

AA2015-8

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**PRIVATELY OWNED
J A 4 0 1 7**

December 17, 2015



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.

Norihiro Goto
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

COLLISION WITH REVETMENT WALL DURING GO-AROUND A PRIVATELY OWNED MOONEY M20K, JA4017 KITAKYUSHU AIRPORT, JAPAN AROUND 17:22 JST, NOVEMBER 16, 2014

November 27, 2015

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

SYNOPSIS

<Summary of the Accident>

A privately owned Mooney M20K, registered JA4017, took off from Yamaguchi-Ube Airport for familiarization flight at around 16:58 Japan Standard Time (JST: UTC+9hr: unless otherwise stated all times are indicated in JST) on Sunday, November 16, 2014. While landing on Runway 18 of Kitakyushu Airport, the aircraft bounced on touchdown and the captain attempted to go-around, but it yawed to the left and collided with a revetment wall at around 17:22.

The captain and one passenger were on board the aircraft, and both of them were seriously injured.

The aircraft was destroyed but there was no outbreak of fire.

<Probable Causes>

It is probable that this accident occurred when, as the Aircraft was executing a go-around, it yawed to the left because the captain could not respond appropriately to the effect of the propeller characteristics of a single engine plane, and flew while maintaining low speed and low altitude because the speed and lift needed for a go-around did not increase, causing it to collide with a revetment wall with a height of about two meters above ground from the fore left of the airframe.

Concerning the fact that the captain could not respond appropriately to the effect of the propeller characteristics of a single engine plane, it is somewhat likely that he could not respond appropriately to the fact that the direction of movement of the airframe had yawed to the left due to the rapid increase in power at low speed, by for example depressing the right rudder pedal, because he was distracted by roll control and was also struggling with pitch control.

Concerning the fact that speed and lift did not increase, it is somewhat likely that, immediately after the captain had increased engine power, he retracted the flaps in near stall speed, as a result of which he could not respond appropriately to the nose up moment which increased as the flaps retracted, the angle of attack became excessive, speed did not increase, and lift did not increase either.

It is somewhat likely that the fact that the captain had not experienced or practiced the go-around in a Mooney M20K type of aircraft contributed to the fact that he could not carry out appropriate rudder and flap operations.

Abbreviations used in this report are as follows.

GPS:	Global Positioning System
KCAS:	Knots Calibrated Air Speed
KIAS:	Knots Indicated Air Speed
MP:	Manifold Pressure
RPM:	Revolutions Per Minute
VFR:	Visual Flight Rules

Unit conversion table

1 ft:	30.48 cm
1 in:	2.540 cm
1 inHg:	33.86 hPa
1 kt:	1.852 km/h
1 lb:	0.4536 kg

1. PROCESS AND PROGRESS OF THE ACCIDENT INVESTIGATION

1.1 Summary of the Accident

A privately owned Mooney M20K, registered JA4017, took off from Yamaguchi-Ube Airport for familiarization flight at around 16:58 Japan Standard Time (JST: UTC+9hr: unless otherwise states all times are indicated in JST) on Sunday, November 16, 2014. While landing on Runway 18 of Kitakyushu Airport, the aircraft bounced on touchdown and the captain attempted to go around, but it yawed to the left and collided with a revetment wall at around 17:22.

The captain and one passenger were on board the aircraft, and both of them were seriously injured.

The aircraft was destroyed but there was no outbreak of fire.

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

On November 16, 2014, the Japan Transport Safety Board designated the investigator-in-charge and two investigators to investigate this accident.

1.2.2 Representatives and Advisers of the 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

November 17-19, 2014: Interviews, examination on accident aircraft, on-site investigation and information gathering

January 16 and 17, 2015: Interviews, examinations on the accident aircraft and an aircraft of the same type

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 were invited from the relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight

On November 16, 2014, a privately owned Mooney M20K, registered JA4017, (hereinafter referred to as “the Aircraft”) took off from Yamaguchi-Ube Airport for familiarization flight with the captain sitting in the left seat and a passenger in the right seat at around 16:58.

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

Flight rules: VFR

Departure aerodrome: Yamaguchi-Ube Airport

Estimated off-block time: 16:55

Cruising speed: 140 kt
Cruising altitude: VFR
Route: Mutsure
Destination aerodrome: Kitakyushu Airport
Total estimated elapsed time: 40 min
Fuel load expressed in endurance: 3 hr and 00 min
Persons on board: Two

The history of the flight up to the accident was summarized as follows according to the statements of the passenger and the Air Traffic Controller at Kitakyushu Airport (hereinafter referred to as “the Controller”). However, no statement in this regard has been obtained from the captain since he has no memory of the history of that day’s flight owing to the impact of the accident.

(1) Passenger

On the day of the accident, the captain and passenger planned to make a round trip flight between Kitakyushu Airport and Yamaguchi-Ube Airport. The captain made preparations such as conducting a preflight inspection and checking the fuel level. The passenger has a pilot certificate, but his aviation medical certificate had expired; therefore, he did not have control of the Aircraft but sat in the right seat as a person in charge of communicating with air traffic control.

On landing at Kitakyushu Airport, the Aircraft bounced twice as it touched down. When it bounced, the Aircraft was aligned with the runway, and there was no malfunction sign in the Aircraft. After the second bounce, the passenger thought that the Aircraft might porpoise*¹, and advised the captain to go-around*². Immediately after that, the captain applied to full power and started a go-around maneuver, but the nose yawed to the left and the Aircraft deviated from the runway flying at low altitude. At that time, the passenger felt that the pitch was unstable and that the captain was struggling with pitch control*³. Although it was just after sunset, the surrounding area was as bright as daytime and visibility outside was good.

The passenger confirmed that the captain extend the flaps to the full-down position on landing, but he could not remember how the captain was operating the flaps and landing gears during the go-around, while the passenger himself did not carry out any assistance of control operation.

(2) The Controller

At the time of the accident, the Controller was in charge of controlling the Aircraft at the tower. When the Controller gave landing clearance, the wind direction was between 170° and 180°, wind speed was three kt, and visibility was good. The Aircraft flew in as usual, and seemed to have touched down as normal near the runway centerline between taxiways T-1 and T-2. The Aircraft then appeared to lift off again just after passing through the side of taxiway T-2 and suddenly change the heading to the left while flying at low altitude, before finally colliding with the revetment wall.

*1 “Porpoise” 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.

*2 “Go-around” is a maneuver whereby a landing is aborted and the aircraft is taken back into the air to attempt another landing.

*3 “Pitch control” refers to control of the upward and downward movement of the nose of an aircraft.

This accident occurred at the revetment wall on the east side of the runway at Kitakyushu Airport (latitude 33°50'59" north, longitude 131°02'10" east), around 17:22 on November 16, 2014. (See Figure 1: Estimated Flight Route Captured from GPS Records, Figure 2: Schematic View of the Accident Site, Photo 2: Empennage Contact Marks, Impact Scars and Halt Position)

2.2 Injuries to Persons

Two persons, the captain and the passenger, suffered serious injuries including fractures.

2.3 Damage to the Aircraft

2.3.1 Extent of Damage

Destroyed

2.3.2 Damage to the Aircraft Components

Entire fuselage:	Distorted and cracked
Front of fuselage:	Broken
Left main wing:	Broken off
Engine:	Mount broken
Propeller:	Detached
Right main landing gear:	Down lock mechanism damaged
Nose landing gear:	Down lock mechanism damaged

(See Photo 1: The Accident Aircraft)

2.4 Personnel Information

Captain	Male, Age 55	
Private pilot certificate (Airplane)		
Rating for single engine (land)		November 15, 2004
Class 2 aviation medical certificate		
Valid until		December 18, 2014
Specific pilot competence review		
Expiration Date of Piloting Capable Period		April 26, 2016
Total flight time		845 hours 12 minutes
Flight time in the last 30 days		6 hours 57 minutes
Total flight time on the type of aircraft		13 hours 43 minutes
Flight time in the last 30 days		6 hours 57 minutes

2.5 Aircraft Information

2.5.1 Aircraft

Type	Mooney M20K
Serial number	25-1135
Date of manufacture	August 14, 1987
Certificate of airworthiness	Dai-2014-307
Valid until	September 9, 2015
Category of airworthiness	Airplane, Normal N
Total flight time	1,403 hours 47 minutes
Flight time since last periodical check (100-hr check on July 27, 2014)	23 hours 01 minutes

2.5.2 Engine

Type	Continental TSIO-360-MB1
Serial number	279341-R
Date of manufacture	October 31, 2006
Total time in service	147 hours 51 minutes
Date of installation to the Aircraft	July 27, 2014
Time in service since last overhaul (performed on May 14, 2013)	23 hours 01 minutes

2.5.3 Weight and Balance

When the accident occurred, the weight of the Aircraft was estimated to have been 2,819 lb and its position of center of gravity (CG) was estimated to have been 45.6 in aft of the reference datum line. Both of them were estimated to have been within the allowable ranges (maximum take-off and landing weight 2,900 lb and CG range 43.2-49.3 in corresponding to the weight of the Aircraft at the time of the accident).

2.5.4 Fuel and Lubricating Oil

The fuel was Avgas 100LL and the lubricating oil was Royco MIL-C-6529 Type II.

2.6 Meteorological Information

The aviation weather reports for Kitakyushu Airport immediately after the accident were as follows:

17:27 Wind direction 170°; Wind speed 3 kt; Prevailing visibility 25 km
Cloud: Amount 1/8-2/8; Type Cumulus; Cloud base 3,000 ft
Temperature 14°C; Dew point 5°C; Altimeter setting (QNH) 30.23 inHg

2.7 Information on the AFM

(1) AFM of the Aircraft

In Section IV “Normal Procedures” in the Airplane Flight Manual (hereinafter referred to as “AFM”) of the Aircraft, it is stated under procedures for “*BEFORE TAKEOFF*” and “*TAKEOFF*”, *after Flaps operation check, flaps should be set at takeoff position (Ten Degrees) and that nose wheel should be lifted at 67 KIAS*⁴, and under procedures for “LANDING”, that the airspeed on final*⁵ should be 75 KIAS (Full Flaps)*. The following statement is also described. (Excerpt)

GO AROUND (BALKED LANDING)

CAUTION

*From a flaps extended and power at idle trimmed condition*⁶, the force required for nose down pitch control will rapidly increase when Maximum Continuous Power (MCP) is applied and as flaps are fully retracted. Little control force change will be experienced when retracting the landing gear.*

*4 “KIAS” refers to indicated airspeed, using figures expressed in units of knots (kt).

*5 “Final” refers to the final approach for landing.

*6 “Trimmed condition” here refers to a state in which adjustments have been made so that the upward and downward steering force can be reduced in accordance with the speed, flap angle, power and other aspects of the airframe.

Power 36.0" MP and 2700 RPM
Mixture VERIFY FULL RICH
Flaps After climb established TAKEOFF position
Trim Reduce control force by trimming
 NOSE DOWN
Airspeed Accelerate to 77 KIAS
Landing Gear RETRACT
Flaps RETRACT
*Cowl Flaps**7 OPEN
Airspeed Accelerate to 94 KIAS
 (Omitted)

“Performance Chart” in Section V “Performance” in the AFM of the Aircraft includes the following statement concerning the stall speed at 0 angle of bank, angle of bank versus stall speed. (Excerpt)

<i>GROSS WEIGHT</i>	<i>2,900 lbs</i>		<i>2,600 lbs</i>	
	<i>KCAS</i> *8	<i>KIAS</i>	<i>KCAS</i>	<i>KIAS</i>
<i>GEAR AND FLAP POSITION</i>				
<i>GEAR UP, FLAPS 0° (FULL UP)</i>	<i>62.5 kt</i>	<i>61.0 kt</i>	<i>59.0 kt</i>	<i>58.0 kt</i>
<i>GEAR DOWN, FLAPS 10° (TAKEOFF position)</i>	<i>61.5 kt</i>	<i>60.5 kt</i>	<i>58.5 kt</i>	<i>58.0 kt</i>
<i>GEAR DOWN, FLAPS 33° (FULL DOWN)</i>	<i>57.5 kt</i>	<i>59.0 kt</i>	<i>54.5 kt</i>	<i>56.5 kt</i>

*Conditions: CG position forward. Power idle.

(2) AFM of the Cessna 172RG

Section 4 “Normal Procedures”, “CHECKLIST PROCEDURES” in the AFM for the Cessna 172RG (hereinafter referred to as “the Cessna”), which the captain used to own before purchasing the Aircraft, includes the following statement. (Excerpt)

LANDING

Balked Landing

- 1. Power* FULL THROTTLE and 2700 RPM
- 2. Carburetor heat* COLD
- 3. Wing flaps* RETRACT to 20°
- 4. Climb Speed* 55 KIAS
- 5. Wing Flaps* RETRACT slowly after reaching 65 KIAS
- 6. Cowl Flaps* Open

(Omitted)

Moreover, SECTION 4 “NORMAL PROCEDURES”, “AMPLIFIED PROCEDURES” in the AFM for the Cessna includes the following statement. (Excerpt)

LANDING

BALKED LANDING

In a balked landing (go-around) climb, the wing flap setting should be reduced to 20° immediately after full power is applied. After all obstacles are cleared and a safe altitude

*7 “Cowl flaps” are openable and closable flaps attached to openings where cooling air flowing into the engine casing is discharged. The amount of cooling air discharged is regulated by adjusting the opening of these flaps.

*8 “KCAS” refers to calibrated airspeed, using figures expressed in units of knots (kt) to represent indicated airspeed corrected for positional and instrument error. In standard atmospheric pressure at sea level, it is equal to true airspeed.

and airspeed are obtained, the wing flaps should be retracted.

(Omitted)

2.8 Difference Between the Aircraft and the Cessna in the Operation of Flap Switch

The flap switch on the Cessna has detents which stop the movement of the switch lever at the 0°, 10°, 20° and 30° positions. When a pilot sets the switch lever to the intended position, the flaps move to the selected angle by its tracking function, and then automatically stop there. A pilot can confirm the angle by looking at the flap position indicator after the flaps have stopped.

By contrast, the flap switch on the Aircraft is a three position switch with “Up”, “Neutral” and “Down”. When a pilot moves down the switch from Neutral to Down position, the flaps move down accordingly, but if he or she takes his or her hand away, a spring causes the switch to return to the Neutral position and the flaps extension stops. When the switch is put at the Up position, the switch will stay at the Up position even if the hand is taken away, and the flaps will continue to move up unless the switch is returned to the Neutral position manually. Therefore, when a pilot intends to move the flaps up, he or she must move the flap switch manually to the neutral position after moving up it while looking at the flap position indicator. The flap position indicator displays “Up”, “Takeoff” and “Down” positions. In addition, then the operating time of the flaps was measured on the ground using another aircraft of the same type, the time from FULL DOWN to the TAKEOFF position was about four seconds, and the time from the TAKEOFF position to FULL UP was about two seconds.

2.9 Information on Accident Site and Wreckage

Trace marks left when the empennage and the right and left main wheels touched down were confirmed on the grass area just in front of the revetment wall with which the Aircraft collided. There were impact scars on the surface of the revetment wall on the extension of the empennage contact mark, and the direction from the contact mark to the impact scars was 130°. In addition, the surface of the revetment wall was also scored by marks left when the Aircraft collided from the left wing tip and slid to the right along the revetment wall while maintaining its heading at the time of the collision, and by propeller slash marks. The revetment wall with which the Aircraft collided stood at a height of about two meters from the ground, was made of concrete and ran parallel to the runway at a distance of about 160 m east of the runway centerline.

The three control knobs for the throttle of the Aircraft, the mixture and the propeller pitch were all at the most fore and in the full power positions. There were signs that the engine spark plugs had been firing normally. The flap switch was in the Up position, and the flaps were FULL UP. As for the elevator trim, the switch / circuit breaker for the electric trim were on, and the trim screw nut beneath the cabin floor was in the nose up position. In addition, circuit breakers related to the flight control system including the electric trim remained on. While push-pull rods and torque tubes are used for the steering force transmission mechanism of the flight control system, the operational status of the flight control system could not be confirmed as these were bend and refraction together with the airframe. As for the landing gears, the operating switch was in the landing gear down position and the left main landing gear had extended normally, but the down lock mechanisms of the right main landing gear and the nose landing gear were damaged.

Additionally, the cockpit roof and the left control wheel had been cut away to assist the rescue operation.

(See Figure 2: Schematic View of the Accident Site, Photo 1: The Accident Aircraft, Photo 2: Empennage Contact Marks, Impact Scars and Halt Position, and Photo 3: Propeller Slash Marks on Revetment

Wall Surface)

2.10 Additional Information

2.10.1 Statements of the Captain and the Joint Owner Concerning the Controllability of the Aircraft

(1) Captain

The captain could remember events up to the evening before the accident day, but did not remember at all of his behavior from the morning of the day of the accident.

The Aircraft has a faster cruising speed than the Cessna previously owned by the captain, and there are a lot of operational procedures before landing, such as operating cowl flaps before landing, confirming parking brake off; therefore, the operation is trouble same. The sensation on landing of the Aircraft is not so different from that of the Cessna, and the approach speeds are also similar. The two aircraft have different switch structures, but there is no sense of oddness when operating flaps. When stopping the flaps at a given position, the switch has to be returned to the neutral position when they reach the intended position while looking at the flap position indicator, but the captain had never had any trouble with the operation. He had experienced small bounces when landing in the past, but not a large one. He had not experienced or practiced a go-around in the Aircraft, but he fully understood the procedure. If the flaps of the Aircraft are downed from the half way position to Full Down on landing, the nose down tendency is larger than that of the Cessna. He had heard from the joint owner that its nose would be difficult to control if the flaps were upped while the trim setting was for full down flaps. He had never operated the trim manually as it was easier and quicker to use the electric trim. Moreover, he had practiced the go-arounds many times in the Cessna.

As for the refueling, he had filled the fuel tank before a flight on November 8. No abnormalities were seen in the Aircraft until this accident.

(2) Joint owner

The joint owner purchased the Aircraft jointly with the captain in September 2014. Compared to the Cessna, the Aircraft is as powerful as a sports car, but is prone to bouncing because rubber is used in the landing gear shock absorbers and is difficult to land. The joint owner had previously experienced executing go-arounds twice and landing after it had bounced. In addition, the joint owner had informed the captain that the Aircraft to bounce.

If the flaps are extended during landing, the nose up trim has to be made bigger. During a go-around, the flaps retract into the TAKEOFF position, but if the switch is not stopped at the TAKEOFF position and the flaps are retracted to FULL UP, pitch control becomes difficult because quite a lot of power is needed to control and maintain the nose with the nose up trim assumed for landing.

2.10.2 Handheld GPS Records

According to the retained records from the handheld GPS receiver (hereinafter referred to as “GPS”) brought into the Aircraft by the people on board, after taking off from Yamaguchi-Ube Airport it flew via the Kanmon Straits before making its approach to Runway 18 of Kitakyushu Airport. The ground speed*9 of the Aircraft on its final approach, as calculated from GPS records, changed from about 83 kt to 75 kt, and the ground speed after passing T-2 onwards, where the

*9 “Ground speed” is the horizontal speed of a flying aircraft relative to the ground.

Aircraft lifted off again, was about 57 kt. From passing T-2 onwards, in the records for 17:22:10, the Aircraft was flying near the runway centerline, but in the records for 17:22:15, it had yawed from the runway to the left. If the Aircraft flew at this speed after veering, the time of collision is estimated to have been about 17:22:21.

(See Figure 1: Estimated Flight Route Captured from GPS Records)

2.10.3 Yawing to the Left

The Aircraft was fitted with a clockwise propeller. On yawing to the left due to P-factor, torque reaction and the influence of the propeller slipstream, the content stated in Japan Aeronautical Engineers Association, Eds. “Aerodynamics I: Propeller Aircraft” (JAEA, 2006, p.101) and Kazuo Ochiai, “Aviation Engineering Course 1: Aerodynamics” (JAEA, 2003, p.77 and p.103) can be summarized as follows.

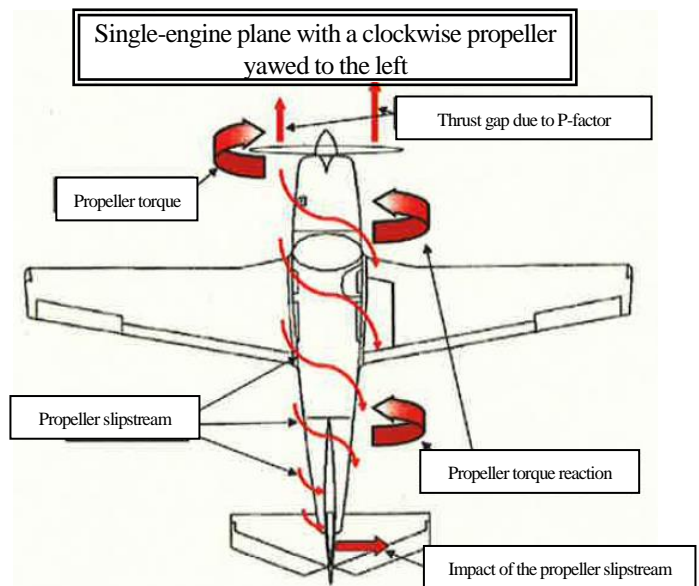
(1) P-factor

The angle between the direction of flight and the propeller rotation axis becomes larger as the slow flight speed at high engine power. In that case, the left-right asymmetry is generated in the thrust distribution of propeller surface; accordingly, it tends to yawing the nose to the left appear strongly in a clockwise propeller.

(2) Reaction of the propeller torque

When engine power suddenly increases, the torque applied to the propeller also suddenly increases. In reaction to this, a tendency arises for an airframe to be subjected to torque in the opposite direction to the propeller rotation and to roll to the left in clockwise propeller.

Torque reaction is easy to correct at high flying speed, when the ailerons come into good effect, but at low speed, there is a risk of going into a spin if the engine power is suddenly changed.



(3) Influence of the propeller slipstream

If the propeller is clockwise rotation, the propeller slipstream rotates to the right, and air stream blow against the vertical stabilizer from the left. Therefore, if the engine is set to high power and high revolutions during low speed, a tendency arises for the nose yaws to the left. When the flying speed is increased, the rudder becomes more effective and this tendency diminishes.

2.10.4 Corrective Action of Bounce during Landing

Generally, corrective actions of bounce depend on the height of the bounce, the strength of crosswind and the length of the runway. When the bounce is small and the runway is long, flare is performed in accordance with the sink and an appropriate touchdown attitude is adopted. When the bounce is large or there is a likelihood of being forced adrift by crosswind, a go-around is performed. If nose down operation is carried out during a bounce, there is a risk of touching down with the nose

landing gear and getting into porpoising.

2.10.5 Electric Trim

The Aircraft is installed an electric trim, and when the electric trim malfunctions, the pilot is alerted by a warning light and a sound alarm. The warning light also goes on when the power for the electric trim is switched off or when the system has not been given a pre-flight inspection. To operate the electric trim, a split control switch mounted on the top left of the left control wheel is moved up or down.

2.11 Information on the Rescue Operation

According to Kitakyushu Airport Office of Osaka Regional Civil Aviation Bureau, at the request from the Controller at 17:22, three fire trucks, one emergency rescue lighting car and one command car of the Air Safety Foundation were dispatched. In addition, twenty firefighting vehicles, one fireboat and one helicopter ambulance of Kitakyushu City Fire Bureau and one ambulance of Kitakyushu General Hospital were also dispatched.

3. ANALYSIS

3.1 Airman Competence Certificates

The Captain held both 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 Relationship to the Meteorological Conditions

According to the special observation weather reports immediately after the accident as described in 2.6 and the statements in 2.1(1) and (2), the meteorological conditions when the accident occurred were that wind was weak and visibility was good. Based on these observations, it is highly probable that meteorological conditions at the time of the accident were not related to the occurrence of this accident.

3.4 Relationship to the Aircraft Damage

As described in 2.9, it was unable to confirm the operational status of the flight control system owing to the Aircraft damage; however, the passenger states that there was no abnormality in the airframe, as described in 2.1(1); accordingly it is probable that there was no problem with the state of the airframe including the flight control system until this accident occurred. In addition, there were signs that the engine spark plugs had been firing normally and the revetment wall was scored by propeller slash marks as described in 2.9; therefore, it is highly probable that the engine had been working until the time of the collision. Moreover, the related circuit breakers including the electric trim had not been tripped as described in 2.9, and the passenger made no statement concerning the warning devices indicating the electric trim malfunction as described in 2.10.5; therefore, it is probable that the

electric trim was working normally. From these, it is probable that the state of the airframe was not related to the occurrence of this accident.

3.5 Situation from Go-around to Collision

- (1) As described in 2.1(1), the passenger states that he advised to go-around after the Aircraft had bounced twice on touchdown, and immediately after that, the captain applied full power and started a go-around maneuver, but the nose yawed to the left and it deviated from the runway flying at low altitude.
- (2) As described in 2.1(2), the Controller states that the Aircraft, after touching down normally, lifted off again near T-2 and suddenly changed the heading to the left, then collided with the revetment wall at low altitude.
- (3) As described in 2.9, the throttle knob of the Aircraft had been pushed to the most fore position, and the flaps were FULL UP which were confirmed at the accident site. In addition, the surface of the revetment wall also scored marks left when the Aircraft collided from the left wing tip and slid to the right along the revetment wall while maintaining its heading at the time of the collision.
- (4) Since the Aircraft bounced twice on touchdown as described in 2.1(1), it is somewhat likely that the speed had decreased significantly just before the go-around. According to the GPS records brought into the Aircraft as described in 2.10.2, its ground speed after passing T-2 onwards was about 57 kt. Since the wind at the time was a headwind with a velocity of about three kt as described in 2.1(2) and 2.6, it is probable that the airspeed at this time was about 60 kt. Therefore, it is probable that the Aircraft was in a state quite close to stall speed if the flaps were not FULL DOWN position as described in 2.7(1).
- (5) According to the GPS records as described in 2.10.2, it is somewhat likely that the movement direction of the Aircraft yawed to the left some time after 17:22:10 and that the collision with the revetment wall occurred at 17:22:21. Therefore, it is somewhat likely that there were about ten seconds from the time when the Aircraft started the go-around until it collided with revetment wall. In addition, since the flaps of the Aircraft were FULL UP after the accident as described in 2.9, and the time needed for the flaps to change from FULL DOWN to FULL UP is about six seconds as described in 2.8, it is somewhat likely that it yawed to the left from the runway while retracting its flaps, and that they had been FULL UP by the time of the collision.

Based on the above, it is probable that the Aircraft started the go-around at full power when the airspeed had decreased to near stall speed after bouncing on touchdown, it then yawed to the left, and, while still at low altitude, collided with a revetment wall with a height of about two meters above ground from the front left of the airframe with its flaps in FULL UP position.

3.6 Yawing to the Left

Since the Aircraft bounced twice on touchdown when starting the go-around as described in 3.5(4), it is probable that it had decreased to near stall speed. And then it is probable that, due to the rapid increase in power at low speed, it became susceptible to the effects of P-factor, reaction of the propeller torque and propeller slipstream described in 2.10.3, and that the nose was yawed to the left and the airframe rolled to the left.

In addition, it is probable that the Aircraft has the characteristic that, when retracting the flaps to FULL UP with the trim set to nose-up during landing, the force required for nose down rapidly

increases, and as the flaps retract the nose-up moment increases as described in 2.7. It is somewhat likely that, when the Aircraft started yawing to the left, the flaps were not yet FULL UP as described in 3.5(5), but the passenger states that the captain seemed to be struggling with pitch control immediately after applying to full power for the go-around as described in 2.1(1). In light of above mentioned facts, it is somewhat likely that the captain retracted the flaps immediately after applying full power with the nose up trim setting for flaps FULL DOWN, as a result of which the nose up moment of the Aircraft increased as the flaps retracted, and then the captain struggled with pitch control.

Moreover, it is somewhat likely that the lift decreased in conjunction with the rolling of the airframe caused by the rapid increase in power. It is somewhat likely that the captain was distracted by roll control and was also struggling with pitch control; therefore, he could not respond appropriately to the fact that the direction of movement of the airframe had yawed to the left, by for example depressing the right rudder pedal. As a result of these factors, it is somewhat likely that the direction of movement of the airframe yawed to the left from the runway.

3.7 Timing of Flap

As described in 2.10.1(1), the captain states that, although the Aircraft has a lot of operational procedures before landing, its landing sensation is not so different from that of the Cessna, and he had no sense of oddness when operating the flaps. The captain also states that, although he had not experienced or practiced the go-around in the Aircraft, he had practiced the go-around many times in the Cessna. In addition, the detailed explanation of the go-around in the Cessna as described in 2.7(2) instructs that the flaps should be retracted immediately after applying full power. From these, it is somewhat likely that, although it was stipulated in the AFM of the Aircraft that the flap retracting operation should be undertaken after the ascent has been established as described in 2.7(1), the captain immediately retracted the flaps after applying the engine to full power, in accordance with the operational procedure of the Cessna that he had practiced many times, instead of waiting for the ascent established condition.

Moreover, it is somewhat likely that, after increasing engine power, the captain was too busy controlling roll and pitch due to the effect of the propeller characteristics of the Aircraft as described in 3.6. Based on these, it is somewhat likely that the captain retracted the flaps immediately after increasing engine power; just before the effect of the propeller characteristics occurred.

In addition, it is somewhat likely that, if the flaps had not retracted FULL UP but had been left in the TAKEOFF position as stipulated, the difficulty of pitch control would have been mitigated.

3.8 Flying at Low Altitude

As stated in 3.5(4) and 3.7, it is somewhat likely that the captain retracted the flaps in a state quite close to stall speed immediately after increasing the engine to full power. And then it is somewhat likely that the captain could not respond appropriately to the nose up moment which increased as the flaps retracted in the Aircraft, the angle of attack became excessive, speed did not increase from a state quite close to stall speed, and lift did not increase either. For this reason, it is somewhat likely that the Aircraft continued to fly at low speed and low altitude and with an excessive angle of attack while the flaps were being retracted.

3.9 The Necessity of Go-around Practice

As described in 2.10.1(1), the captain states that, although he had not experienced or practiced a go-around in the Aircraft, he fully understood the procedure. Since it is somewhat likely that, even if he

understood the procedure, the operation was in fact not carried out according to the procedure as described in 3.7. Hence, it is probable that, when familiarize with a new aircraft, ample practice in the go-around should be carried out in the same way as landing practice, and proficiency should be acquired in the flight characteristics of the aircraft as well as its operational procedure.

4. PROBABLE CAUSES

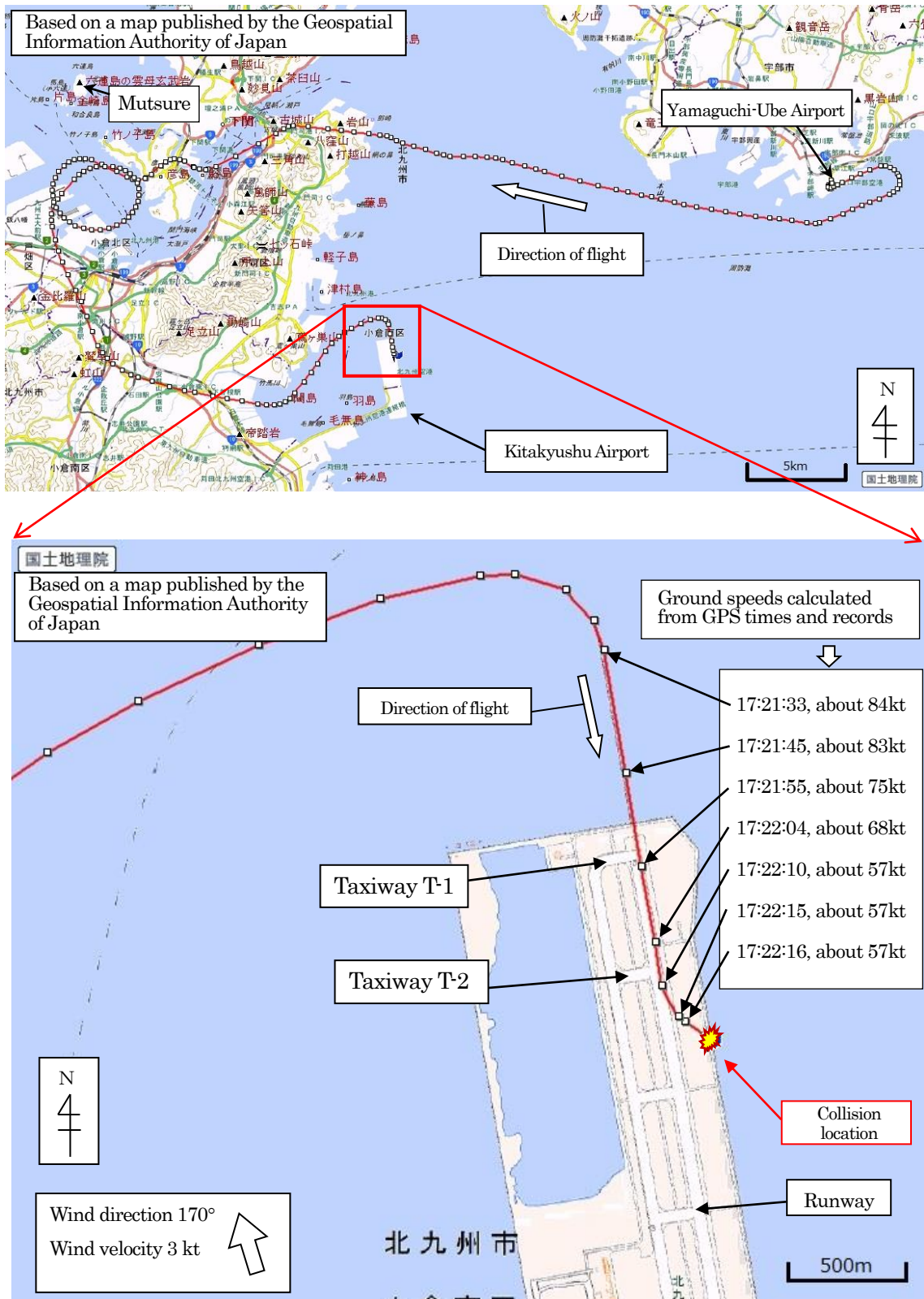
It is probable that this accident occurred when, as the Aircraft was executing a go-around, it yawed to the left because the captain could not respond appropriately to the effect of the propeller characteristics of a single engine plane, and flew while maintaining low speed and low altitude because the speed and lift needed for a go-around did not increase, causing it to collide with a revetment wall with a height of about two meters above ground from the fore left of the airframe.

Concerning the fact that the captain could not respond appropriately to the effect of the propeller characteristics of a single engine plane, it is somewhat likely that he could not respond appropriately to the fact that the direction of movement of the airframe had yawed to the left due to the rapid increase in power at low speed, by for example depressing the right rudder pedal, because he was distracted by roll control and was also struggling with pitch control.

Concerning the fact that speed and lift did not increase, it is somewhat likely that, immediately after the captain had increased engine power, he retracted the flaps in near stall speed, as a result of which he could not respond appropriately to the nose up moment which increased as the flaps retracted, the angle of attack became excessive, speed did not increase, and lift did not increase either.

It is somewhat likely that the fact that the captain had not experienced or practiced the go-around in the type of the Aircraft contributed to the fact that he could not carry out appropriate rudder and flap operations.

Figure 1: Estimated Flight Route Captured from GPS Records



*At Kitakyushu Airport, magnetic north is 7° west of true north.

Figure 2: Schematic View of the Accident Site

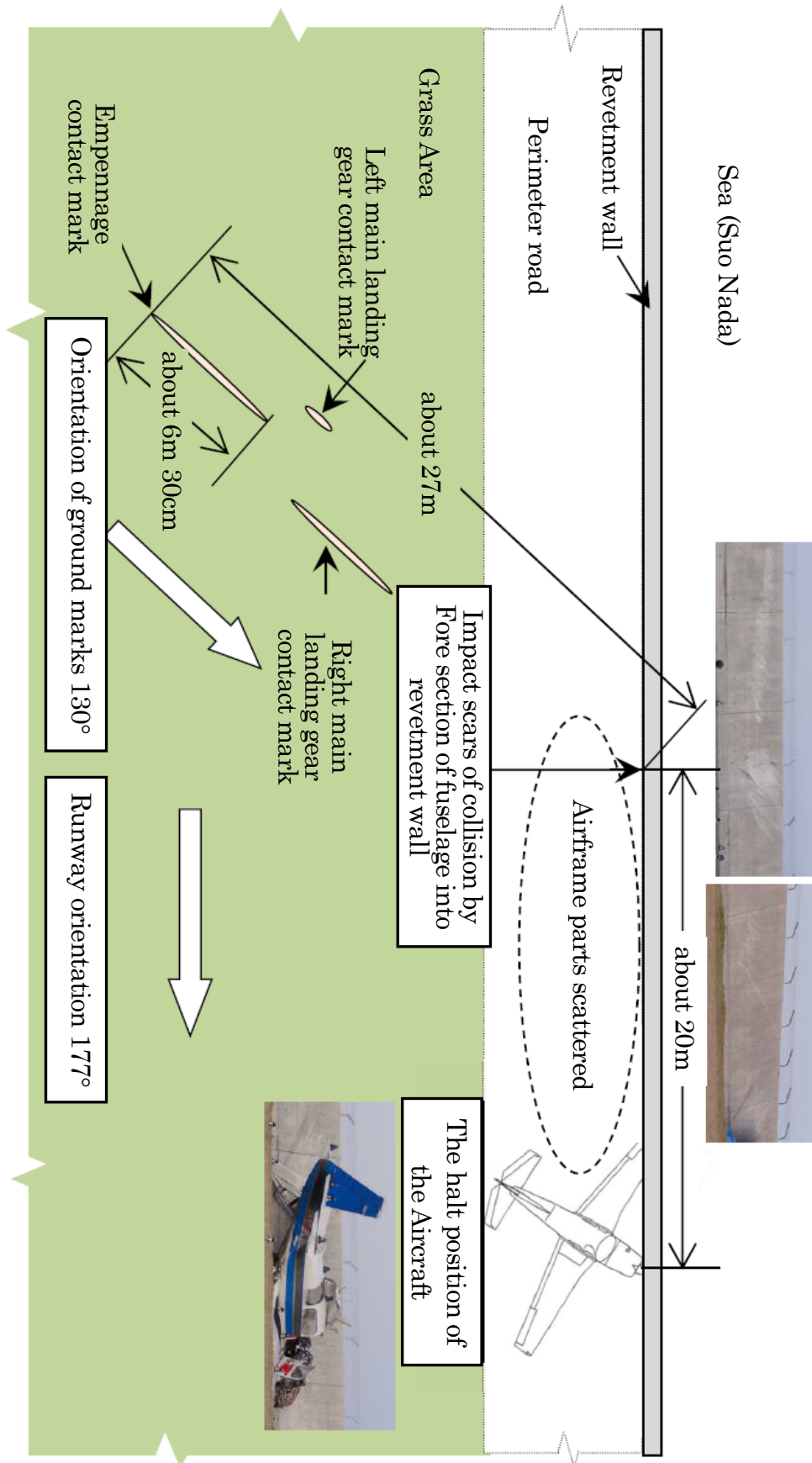


Figure 3 Three-Angle View of Mooney M20K

unit: m

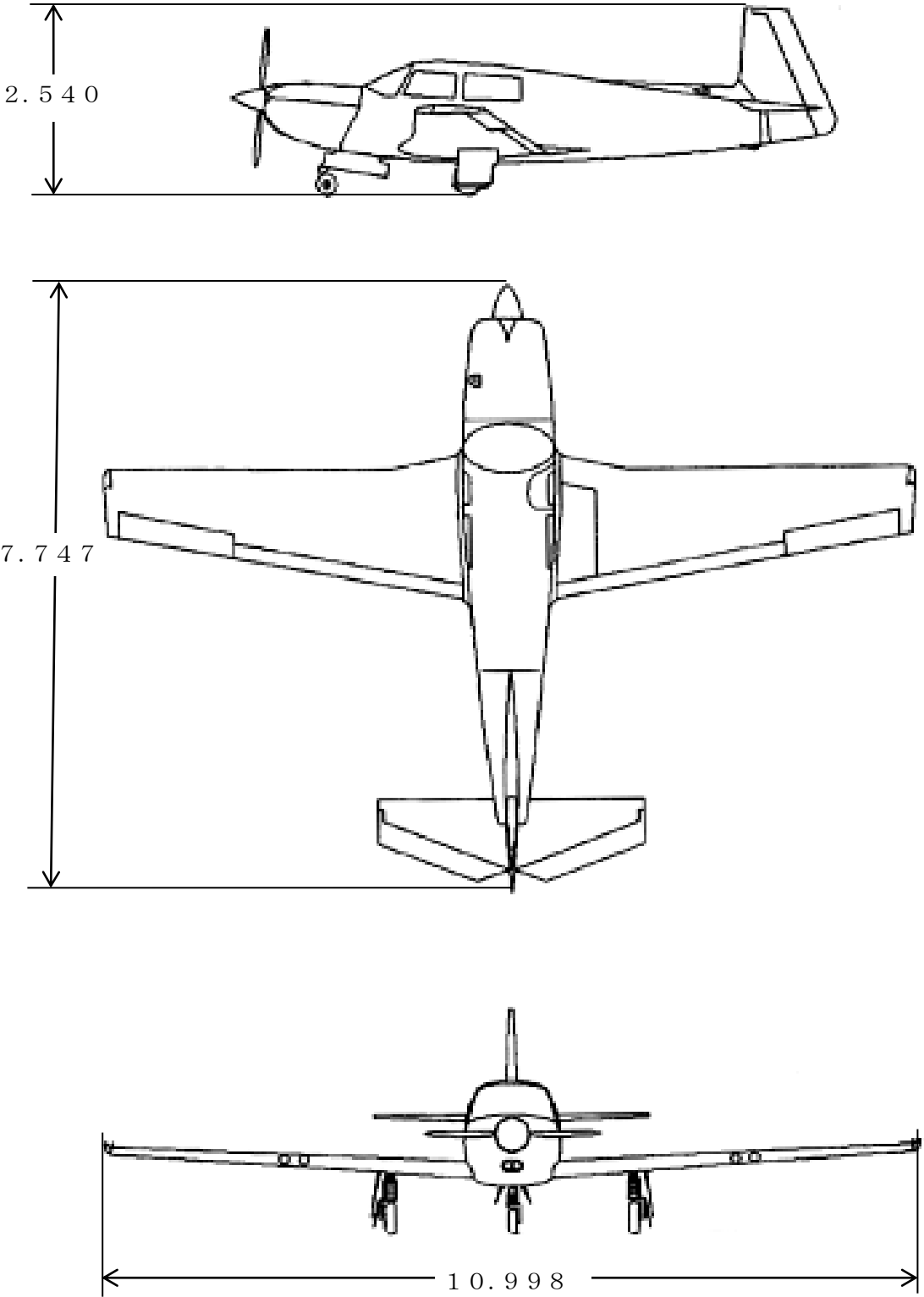


Photo 1: The Accident Aircraft



Photo 2: Empennage Contact Marks, Impact Scars and Halt Position

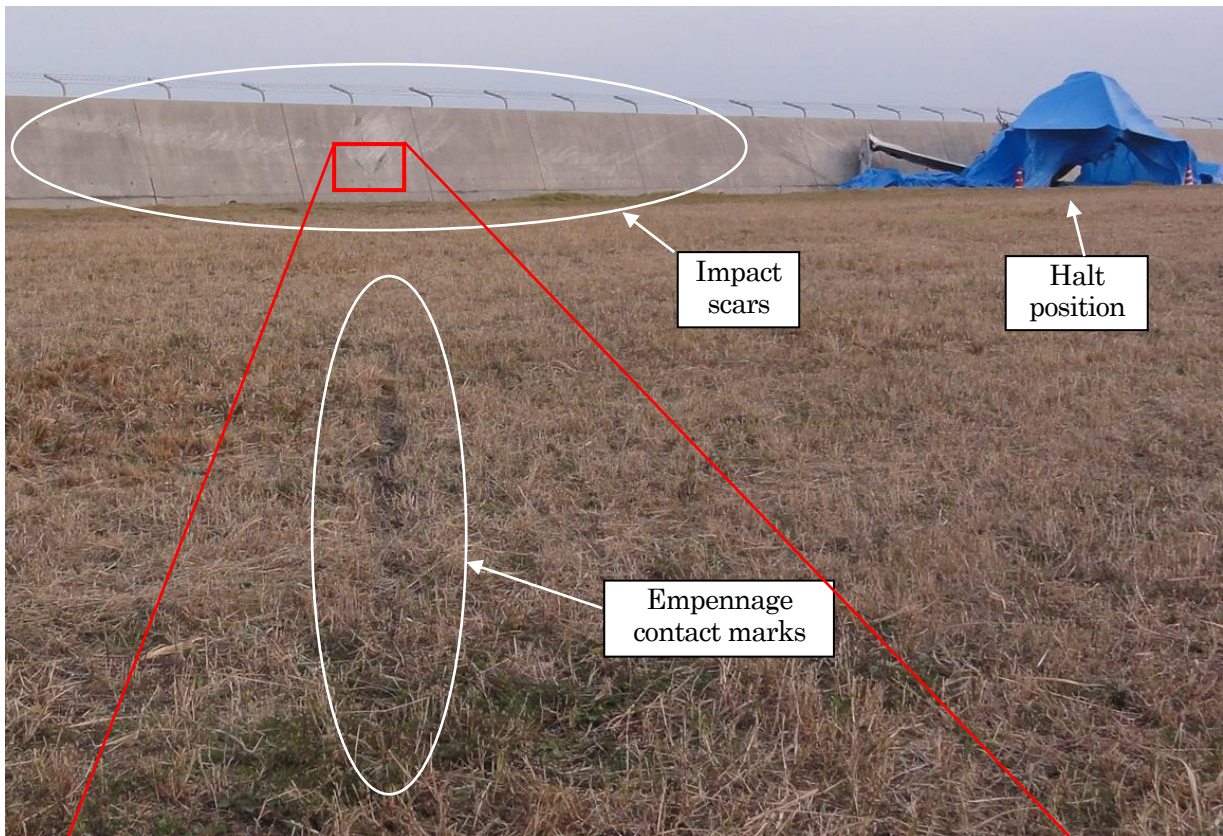


Photo 3: Propeller Slash Marks on Revetment Wall Surface

