with the gear retracted in the Aircraft investigation. The warning was sounded when the flap was set to 30° with the gear retracted.</p> <p>One of the two screws that fix the switch to send signals to the gear warning depending of the status of the throttle onto the throttle control linkage part is lost and the ground wire of the switch was came off. It was confirmed that the gear warning was sounded in case of the throttle was set to the idle position when came off ground wire was connected.</p> <div data-bbox="986 1375 1442 1653" style="text-align: right;"> </div> <p style="text-align: center;">Switch attachment status</p>
<p>2.6 Meteorological information</p>	<p>Observation values of aviation weather during the time period relevant to the accident at the Airport were as follows:</p> <p>17:00 Wind direction 230°, Wind velocity 8kt, Visibility 20km</p> <p>Clouds: Amount FEW(1/8~2/8), Cloud type cumulus, Cloud base 4,000ft, Amount BKN(6/8~7/8), Cloud base: unknown,</p> <p>Temperature 23°C, Dew point 6°C</p> <p>Altimeter setting (QNH) 30.10inHg</p>

2.7 Additional information

(1) Video picture

Picture of the Aircraft landing on the Airport was recorded by the video camera carried on the Aircraft.



The shadow of the Aircraft immediately before landing was recorded on the picture. The shadow shows that the landing gear was not extended.

(2) Flight manual

No item to check the gear warning is mentioned in the flight manual of the Aircraft.

Operations before landing are described as follows:

4-2. CHECKLIST PROCEDURES (Normal operation)

(an omission)

4-2-9. BEFORE LANDING

- 1. Seats, belts, shoulder harnesses · · ADJUST and LOCK.*
- 2. Fuel Selector Valve · · · · · BOTH.*
- 3. Landing Gear · · · · · DOWN (below 140KIAS).*
- 4. Landing Gear · · · · · CHECK (observe main gear down and green indicator light illuminated)*
- 5. Mixture · · · · · RICH*
- 6. Carburetor Heat · · · · · ON (apply full heat before closing throttle)*
- 7. Propeller · · · · · HIGH RPM*
- 8. Autopilot (if installed) · OFF*

(3) Maintenance of the Aircraft

According to the maintenance record and the mechanic who performed daily maintenance of the Aircraft, the periodic inspection (50, 100, 200hr) of the Aircraft and maintenance of the gear warning system during the last six months were as follows. The periodic inspection was repeated at the flight time. 200hr periodic inspection includes items of 100hr and 50hr periodic inspection and 100hr periodic inspection includes items of 50hr periodic inspection.

- October 30, 2014: Carburetor replacement
- November 8, 2014: 50hr periodic inspection
- December 25, 2014: 100hr periodic inspection
- February 3, 2015: Adjustment of gear warning and test flight
- February 7, 2015: 50hr periodic inspection
- April 20, 2015: 200hr periodic inspection

On October 30, 2014, the gear warning was adjusted as an activity accompanying the carburetor replacement. After that, on February 3, 2015, faulty setting of the gear warning was adjusted and test flight was

	<p>performed. However, the gear warning was not checked in the later periodic inspections.</p> <p>(4) Check items of the gear warning of the Aircraft</p> <p>According to the manufacturer of the Aircraft, the gear warning system is checked in 100hr periodic inspection. The gear warning system is checked in the following inspection items.</p> <p><i>MODEL 172RG SERVICE MANUAL</i> <i>SECTION 2 : GROUND HANDLING, SERVICING, CLEANING, LUBRICATION AND INSPECTION</i> <i>RETRACTION SYSTEM</i> (An omission)</p> <p><i>4. Check adjustment and operation of the main gear up and down indicator switches, nose gear up and down indicator switches and nose gear squat switch.</i></p> <p><i>Check indicator for proper operation.</i></p> <p>Adjustment procedure of gear warning by throttle is described in MODEL 172RG SERVICE MANUAL “Section 5, 5-41, RIGGING THROTTLE-OPERATED GEAR WARNING HORN MICROSWITCH.”</p>
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3 ANALYSIS

3.1 Involvement of weather	No
3.2 Involvement of pilot	Yes
3.3 Involvement of equipment	Yes
3.4 Analysis of known items	<p>(1) Belly-landing</p> <p>It is highly probable that the Aircraft belly landed and the lower surface of the Aircraft was damaged because the captain did not extend the landing gear.</p> <p>It is probable that the captain forgot the gear once extended was retracted and skipped check of gear down in the operation before landing using the checklist because he felt mentally trapped because he thought the Aircraft plunged into the volcanic smoke during flight and other traffic were waiting for landing, and he did not go through downwind where usually the landing gear was extended because the period before landing got short due to the runway change.</p> <p>Additionally, the captain confirmed the gear warning horn before. It is probable that he may notice the gear was not extended if the horn was sounded, and it is somewhat likely that the relatively he thought the gear was extended until touch down because the horn did not sound, as stated later in (3).</p> <p>(2) Use of checklist for safe flight</p> <p>It is probable that he did not securely performed procedures based on</p>

	<p>the checklist because the captain skipped the gear down item when using the checklist for landing operation.</p> <p>Checklist is not only for secure operation but also for checking the status of the aircraft depending on flight status. It is probable that it is necessary to operate and check securely without skipping the checklist items even if pilots do not have mental or temporal capacity.</p> <p>(3) Gear warning</p> <p>It is probable that the gear warning horn was not sounded even if the throttle was set to idle because the flap was set to 20° when landing due to crosswind and the ground wire of the switch for gear warning was came off.</p> <p>It was not possible to determine when the ground wire of the switch for gear warning was came off. It is probable that abnormal ground wire could be noticed if the gear warning was checked during 200hr periodic inspection (including 100hr periodic inspection) performed about one week before the occurrence of this accident. If so, it is somewhat likely that the captain may notice the gear not extended by the gear warning horn sound.</p>
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4 PROBABLE CAUSES

<p>In this accident, it is highly probable that the Aircraft belly landed and the lower part of the Aircraft was damaged because the captain did not extend the landing gear in landing.</p> <p>It is probable that the captain did not extend the gear because he forgot he retracted the gear once extended and skipped check of the gear down according to the checklist.</p> <p>Meanwhile, it is somewhat likely that the relatively the captain thought the gear was extended until touch down because the gear warning horn was not sounded.</p>
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5 SAFETY ACTIONS

<p>On May 1, 2015, Japan Civil Aviation Bureau, receiving factual information from the Japan Transport Safety Board, notified All Japan Air Transport and Service Association Co., Ltd. and Japan Aircraft Pilot Association of making members know the information about the viewpoint of preventing aircraft accidents.</p>
