

AA2016-3

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**PRIVATELY OWNED
J A 5 9 F B**

April 28, 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

DAMAGE FROM BELLY LANDING
A PRIVATELY OWNED
PIPER PA-28R-201T, JA59FB
CHOFU AIRFIELD
AROUND 16:41 JST, OCTOBER 12, 2014

March 25, 2016

Adopted by the Japan Transport Safety Board

Chairman	Kazuhiro Nakahashi
Member	Toru Miyashita
Member	Toshiyuki Ishikawa
Member	Sadao Tamura
Member	Keiji Tanaka
Member	Miwa Nakanishi

SYNOPSIS

<Summary of the Accident>

On Sunday, October 12, 2014, at around 16:41 (JST: UTC+9hr, unless otherwise stated, all times are indicated in JST on a 24-hour clock), a privately owned Piper PA-28R-201T, registered JA59FB made a belly landing causing the airframe to be damaged when landing on the runway 17, of Chofu Airfield .

The Pilot and two passengers were on board the aircraft, but there were no injured.

The airplane was substantially damaged, but there was no outbreak of fire.

<Probable Causes>

It is highly probable that this accident occurred while the alternator of the JA59FB failed during the flight and it is highly probable that the pilot did not notice this and continued flight with the power of battery only, which caused decreased battery voltage, and in spite of this, the emergency landing gear extension operation was not made and the gears were not down, causing the belly landing, with the airframe damaged.

It is probable that an emergency landing gear extension operation was not made because the pilot thought that the gears had already being down with normal operation and the confirmation and the operation of the emergency gear extension procedure described in the Airplane Flight Manual were not appropriately executed.

It is somewhat likely that a delay in recognition of the alternator failure by the pilot was due to the fact that the alternator annunciator light did not illuminate because of failure and the ammeter located in the instrument panel in front of the forward left seat was hard to check for the seated in the right seat.

This report uses the following abbreviations

ATIS: Automatic Terminal Information Service
TCA: Terminal Control Area
VFR: Visual Flight Rules
VOR: VHF Omni-directional Radio range

Conversion table

1 kt:	1.852 km/h (0.5144 m/s)
1 ft:	0.3048 m
1 lb:	0.4536 kg
1 nm:	1,852 m
1 in:	2.54 cm
1 inHg:	3,386 Pa

1. PROCESS AND PROGRESS OF AIRCRAFT ACCIDENT INVESTIGATION

1.1 Summary of the Accident

On Sunday, October 12, 2014, at around 16:41 Japan Standard Time (JST: UTC+9hr, unless otherwise stated, all times are indicated in JST on a 24-hour clock), a privately owned Piper PA-28R-201T, registered JA59FB made a belly landing causing the airframe to be damaged when landing on the runway 17 of Chofu Airfield .

The Pilot and two passengers were on board the aircraft, but there were no injured.

The aircraft was substantially damaged, but there was no outbreak of fire.

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

On October 13, 2014, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and an investigator to investigate this accident.

1.2.2 Representatives from Relevant States

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

1.2.3 Implementation of the Investigation

October 14, 2014: On-site investigation, aircraft examination and interviews

October 15, 2014: Interviews

October 16 2014: Battery examination

October 17, 2014: Airframe electrical system and electrical equipment tests

October 20, 2014: Interviews

November 11, 2014: Landing gear operation test and the annunciator light electrical continuity test

November 14, 2014: Radio communication equipment test

1.2.4 Comments from the Parties Relevant to the Cause of the Accident

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

1.2.5 Comments from the relevant State

Comments on the draft Final Report were invited from the relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight

On October 12, 2014, a privately owned Piper PA-28R-201T, registered JA59FB, took off from Akita Airport at around 14:40 for the familiarization flight with a pilot on the right front seat and two passengers on the left front and rear seat bound for the Chofu Airfield (hereinafter referred to as "the Airfield").

The outline of the flight plan for the Aircraft was as follows:

Flight rules: VFR

Departure aerodrome: Akita Airport

Estimated off-block time: 14:40

Cruising speed: 130 kt

Cruising altitude: VFR

Route: Yuzawa, Yamagata, Shirakawa, Sekiyado

Destination aerodrome: Chofu Airfield

Fuel load expressed in endurance: 3 hr

Persons on board: Three

The history of the flight up to the accident is summarized as below, according to the statements of pilot, passengers A and B, and witness.

(1) Pilot

The pilot, sat in the right front seat at the Akita Airport, checked the illumination annunciator light (to be described 2.8.3) illumination before starting the engine and the illumination of annunciator light illumination after starting the engine using the test switch , and the alternator output with the ammeter; accordingly, he confirmed there were no anomalies. Besides, the pilot checked normal operation of cranking with the starter on starting the engine.

The aircraft took off from the Akita Airport at 14:40 and there was no malfunction with the radio communication equipment in radio communication on leaving the Akita control zone.

The pilot, one hours and 20-30 minutes after taking off around Nasu VOR, received ATIS *1 from Tokyo and Narita International Airports to check the weather conditions.

The pilot changed the radio frequency of the aircraft to that of the Chofu flight services*2 station ("flight service") over the Sekiyado VOR (about 25 nm north east of the Airfield), but no radio exchange of communication between other aircraft and the flight service was heard. Later, the pilot tried to call the flight service over Oizumi (visual reporting point about 6 nm north east of the Airfield) for landing several times, but no response from the flight service. Since no anomalies were indicated in the frequency display of the radio communication equipment, the pilot changed the frequency and tried to monitor the "Tokyo TCA*3" but could not be received the signal.

*1 "ATIS (Automatic Terminal Information Service)", refer to the continuous repetitive broadcast of recorded information for aircraft operation such as weather ATC procedure airport conditions and operational conditions of navigation aids.

*2 "Flight service station" refers to a radio facility operated by the founder of the relevant airport or administrator for the aircraft telecommunications for flight assistance.

*3 "TCA (Terminal Control Area)" refer to the service in approach control areas, especially those with many VFR (Visual Flight Rules) aircraft, aircraft traffic information or the position information for the relevant aircraft is made available.

Circling above the Oizumi area, the pilot checked the engine instruments and found the ammeter indicated 0 (zero); ensuring that the alternator-related circuit breaker ^{*4} was not tripped, the pilot reset the alternator switch as a measure against alternator failure, but there was no change of the ammeter indication.

The pilot concluded that in addition to the alternator failure of the battery capacity has been decreased ; therefore turned off the switches of all electrical devices, such as including transponder, excluding the alternator and No.1 and No.2 radio equipment, in order to reduce the power load. The pilot conducted the measures against the alternator failure all in his memory without confirming the description of the aircraft flight manual.

The pilot also called the flight service at Inokashira (visual reporting point about 2.8 nm north east of the Airfield) with no response, and then transmitted one-way information of the position of the Aircraft watching other aircraft according to the "Chofu Airfield Flight Method in the event of the failure of the radio equipment" and made a right angle flight from east to west of the runway at an altitude of 1,500 ft.

The pilot confirmed the windsock in the Airport and decided to use runway 17 and entered the right downwind for the runway 17.

The pilot requested the passenger (the passenger A, as described later) sat in the left front seat to lower the landing gear with operating the gear lever. The pilot noticed that the three landing gear position indicators did not illuminate after the gear lever was operated, but he concluded that the landing warning devices ^{*5} (gear warning) did not function despite reduced power condition because of the low battery in addition to the alternator failure and also thought that the aircraft was under the gear extension condition; therefore, he continued the approach to the runway. Since the aircraft was already approaching the vicinity of the Airfield, the pilot decided not to transmit with the transponder 7600 used in the event of the radio communication failure, as well as because of the Airfield being unable to monitor the transponder transmission code.

The pilot made the normal operation for landing, but he felt the aircraft floated and touched down a little bit foreshore on the runway then he saw that, with an abnormal noise, tips of the propeller blades bent and rotated; accordingly he realized the aircraft had made a belly landing.

When the aircraft d on the runway, the pilot turned off all the switches and closed the fuel selector valve of the Aircraft.

The pilot ensured that the passengers were all safe and all evacuated from the aircraft.

There was no fuel leakage and there was no outbreak of fire.

(2) Passenger A

Passenger A has a private pilot certificate and had been on a familiarization flight for the maneuvering of the aircraft. On the day of the accident, he had done training of a series of take-offs and landings at the Odate-Noshiro Airport and changed the maneuver with passenger B (later described). After the training of the Passenger B,

*4 "Circuit breaker" refers to a protection device for breaking the circuit by protruding a knob to prevent the electrical device from wiring damage or breakage when the capacity for current flowing in the device or wiring for the electrical circuit is exceeded.

*5 "Landing warning device" refers to an audible sound and warning light to the pilot when landing gear is not in the right down position while the aircraft is ready to land.

he took sat in the left front seat again and made a flight to Akita Airport.

Passenger A did not feel the anomalies in the Aircraft during his maneuver.

Passenger A recognized no anomalies with the engine operation when the engine started at the Akita Airport and after take-off radio communication when the aircraft leaved the Akita control zone.

Passenger A did not realize any anomalies in the instruments during the cruise and he did not remember the ammeter indication.

The pilot called the flight service over Oizumi before landing, but there was no response.

Passenger A remained sat in the left front seat front from Akita Airport onward but he never took control; the aircraft maneuvering from the Akita Airport to the Airfield was made by the pilot in the right front seat; the only exception is the gear lever operation by passenger A for the gear extension on the traffic pattern as requested by the pilot. Passenger A felt it odd because he did not feel the airframe vibration, wind noise change and decreasing of the aircraft speed which are usually felt on gear extension operation, but he did not tell the pilot anything.

(3) Passenger B

Passenger B has a private pilot certificate and had been on a familiarization flight with the maneuvering of the aircraft. On the day of the accident, he had done training of a series of take-offs and landings at the Odate-Noshiro Airport after passenger A, then changed the maneuvering and the controls took the rear seat.

Since passenger B took the rear seat he did not know the flight entirely, but he did not notice any anomalies until the aircraft electrical troubles over Oizumi.

(4) Witness

The witness, engaged in communication work in the control tower in the Airfield, heard noisy signals a couple times which seemed to be calls for the flight service at about 16:35, but could not understand what was transmitted.

The witness sent a response for confirmation of the radio transmission; on confirming the flight plan, the witness recognized that the aircraft was the only one to be arriving at the Airfield during the time period and, in the middle of it, kept sending the registration number of the aircraft.

The witness visually recognized the aircraft on the runway 17 final leg at about 16:39. Later, the witness visually recognized on the short final leg that the aircraft landing gears were not down, and repeatedly transmitted over the radio "Check, Gear-down" (alert to the overlooked gear-down operation).

This aircraft accident occurred on the runway of the Airfield (35°40'18" N and 139°31'41" E) and the time of this accident was around 16:41 on October 12, 2014.

(See Figure 1: Estimated Flight Route and Accident Site Layout)

2.2 Injuries to Persons

Nobody was injured or killed.

2.3 Damage to the Aircraft

2.3.1 Extent of Damage

The aircraft was substantially damaged.

2.3.2 Damage to the Aircraft Components

- (1) Fuselage Damage to the lower section
- (2) Propeller Damage to both blades
- (3) Flaps Damage to the lower surfaces



Photo 1. Accident Aircraft (Provided : Chofu Airfield Management Office, Tokyo Metropolitan Government)

2.4 Personnel Information

Pilot: Male, age 72

Private pilot certificate (Airplane)	November 2,2011
Type rating for Single Engine Land	April 12, 1969
Pilot Competency Assessment/Confirmation	March 24, 2014
Validity	March 24, 2016
Flight Instructor certificate (Airplane)	May 26, 1971
Class 2 aviation medical certificate	
Validity	January 28, 2015
Total flight time	15,551 hr 12 min
Flight time in the last 30 days	3 hr 35 min
Total flight time on the type of aircraft	348 hr00 min
Flight time in the last 30 days	0 hr 00 min

The pilot previously held a commercial pilot certificate but changed to a lower class certificate and acquired the current certificate (private pilot certificate).

2.5 Aircraft Information

2.5.1 Aircraft

Type	Piper PA-28R-201T
Serial number	28R-7803159
Date of manufacture	January 2, 1978
Certificate of airworthiness	No.To-25-446

Validity	December 4, 2014
Category of airworthiness	Airplane Normal N
Total flight time	3,060 hr 49 min
Flight time since last periodical check (50-hr check on July 10, 2014)	20 hr 22 min

(See Figure 2: Three Angle View of Piper PA-28R-201T)

2.5.2 Weight and Balance

When the accident occurred, the weight of the aircraft was estimated to have been about 2,553 lbs and that the position of center of gravity (CG) was estimated to have been 88 in to the rear of the reference line, both which were estimated to have been within the allowable ranges (maximum landing weight of 2,900 lbs and CG range of 81.7 in to 90.0 in corresponding to its weight at the time of the accident).

2.5.3 Fuel and Lubricating Oil

The Fuel was aviation gasoline 100LL and the lubricating oil was Phillips X/C MIL-L-22851.

2.6 Meteorological Information

Aviation special weather report of the Airfield

16:42 Wind direction 160°, Wind velocity 7 kt, Prevailing visibility 15 km
 Clouds: Amount FEW, Type Cumulus, Cloud base 4,000 ft
 Temperature 20°C, Dew point 8°C
 Altimeter setting (QNH) 30.20 inHg

2.7 Detail Circumstances of the Accident Site and Damage

2.7.1 The Accident Site Description

The Airfield is an airfield for public that Tokyo Metropolitan Government manages, with an elevation about 42 m, paved runway of 800 m in length, 30 m in width with 60 m stopway areas on both ends. The runway is provided with the designation markings of 17/35 showing magnetic bearings as well as centerline marking and halfway marking.

The accident location is on the runway of the Airfield and there was a first touch down mark: the propeller slashes almost on the centerline marking about 16 m north of the halfway marking of the runway. Besides, the aircraft came to halt at about 205 m south of the halfway marking, about 3 m west of the centerline marking, with the nose to the south-southeast. On the runway are some scratch marks left caused by the airframe between the first touch down mark and the stop position.

(See Figure 1: Estimated Flight Route and Accident Site Layout)

2.7.2 Details of Damage

(1) Fuselage

Damage to the primary structure members (keels) in the bottom of the fuselage

Partial wear to the various antennas and boarding step equipped at the lower of the fuselage

(2) Propeller

Both blades damaged with the tips bent backward

(3) Flaps

Damaged to the inside portions of flaps (right and left) on the trailing edges of the main wings

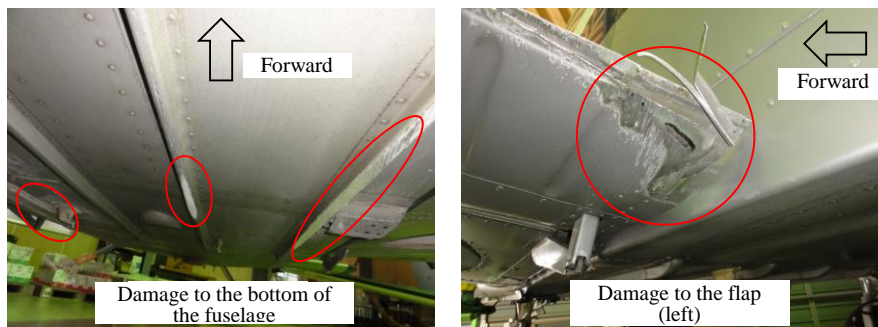


Photo 2: Situation of damage

2.8 Tests and Researches

2.8.1 Test and Research on the landing gear system

(1) Result of the landing gear system operational test was described below.

After charging the battery, normal gear operational test by operating the landing gear lever showed the gear-up and gear-down operated normally and also the landing gear position indicators normally operated: lighting on and off.

In addition to that the gear warning horn and light in the landing warning device also functioned normally.

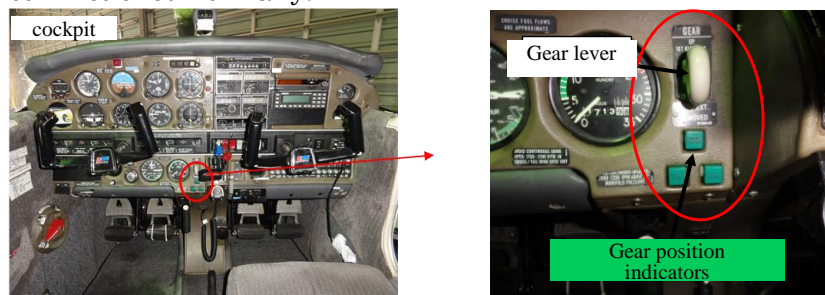


Photo 3: Gear lever and Gear position indicators

Emergency gear extension test with the aircraft power supply turned off showed that the normal gear extension status was accomplished in about three seconds on operation of the emergency gear lever and the gears locked to the down position.



Photo 4: Emergency gear lever

(2) Information on the aircraft emergency gear extension operation

There was a record of the flight test for the airworthiness certification for the aircraft in which all the gears operated normally with the emergency gear extension test and the gear position indicators also illuminated normally.

On moving the aircraft after the accident, a mechanic operated the emergency gear-down lever and the all the gears normally downed.

2.8.2 Survey by electrical system

Result of the survey of the electrical system of the aircraft was described below.

(1) Alternator

The disassembly inspection of the alternator revealed the wiring to the negative terminal of the field coil was disconnected showing the alternator of the aircraft did not have a normal function.

There was no anomaly in the alternator related circuit breaker and there was no evidence of overcurrent in the circuit.

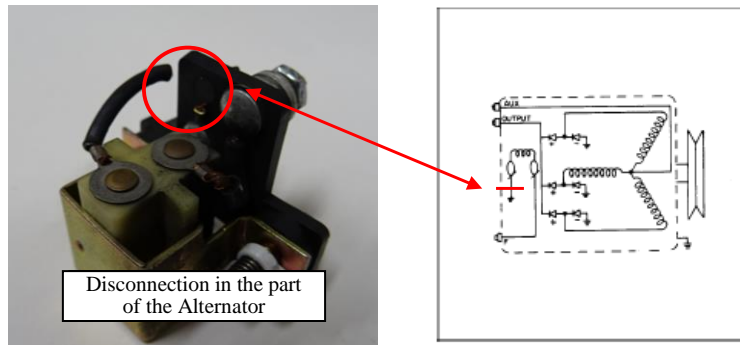


Photo 5: Disconnection in the part of the Alternator (Figure)

(2) Battery

The lead battery installed on the aircraft is rated at 12 V of voltage and the electrolyte specific gravity is 1.290 when fully charged. It was installed in the aircraft on December 1, 2011. Voltage and electrolyte specific gravity were measured; the electrical load on the battery reduced the battery voltage down to about 6.8 V and the electrolyte specific gravity was from 1.15 to 1.20 (20°C).

"Aircraft Maintenance Engineer Handbook (Revised Edition)" The Japan Aeronautical Engineers' Association, (2013) has the following description and table regarding the electrolytes and the charge amount for the lead battery.

(Excerpts)

(4) *Battery capacity can be easily estimated by measuring the specific gravity. This is because the relationship between the discharge amount and the specific gravity is linear; since the specific gravity when the battery is fully charged is 1.290 (20°C), the discharged state in the middle can be estimated.*

Table. *Relationship between specific gravity and charged amount*

<i>Electrolyte specific gravity</i>	<i>Charged status</i>
<i>1.290</i>	<i>100%</i>
<i>1.248-1.243</i>	<i>75%</i>
<i>1.207-1.190</i>	<i>50%</i>
<i>1.166-1.146</i>	<i>25%</i>
<i>1.125-1.100</i>	<i>Fully discharged</i>

The battery of the aircraft, when applied to the relation between the specific gravity and the charged amount, shows that its battery level decreased to about 50% or less.

The battery of the aircraft was visually checked externally by a mechanic or an operator or the electrolyte refilled as needed every 30 days and there were the periodical check records.

However, the measurement of the specific gravity of the electrolyte was not defined in a document such as the maintenance manual of the aircraft and those values were not recorded.

2.8.3 Annunciator lights (Warning lights)

The annunciator lights of the aircraft are placed in the front panel at the left front seat; when the alternator output, oil pressure or of the engine lubricating system or vacuum pressure is low, the respective light is illuminated, alerting the pilot to the occurrence of the anomalies. When turning on the battery switch before starting the engine, all the annunciator lights will be illuminated if they are normal.

The survey revealed that an electrical wiring in the annunciator light of the alternator was disconnected; even when its output decreased below the specified value, it was not illuminated. With the lamp lighting test; however, where the annunciator lighting lamp status (lamp enabled/disabled status) is checked with the test switch, it turned on normally because the current does not pass through the point where the electrical wiring was disconnected.

In the Airplane Flight Manual of the aircraft, there was a check item for the annunciator light by pressing the test switch after starting the engine.

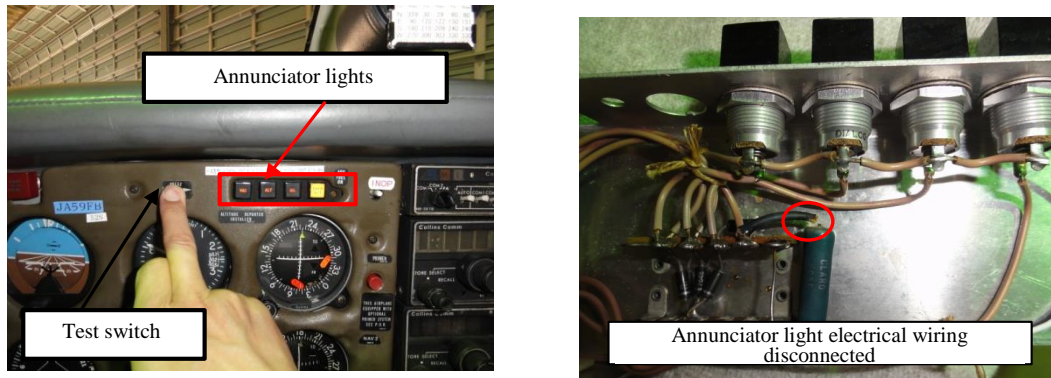


Photo 6: Annunciator Lights (Warning Lights)

2.8.4 Radio communication equipment test

The radio communication equipment installed in the aircraft was tested by the company where the periodical radio test for it had been conducted.

With the specified voltage and current were applied to the radio communication equipment, a transmit and receive tests was performed, and then no anomalies were found.

When the input voltage to the radio communication equipment was gradually decreased, noise is mixed at about 10 V with the transmit and receive being disabled and the frequency display on the device became dark at 7 to 8 V, making the identification of the numerals difficult.

2.9 Additional Information

2.9.1 Normal landing gear down and gear up system and emergency gear extension system

(1) Normal landing gear down and gear up are achieved with operating the gear lever; the electronic hydraulic pump is activated and the hydraulic pressure allow the gear to be extended and retracted.

According to the aircraft manufacturer, the minimum operating voltage for the electronic hydraulic pump installed in the aircraft is about 12 V.

When the landing gear is extended, it is mechanically down-locked; when it is retracted; however, there is no up- locked mechanism and it is held in the up position with the hydraulic pressure.

(2) If the electronic hydraulic pump does not operate due to electrical system failure, the emergency gear extension operation can be used for extending the landing gears (no power is required).

Pressing down the emergency gear-down lever located between the left and right front seats the gears to be free fell with their own weights from the up-locks and locked into the down position.

(3) The Airplane Flight Manual has the following description for emergency gear extension system.

(Excerpts)

Emergency gear-down

Before starting the emergency gear-down operation

Master switch Check it is on

Circuit breaker *Check*
Instrument panel light *Off (daytime)*
Gear position indicator (lamp works) *Check*
Emergency gear lever *Up position*
When gear down and lock state cannot be assured
Airspeed *Decrease lower than 88 KIAS*
Gear selector *Gear-down position*
If the gear still does not lock to the down position, press the emergency gear down lever to the "Emergency down" position and hold it.
If it still does not lock to the down position, move the aircraft body vigorously right and left using the rudder.

2.9.2 Procedures for Alternator failure

The Airplane Flight Manual of the aircraft has the following description as the procedures in the event of the alternator failure.

Alternator failure
Check whether it fails.
Reduce the power load as much as possible.
Alternator
Circuit breaker *Check*
Alternator switch *Off (1 second), later On*
If the output cannot be recovered
Alternator switch *Off*
Reduce the power load and land as soon as possible.
If the battery is fully discharged, use the emergency gear-down procedure to lower the gear. Gear position indicators are not lit.

2.9.3 Aircraft's battery power supply rated capacity and the usage load current

Battery installed in the aircraft has the capacity rated of 35 AH*6.

Result of the investigation showed the usage load current during the flight of the aircraft averaged about 25 to 30 A per hour based on the usage situation of the instruments and radio equipment.

2.9.4 Ammeter

The aircraft has an ammeter equipped with the front panel to the left of the base of the control wheel shaft to the left front seat for indicating the current value output by the alternator driven by the engine.

When the alternator is not driven (engine stopped) or when the alternator is driven but in failure, the ammeter indicates zero.

*6 "AH" refers to a unit of battery capacity, generally represented as a current (A) delivered to the electrical load multiplied by time (H) as ampere-hour (AH).

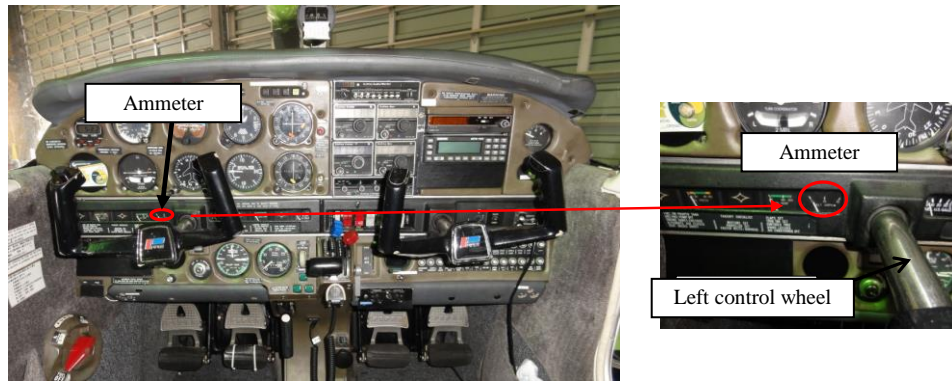


Photo 7. Ammeter

2.9.5 Check list

The aircraft check list made available on board and used by the pilot was created by himself by referring to the Airplane Flight Manual of the aircraft and contained the descriptions of the normal operation items, but not include the emergency operations such as "alternator failure" or "emergency gear extension."

2.9.6 Radio communication equipment failure procedures

The following descriptions are prescribed for the flight in the event of radio communication equipment failure.

(1) Ordinance for Enforcement of the Civil Aeronautics Act

Article 206 (Air navigation in the case of communication equipment failure)

Aircraft shall follow the following methods when there is a failure in communication equipment and intend to navigate in a control area, control zone or information zone.

(i) *If in visible meteorological conditions, it shall maintain visible meteorological conditions and continue flight, and shall land at the nearest airport etc. where it is deemed to be possible to land safely, and shall immediately notify an air traffic control provider of its landing.*

((ii) to (iv) omitted)

(2) Aeronautical Information Manual Japan(AIM-j) (Compiled by NPO AIM-Japan Editorial Association, Published by Japan Aircraft Pilot Association, Sections 581 and 582)

(Summary)

Try to reestablish the radio communication first, and if the recovery is not possible, use the transponder, if available, to transmit 7600 and the VFR aircraft should fly toward the Tower of the airport where a safe landing is presumed to be possible while blinking the landing light then execute a landing by the instruction by the light gun*7 at the Tower airport.

(3) Flight route and flight methods in the event of radio communication equipment failure

*7 A light gun (ATC light signal) refers to an used in airports with air traffic control service when radio communication is disabled. Using the signals from the airport controller by means of the different combinations of light colors (green, red, white) for minimum transmission of information issued to the aircraft, vehicles or persons. This was not provided in the Airfield, because traffic control service is not available there.

over the Airfield

The Airfield has its own designation for the flight route and methods in case of the radio communication equipment failure of the aircraft for the safety of the flight, and the description as below is shared among persons who use the Airfield.

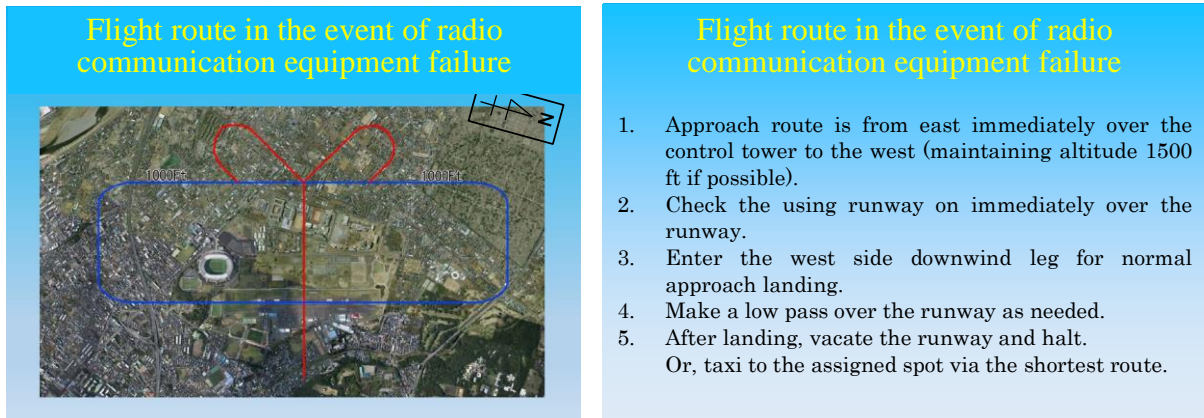


Figure: Flight route in the event of radio communication equipment failure at Chofu Airfield

3. ANALYSIS

3.1 Airman Competence Certificate and Aviation Medical Certificate

The pilot held a valid airman competence certificate and a valid aviation medical certificate.

3.2 Airworthiness Certificate

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

3.3 Effects of Meteorological Conditions

As described in 2.6, it is considered the meteorological conditions at the time of the accident were not related to the occurrence of this accident.

3.4 Alternator and Battery Voltage Conditions

According to the statement of relevant parties as described in 2.1, it is probable that the aircraft had no battery voltage anomalies before flight at the Akita Airport because there were no anomalies on starting the engine only with the battery power.

The check list used by the pilot contains the description of the check item for the confirmation of the value of the ammeter before take off, and the pilot stated that there were no anomalies for the ammeter. Accordingly, it is somewhat likely that the alternator failure have taken place after leaving the Akita Airport on the day of the accident.

As described in 2.8.4, the radio communication equipment on the aircraft disabled to transmit or receive when the input voltage became lower than about 10 V and the visual

check of the frequency indication became difficult when the input voltage was as low as about 7 to 8 V. As described in 2.1, there were no anomalies for receiving the radio information around Nasu VOR; therefore, it is probable that the battery voltage was maintained at about 10 V at there. Later, while there were no anomalies for the frequency indication in the radio communication equipment before approaching the Airfield for landing, the receiving and transmitting capabilities were disabled. Consequently, it is somewhat likely that the aircraft battery voltage became as low as about 8 to 10 V.

Considering the load current during the flight and the battery rated capacity as described in 2.9.3, it is somewhat likely that the battery power alone would keep the aircraft flying for maximum of about one hour if the battery was new; however, it is likely that the battery installed in the aircraft about three years ago the accident could have deteriorated in performance; therefore, so it cannot be clarified when the alternator failure occurred.

3.5 Landing Gears Operating System Conditions

As described in 2.8.1, it is probable that there were no anomalies in the landing gears operation of the aircraft either for normal and emergency operations.

According to the statement in 2.1 (1), after the pilot acknowledged the alternator failure of the aircraft, he performed the gear extension operation with the normal procedure for landing at the airfield. As described in 2.9.1 (1), the minimum voltage required for the operation of the electronic hydraulic pump installed for the landing gear system of the aircraft is about 12 V while it is probable that the battery power was reduced as low as 8 to 10 V due to the alternator failure. Therefore, it is probable that the landing warning devices did not work with the battery power of the aircraft and it is probable that the normal operation of gear extension using the electronic hydraulic pump was disabled. In spite of the gear position indicators were not illuminated, it is highly probable that the pilot did not perform the emergency gear extension operation in the Airplane Flight Manual described in 2.9.1 (3).

3.6 Situation between the Radio Communication Failure to the Recognition of the Electrical Power Supply Malfunction

According to the statement of the relevant parties, as described in 2.1, it is probable that there were no anomalies with the aircraft radio communications at the time of departure from the Akita Airport.

After the radio communication at the time of leaving the Akita control zone, the pilot did not perform the communications with other air traffic control facilities until the radio transmission to get the landing information from the Airfield. It is probable that it was not until passing over the visual reporting point of the Airfield that the pilot recognized the radio communication was disabled.

As described in 2.8.2 (1), it is probable that the alternator of the aircraft could not generate power, but it is also probable that the annunciator light which should be illuminated in this situation was disabled from lighting due to the disconnected electrical wiring as described in 2.8.3. Regarding this disconnection, the pilot stated that the annunciator light did illuminate without any anomaly when he turned on the battery switch before starting the engine at the Akita Airport. According to the statement of the pilot, it indicated that the

wiring was not disconnected before starting the engine but rather after starting the engine. However, it was not possible to determine when the disconnection occurred could not be estimated from the disconnected conditions.

As described in 2.9.4, the alternator failure of the aircraft can be checked with the lowered ammeter indication (zero). However, it is somewhat likely that finding the alternator failure was delayed due to poor line of sight to the ammeter on the instrument panel overshadowed by the left front seat control wheel leave while the pilot was seated on the right front seat.

The pilot sat in the right front seat where few instruments were equipped with. Considering the disadvantaged position making it difficult to check the instruments, as compared with the left front seat where significant instruments are located for the seat, it is probable that more attention should have been paid to the instruments during the flight. A pilot seated on the left front seat should also be aware of this fact and monitor the instruments.

3.7 Situations Leading to the Belly Landing

It is high probable that the pilot did not use the transponder to transmit 7600 and did not turn on the landing light as described in 2.9.6 (2) because the pilot thought that the aircraft had already approached close to the Airfield and the flight service cannot monitor the transponder transmission code and the instruction by the light gun signals would not be executed at there; besides the light gun signals.

As described in 2.1 (1), the pilot lowered the landing gear with operating the gear lever to land at the Airfield, and when the gear position indicators did not illuminate the pilot thought it was due to the electrical failure related to the alternator and the battery and assumed that the gear retracted with the normal operation and progressed with approaching for landing in that situation. If the pilot performed the procedure in the event of the alternator failure exactly according to the Airplane Flight Manual described in 2.9.2 at the time he recognized the alternator failure, it is probable that he would have recognized the necessity of emergency landing gear extension, resulting in the completion of the emergency landing gear extension in 2.9.1 (3), free from the assumptions.

As described to in 2.9.5, the check list created and used by the pilot did not include the description of the emergency operations such as "alternator failure" or "emergency landing gear extension." Even after his recognition of the power loss, he did not confirm the description of the emergency operation in the Airplane Flight Manual. It is probable that the pilot should have confirmed the Airplane Flight Manual description for the emergency operation procedure and should have properly performed it.

Moreover, under the circumstances of the alternator failure and the low battery, the pilot performed only the normal operation procedures; he did not confirm the down-locks and did not conduct the emergency landing gear extension procedure as described in the Airplane Flight Manual, leading to the belly landing at the Airfield.

As described in 2.1. (2), although the passenger A had an odd feeling on extending the gears, he stated that he did not tell the pilot that feeling about the gear extension operation.

If passenger A, a certified pilot, had conveyed his feeling of oddness to the pilot, it is somewhat likely that the pilot would have reconfirmed the landing gear extension operation of the aircraft.

4. PROBABLE CAUSES

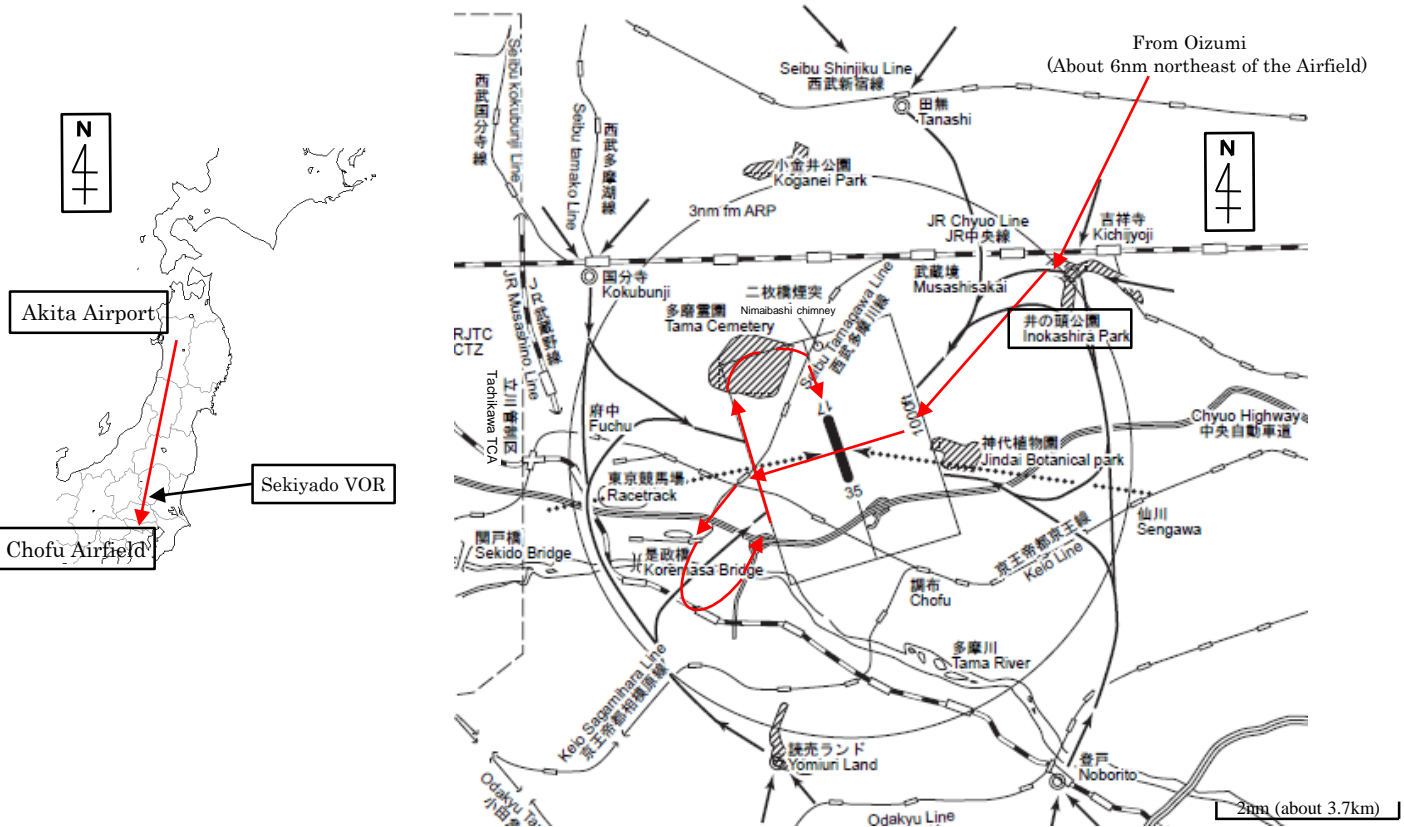
It is highly probable that this accident occurred while the alternator of the aircraft failed during the flight and it is highly probable that the pilot did not notice this and continued flight with the power of battery only, which caused decreased battery voltage, and in spite of this, the emergency landing gear extension operation was not made and the gears were not down, causing the belly landing, with the airframe damaged.

It is probable that an emergency landing gear extension operation was not made because the pilot thought that the gears had already being down with normal operation and the confirmation and the operation of the emergency gear extension procedure described in the Airplane Flight Manual were not appropriately executed.

It is somewhat likely that a delay in recognition of the alternator failure by the pilot was due to the fact that the alternator annunciator light did not illuminate because of failure and the ammeter located in the instrument panel in front of the forward left seat was hard to check for the seated in the right seat.

Figure 1: Estimated Flight Route and Accident Site Layout

<Estimated Flight Route>



Source: AIP (Aeronautical Information Publication) Chofu Airfield "Traffic Pattern and Standard Approach Route for Traffic Pattern"

<Accident Site Layout View>

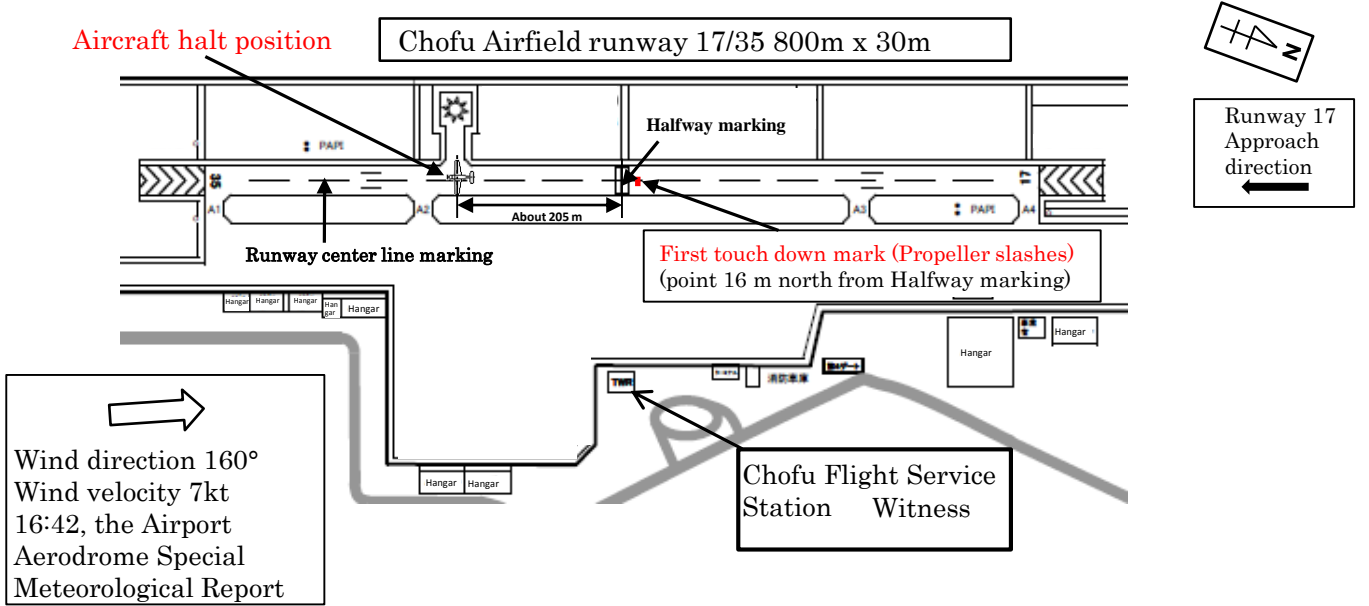


Figure 2: Three Angle View of Piper PA-28R-201T

Unit: m

