AA2012-4

AIRCRAFT ACCIDENT
INVESTIGATION REPORT

PRIVATELY OWNED

J A 2 1 6 8

April 27, 2012

Japan Transport Safety Board

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

PRIVATELY OWNED
SPORTAVIA SF25C (MOTOR GLIDER, TWO-SEATER), JA2168
AT SHINSHINOTSU GLIDING FIELD,
SHINSHINOTSU-MURA, ISHIKARI-GUN, HOKKAIDO, JAPAN
AT ABOUT 10:41 JST, JUNE 12, 2011

April 6, 2012

Adopted by the Japan Transport Safety Board

Chairman	Norihiro Goto
Member	Shinsuke Endoh
Member	Toshiyuki Ishikawa
Member	Sadao Tamura
Member	Yuki Shuto
Member	Toshiaki Shinagawa

1. PROCESS AND PROGRESS OF AIRCRAFT ACCIDENT INVESTIGATION

1.1 Summary of the Accident

On June 12 (Sunday), 2011, at about 10:41 Japan Standard Time (JST; unless otherwise stated, all times are indicated in JST), a Sportavia SF25C, registered JA2168, operated by a private pilot sustained damage to its airframe upon landing at the Shinshinotsu gliding field in Shinshinotsu-mura, Ishikari-gun, Hokkaido, at the end of a familiarization flight.

The captain and a passenger were onboard. The captain was seriously injured and the passenger sustained a minor injury.

The aircraft sustained substantial damage, but there was no outbreak of fire.

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

The Japan Transport Safety Board designated an investigator-in-charge and another investigator on June 12, 2011 to investigate this accident.

1.2.2 Representative of the Relevant State

The Federal Republic of Germany was notified of the occurrence of the accident as the State of Design and Manufacture of the aircraft involved in the accident, but did not designate an accredited representative.

1.2.3 Implementation of the Investigation

June 13, 2011	Interviews
June 14, 2011	On-site investigation, airframe examination and interviews
June 15, 2011	On-site investigation

1.2.4 Comments from Parties Relevant to the Cause of the Accident

Comments were invited from parties relevant to the cause of this 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 June 12, 2011, a Sportavia SF25C, registered JA2168 (hereinafter referred to as "the Aircraft"), operated by a private pilot took off from the Shinshinotsu gliding field (hereinafter referred to as "the Gliding Field") at about 09:59 for a familiarization flight, with the captain seated in the left seat and a passenger in the right seat.

The flight history of the Aircraft up to the time of the accident is summarized below, based on the statements of the captain, the passenger, and a witness.

(1) Captain

On the day of the accident, the captain, a member of a glider club, arrived at the Gliding Field at about 09:30 to fly the Aircraft.

The captain conducted a pre-flight check, confirming that there was no problem with the Aircraft. The weather at that time was fine, the visibility was 10 km or more. From a windsock at the flight service*1, the captain judged that the wind was from the north at about 2 kt.

The captain took off from Runway 36 with the passenger seated in the right seat.

Following the takeoff, the captain flew the Aircraft northward along a river and then practiced "eights around pylons" and other fundamental training maneuvers at altitudes between about 1,000 ft and 2,000 ft within 5 km radius of the Gliding Field.

Afterward, when flying the Aircraft while evading gliders that subsequently took off from the Gliding Field, the captain contacted with the flight service and told that he would be making a touch-and-go landing on Runway 36, with the intention of approaching prior to the aircraft that took off last, and then he entered the downwind leg at an airspeed of about 100 km/h and an altitude of about 1,000 ft. On the downwind leg, the captain reduced the engine speed to an idle (about 1,000 rpm), then lowered the airspeed to about 90 km/h and the altitude to about 700 ft. At that time, the captain was informed by the flight service that the wind was from west or northwest at 2 kt.

Since the captain felt a shaking motion caused by turbulence above the river bank area both when entering the base leg and when entering the final approach, moreover while flying on the final leg, found that the Aircraft was drifting rightward, he stopped making a touch-and-go and reported to the flight service to make a full stop landing.

When the Aircraft was aligned with the final leg at an airspeed of about 90 km/h and an altitude of about 300 ft, the captain determined a point about 100 m from the threshold as the aiming point for the approach, and extended the spoilers*2 halfway.

Feeling that the Aircraft was being lifted by air currents at an altitude of about 100 ft,

*1 : "Flight service" refers to a facility that communicates with flying gliders and other aircraft to exchange information concerning the gliding field, air traffic in the surrounding area, etc. in order to ensure safe and smooth operation of the gliding field.

*2 : "Spoilers" are plates normally stowed in the wings, which extend upward and their angle gradually increases as the control lever is moved in the direction of extension. When extended, the spoilers increase the air resistance on the aircraft while reducing lift, thus decreasing the glide ratio.

the captain pulled the spoiler lever with a slightly strong force toward the extending direction.

Against the corrective effect that would normally be expected, the nose of the Aircraft downed more steeply than intended immediately after pulling the spoiler lever and pointed towards the grass area slightly short of the threshold, and the rate of descent increased as well. The captain immediately released the spoiler lever and pulled the control stick, during which he felt that the elevators were lighter to operate than usual and the rise in nose pitch was not as significant as expected.

The Aircraft sank about 10 m, landed violently on the runway with a nose-down attitude, and then slid about 30 m on the bottom of its nose.

After the Aircraft came to a stop, the captain turned off the main switch, the ignition switch and the fuel cock and got out of the Aircraft. Subsequently, the captain felt pain in his lower back and went to a hospital.

During the flight, the captain did not notice any abnormalities with the Aircraft including the control systems.

The captain knew from his experience that when there was a strong westerly wind, the air currents at the latter half of the final leg involved turbulence produced by the effects of the river bank, and this caused a glider to shake up and down; he nevertheless predicted only slight shaking because the wind on the day of the accident was reported to be weak with a velocity of 2 kt.

(2) Passenger

As a member of the same club as the captain, the passenger had mainly practiced to control gliders, but on the day of the accident he boarded the Aircraft, a motor glider by the recommendation of another member.

Although the passenger could not clearly grasp the situation while the Aircraft was making the approach as he had not understand about landing control techniques and flying characteristics of the Aircraft, he noticed shaking due to turbulence both when the Aircraft entered the downwind leg and when it entered the final approach. The passenger also noticed a rightward drift of the Aircraft due to the crosswind component working from the left at the time of entering the final leg.

During the landing, the passenger had the impression that the Aircraft violently touched the runway surface with a "boom" while remaining a nose-down attitude without a landing flare (a nose-up maneuver prior to touchdown).

After the Aircraft came to a stop, the passenger evacuated from the Aircraft together with the captain. The accident occurred around 10:41 according to the clock inside the Aircraft.

Later, the passenger headed for a hospital as he felt pain in his lower back.

(3) Witness

A witness, a member of the club and a certified instructor for the Aircraft, was on duty at the flight service on the day of the accident and confirmed that the Aircraft took off at

09:59 and departed northward.
Some while later, the Aircraft requested to make a touch-and-go from a point about 2 km northeast of the Gliding Field and 1,500 ft in altitude, and the witness replied and acknowledged.
Subsequently, the witness received position reports from the Aircraft at the downwind leg and at the base leg. The witness then reported "Wind 300° at 2 kt" after checking both the wind vane/anemometer and the windsock at the flight service.
The witness was watching the Aircraft during its approach from the flight service located about 250 m away from the threshold. It appeared that the Aircraft's approach was as usual as always on the path until the short final. However, the Aircraft seemingly went into a touchdown without landing flare, unlike a normal touchdown. Normally, a landing flare is carried out at 2 to 3 m above the ground to level off (transition into level flight) and thereby reduce the rate of descent.

The accident took place at about 10:41 on the runway of the Gliding Field (Latitude 43°16'20"N, Longitude 141°39'07"E).
(See Figure 1 – Estimated Flight Path; Figure 2 – Accident Site and Estimated Flight Path; Photo 1 – Accident Site; Photo 2 – Accident Aircraft)

2.2 Injuries to Persons

The captain was seriously injured with a lumbar fracture, and the passenger sustained a minor injury with a lumbar sprain.

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)	Propeller:	The blades were broken.
(2)	Engine:	The intake and exhaust pipes were deformed.
(3)	Fuselage:	The lower fuselage was damaged.
(4)	Wings:	There were open cracks.
(5)	Landing gear:	The main wheel was deformed and detached; the outriggers (wheels on the wing bottoms) were deformed.

(See Photo 2 – Accident Aircraft.)

2.4 Personnel Information

The captain: Male, Age 69

Private pilot competence certificate (glider)	November 22, 1983
Type rating for high-class glider and motor glider	
Class 2 aviation medical certificate	
Validity:	April 14, 2012
Total flight time (glider and motor glider)	727 h 06 min
Flight time in the last 30 days:	1 h 12 min
Total flight time on the type of aircraft	18 h 52 min
Flight time in the last 30 days:	1 h 12 min

2.5 Aircraft Information

2.5.1 Aircraft

Type:	Sportavia SF25C
Serial number:	4246
Date of manufacture:	July 4, 1974
Certificate of airworthiness:	2010-25-03
Validity:	July 14, 2011
Category of airworthiness:	Utility motor glider (U)
Total flight time:	2,530 h 32 min
Flight time since last periodical check (Annual check conducted on July 4, 2010)	21 h 38 min
Aspect ratio	13.8
Best glide ratio	23:1

(See Figure 3 – Three Angle Views of the Sportavia SF25C.)

2.5.2 Weight and Balance

When the accident occurred, the Aircraft's weight is estimated to have been 573.5 kg and its center of gravity is estimated to have been 221.3 cm aft of the reference line, both of which are estimated to have been within the allowable range (maximum takeoff weight of 580 kg and center of gravity range of 214.3–233.4 cm corresponding to the weight of the Aircraft at the time of the accident).

2.6 Meteorological Information

(1) Wind direction and velocity in Shinshinotu measured by Automated Weather Station of the Japan Meteorological Agency, located about 5 km southeast of the Gliding Field and at almost the same field elevation, are shown in the following table (the average wind and maximum instantaneous wind velocity for the 10-minute period prior to the accident are indicated in kt after conversion from the original m/s):

Time	10:20	10:30	10:40	10:50
Wind direction	293°	270°	270°	270°
Average wind velocity	8 kt	9 kt	10 kt	11 kt
Maximum instantaneous wind velocity	12 kt	12 kt	13 kt	14 kt

(2) Around the time of the accident on June 12, 2011, the wind vane/anemometer and the windsock at the flight service, which were located near the runway below the river bank, indicated winds from 300° at about 2 kt.

2.7 Information on the Accident Site

2.7.1 Outline of the Gliding Field

The Gliding Field was located on a flood plain of the Ishikari River on the Ishikari Plain in Shinshinotsu-mura, Ishikari-gun, Hokkaido. The takeoff/landing zone at a field elevation of about 10m extended from north to south and its asphalt-paved runway was 8 m wide and 1,000 m long in a grassy area of 60 m wide and 2,000 m long.

2.7.2 Site of the Accident

About 70 m west of the runway was a river bank about 5 m in height (at a field elevation of about 15 m) running from north to south parallel to the runway. The shape of the bank section was such that its surface formed an upward slope starting with a line about 100 m west of the runway and then, beyond the road at the top of the bank, a downward slope declined toward the runway.

On the runway section about 88 m north from the runway's south end, there remained tire contact marks, two groove marks, and propeller slash marks (scars) on the runway. The distance between the slash marks was about 75 cm. The Aircraft had stopped with east-northeast heading on the runway about 42 m north of the contact marks.

2.7.3 Details of the Damage to the Aircraft

(1) Propeller: The wooden propeller blades were bent toward the trailing edges and had torn off at a point approximately midway along their length. The tears showed fine splits.

(2) Fuselage and landing gear: The main wheel at the bottom of the fore fuselage had come off the bearings on both sides and was wedged into the fuselage beneath the pilot's seat in a deformed state. The bottom surfaces of both bearings had rubbing marks.

(See Figure 1 – Estimated Flight Path; Figure 2 – Accident Site and Estimated Flight Path; Photo 1 – Accident Site; and Photo 2 – Accident Aircraft.)

2.8 Additional Information

(1) Excerpts from the flight manual

4-8 Landing

The aircraft can be landed with the engine either running or with it stopped.
Approach at about 90 km/h, Control the glide path with the spoilers. As the spoilers are effective, it is not usually necessary to slip the aircraft.
With spoilers extended the rate of descent About 3.5 m/s (at 85 km/h)
When landing at minimum speed (*about 65 km/h*) the aircraft will touch down tailwheel first. *The landing roll distance required is about 100 m when the main wheel brake is used.* (Omitted)

4-11 Low speed flight and stall

Stall speed with the maximum takeoff weight is about 65 km/h either with the engine running or with it stopped. (Omitted)

(2) Landing maneuver of the same aircraft type as the Aircraft

An interview was conducted with a flight instructor who had experience in the landing maneuver for the same type of aircraft of the Aircraft. The outline of the interview is as follows:

The maneuver generally used in landings with the same aircraft type is, after setting the engine to idle between the downwind leg and the base leg, basically the same as for landings with gliders.

A straight path about 800 m long is generally used for the final approach, and the approach is initiated at about 100 m (approximately 300 ft) above ground level (AGL), with the airspeed at about 90 km/h, the spoilers extended halfway, and the threshold as an approach aiming point. The glide ratio is about 10:1 with the spoilers extended halfway, which is smaller than the generally used approach path (8:1). Therefore, if the spoilers are kept extended halfway, the touchdown point is likely to shift forward beyond the intended point unless there is a fairly strong headwind. For this reason, the approach path should be adjusted by gradually extending the spoilers in order to control the aircraft for a correct approach path to the aiming point. Frequently, the spoilers are eventually extended fully at the end of the approach.

Extending the spoilers rapidly during the approach not only causes a rapid increase in the rate of descent, but also creates a tendency to bring the aircraft into a nose-down attitude. As this can lead to a loss of balance, the pilot should be cautious against this type of control.

The pilot should carefully initiate landing flare control at about 5 m (about 15 ft) AGL, then gradually bring the nose up as the aircraft descends and, as instructed in the flight manual, bring the tail wheel and then the main wheel onto the ground at a speed near the minimum airspeed of about 65 km/h.

If updraft, downdraft or other turbulence is encountered during the approach, the pilot should consider increasing the airspeed by 10 km/h or so to keep the controllability of the aircraft.

3. ANALYSIS

3.1 Crew Qualifications

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 Meteorological Conditions

(1) Weather

According to the statements described in 2.1 (1), it is highly probable that the weather at the Gliding Field at around the time of the accident was fine and visibility was good.

(2) Wind direction and velocity

Judging from the statements that a rightward drift of the Aircraft was noticed as it entered the final approach as described in 2.1 (1) and (2), and considering the observation records by the Shinshinotsu Automated Weather Station located on the same plain as the accident site as described in 2.6 (1), it is probable that the wind was from about 270° at about 10 to 13 kt in the portion of the final approach where the leg's altitude is higher than the river bank on the west side of the runway as described in 2.7.2 (i.e., about 16 ft AGL or higher).

With regard to the wind velocity of 2 kt at the flight service as described in 2.6 (2), it is probable that the wind stagnated and relented in the area around the runway that was located below and behind the river bank.

(3) Air currents

It is probable that a westerly wind of about 10 to 13 kt was blowing toward the river bank on the day of the accident as described in (2) above, and thus it is possible that this

westerly wind lifted along the bank surface and contributed to the generation of updraft on the final approach. It is also possible that downdraft involving turbulence were generated on the downwind side of the bank.

3.4 Progress of Events Up to the Occurrence of the Accident

3.4.1 From Approach into Traffic Pattern to Final Approach

According to the statement described in 2.1 (1), the captain entered the final approach leg of the traffic pattern and, while feeling the shaking caused by air currents and noticing a crosswind from the left, started the final approach with the engine at idle, the spoilers extended halfway, and the airspeed at about 90 km/h.

Therefore, it is probable that the captain started the final approach in conformity with the standard flight parameters prescribed in the flight manual as described in 2.8 (1).

3.4.2 From Final Approach to Touchdown

(1) According to the statements described in 2.1 (1), having felt the Aircraft lifted by air currents at an altitude of about 100 ft on the latter half of the final approach leg, the captain pulled the spoiler lever with a slightly strong force, but this caused the nose of the Aircraft to go down more steeply than intended, and the Aircraft to descend at a greater rate, so he released the spoiler lever and pulled the control stick, during which he felt that the elevators were lighter to operate than usual and the rise in nose pitch was not as significant as expected, and eventually the Aircraft violently touched down on the runway with a nose-down attitude.

Therefore, it is probable that, as the Aircraft's rate of descent decreased at an altitude in the vicinity of 100 ft and the Aircraft deviated upward from the predetermined approach path, the spoilers were operated from a half-extended position toward the fully extended position in an attempt to correct the condition, but immediately after these actions were taken nose-down angle became greater and rate of descent became higher. It is probable that, just after the occurrence of this situation, the spoilers were fully retracted and the elevators were operated toward the nose-up direction as a corrective action, but the elevators were lighter to operate than usual and the Aircraft touched down on the runway surface due to an inadequate nose-up attitude.

Judging from the marks left on the runway surface as described in 2.7.2 and the rubbing marks on the main wheel bearings as described in 2.7.3 (2), it is highly probable that the component that first violently touched the runway surface was the main wheel, followed by the propeller blades, and then the main wheel bearings after the main wheel came off.

(2) With regard to the reason that the Aircraft's rate of descent decreased at an altitude in the vicinity of 100 ft and the Aircraft deviated upward from the predetermined approach path, it is possible that, the Aircraft entered into the updraft on the final approach near the river bank generated by a westerly wind with a maximum velocity of about 13 kt as described in 3.3 (3).

(3) According to the statement described in 2.1 (1), the captain operated the spoiler lever

with a slightly strong force from a half-extended position toward the fully extended position. Therefore, it is probable, with regard to the Aircraft's large nose-down angle and high rate of descent, that these events were caused by the captain's rapid control operation for extending the spoilers in an attempt to correct the Aircraft's upward deviation from the predetermined approach path, due to the characteristics of the Aircraft as described in 2.8 (2).

(4) With regard to that the Aircraft made a violent touchdown on the runway in an inadequate nose-up attitude even after the captain's attempt to correct the Aircraft's large nose-down angle and high rate of descent by fully retracting the spoilers and pulling the elevators toward the nose-up position, it is probable that this situation resulted from too low altitude (AGL) to correct such a large nose-down angle and high rate of descent. In addition, it is possible that the downdraft involving turbulence as described in 3.3 (3) constituted a negative contribution to the effectiveness of the control surfaces.

(5) When judged from the statement described in 2.1 (1), it is probable that, while the engine was running idle during the approach, the engine (propeller) speed was about 1,000 rpm. In addition, the distance between the slash marks(scars) left by the propeller blades were about 75 cm as described in 2.7.2. Therefore based on these data, the Aircraft's ground speed at the time of touchdown was estimated as follows.

The equation providing the ground speed based on the slash marks(scars) of the propeller blades (ICAO Manual of Aircraft Accident and Incident Investigation Part III – Investigation 12.4.3) is the following:

Ground speed (kt) = Propeller speed (rpm) × Distance in feet between slash marks (scars) × Number of propeller blades / 101.3.

The calculation results reveal that the Aircraft's ground speed was about 48.6 kt (about 90 km/h). When the wind at the time of the touchdown is assumed to be from 300° and at 2 kt as observed at the flight service, the Aircraft's airspeed was almost equal to its ground speed. This means that the Aircraft's airspeed was greater, with a considerably safe margin, than the stall speed of about 65 km/h under the maximum takeoff weight described in 2.8 (1). Also, since the Aircraft touched down at a point about 88 m north of the threshold past the grass area short of threshold against which the Aircraft's nose would assumedly have momentarily faced when it went down steeply, it is highly probable that the Aircraft did not stall and its nose was brought up to some extent before the touchdown despite the decreased effectiveness of the control surfaces.

3.5 Damage to the Aircraft

When judged from the damage to the Aircraft described in 2.3.2, it is highly probable that the every damage was caused by the external forces working at the time of the accident. It is also highly probable that there were no abnormality with the Aircraft before the accident when judged from the statement of the captain described in 2.1 (1).

3.6 Prevention of Similar Accidents

(1) During the approach for landing, the spoilers must be extended carefully since rapidly extending them can lead to a sudden increase in the rate of descent and a steep nose-down attitude, possibly loosing the balance of an aircraft.

(2) If a river bank or other elevated landform adjacent to a gliding field is on the upwind side, turbulence can be produced in the area on its downwind side. This requires taking necessary measures to properly check the wind condition during approaches by such means as observing the wind condition above the elevated landform.

(3) When turbulence is expected during the approach for landing, a necessary increase in airspeed must be considered in order to keep the controllability of an aircraft.

4. PROBABLE CAUSE

In this accident, it is highly probable that the Aircraft violently touched down on the runway due to an inadequate nose-up attitude, and consequently, the captain and the passenger were injured and the Aircraft was damaged.

With regard to the Aircraft having violently touched down on the runway due to an inadequate nose-up attitude, it is probable that this situation resulted from too low altitude (AGL) to correct such a large nose-down angle and high rate of descent. In addition, it is possible that the downdraft involving turbulence constituted a negative contribution to the effectiveness of the control surfaces.

With regard to the Aircraft's large nose-down angle and high rate of descent, it is probable that these events were caused by the captain's sudden extension of the spoilers in an attempt to correct the Aircraft's upward deviation from the predetermined approach path.

Figure 1 Estimated Flight Path

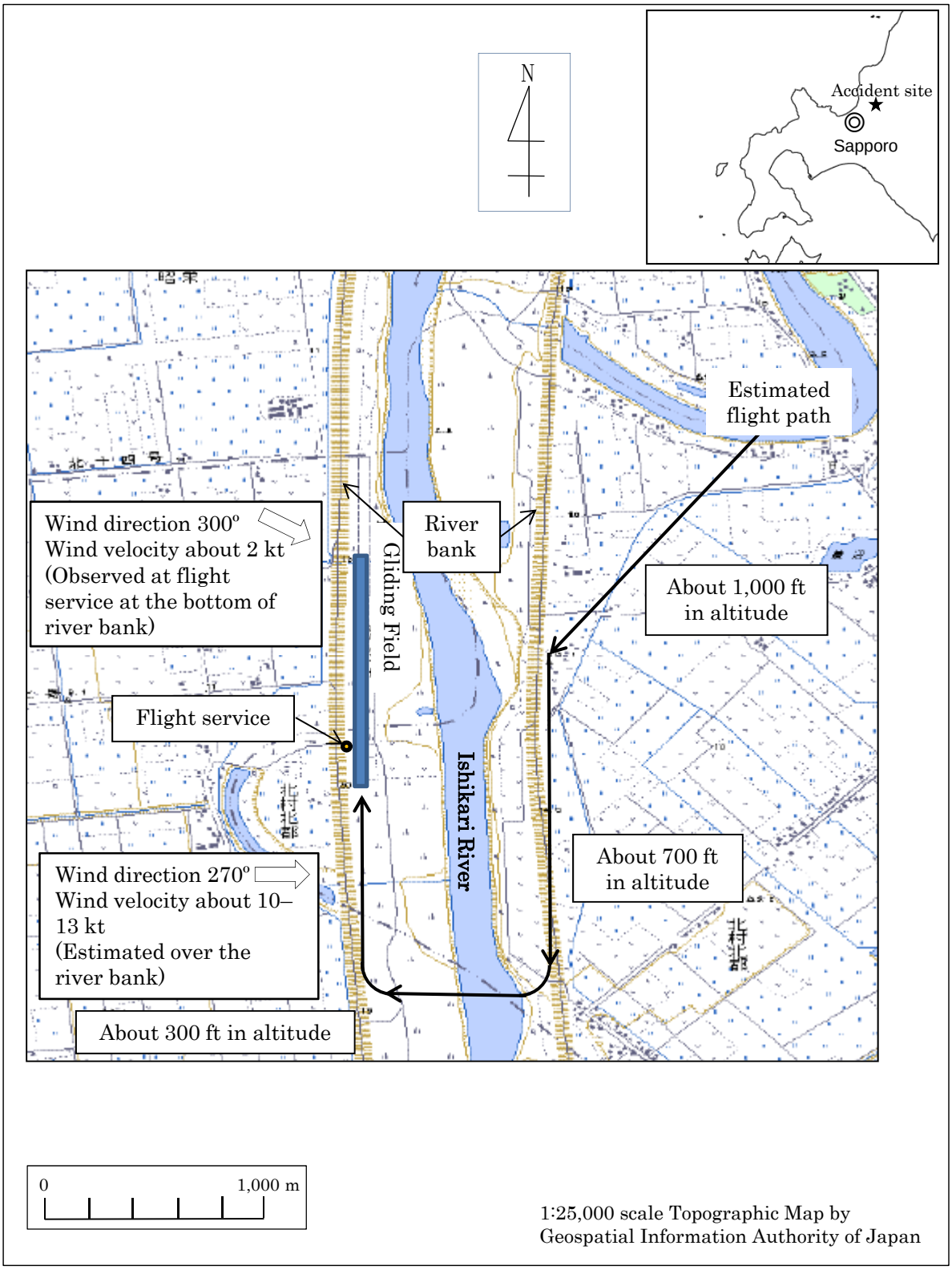
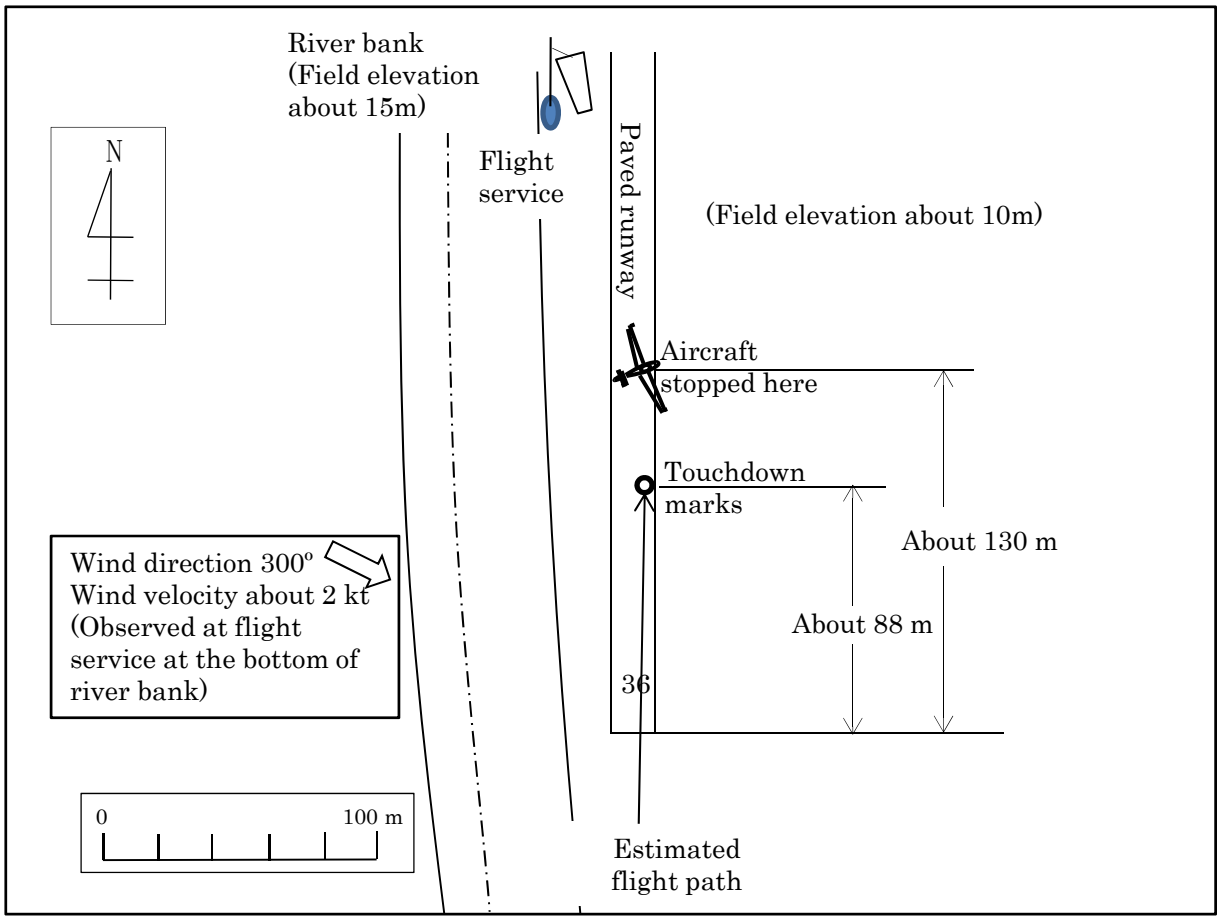


Figure 2 Accident Site and Estimated Flight Path



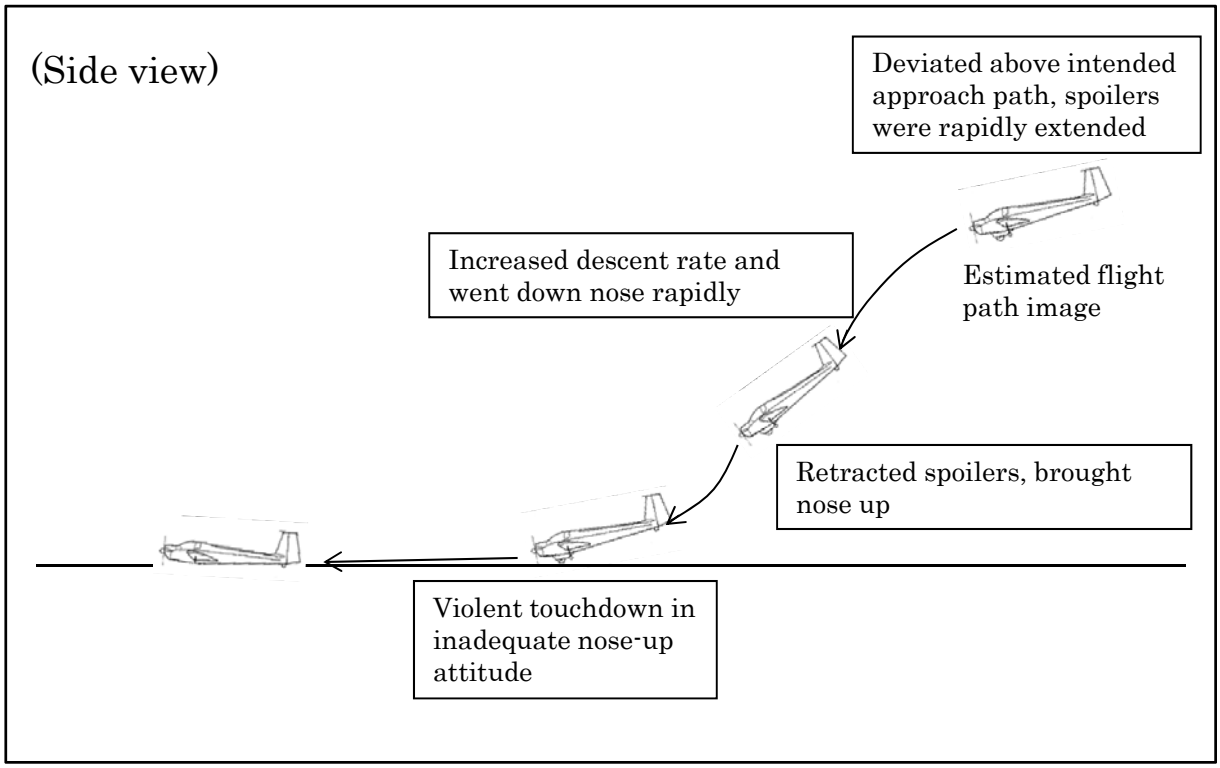


Figure 3 Three Angle View of Sportavia SF25C

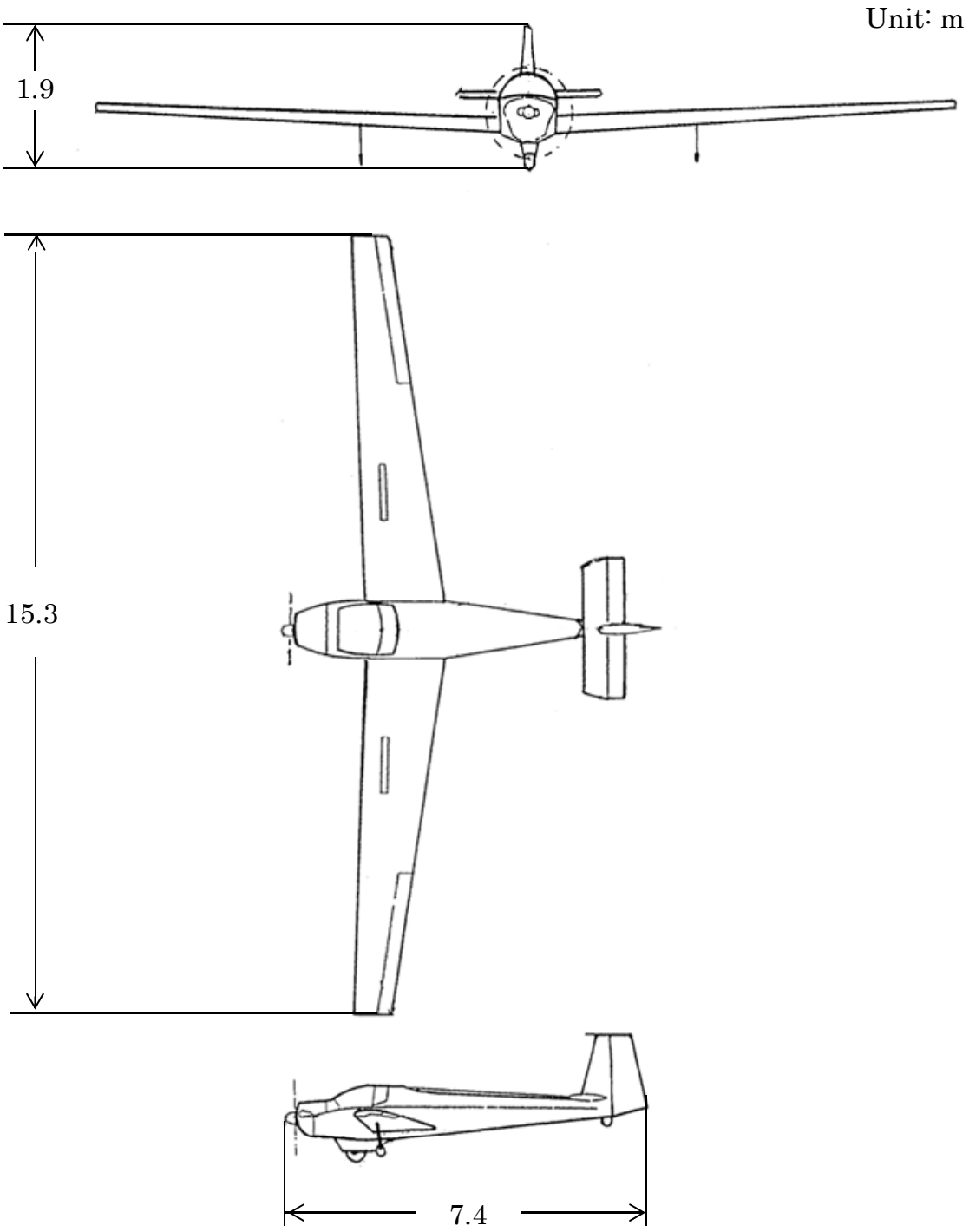


Photo 1 Accident Site

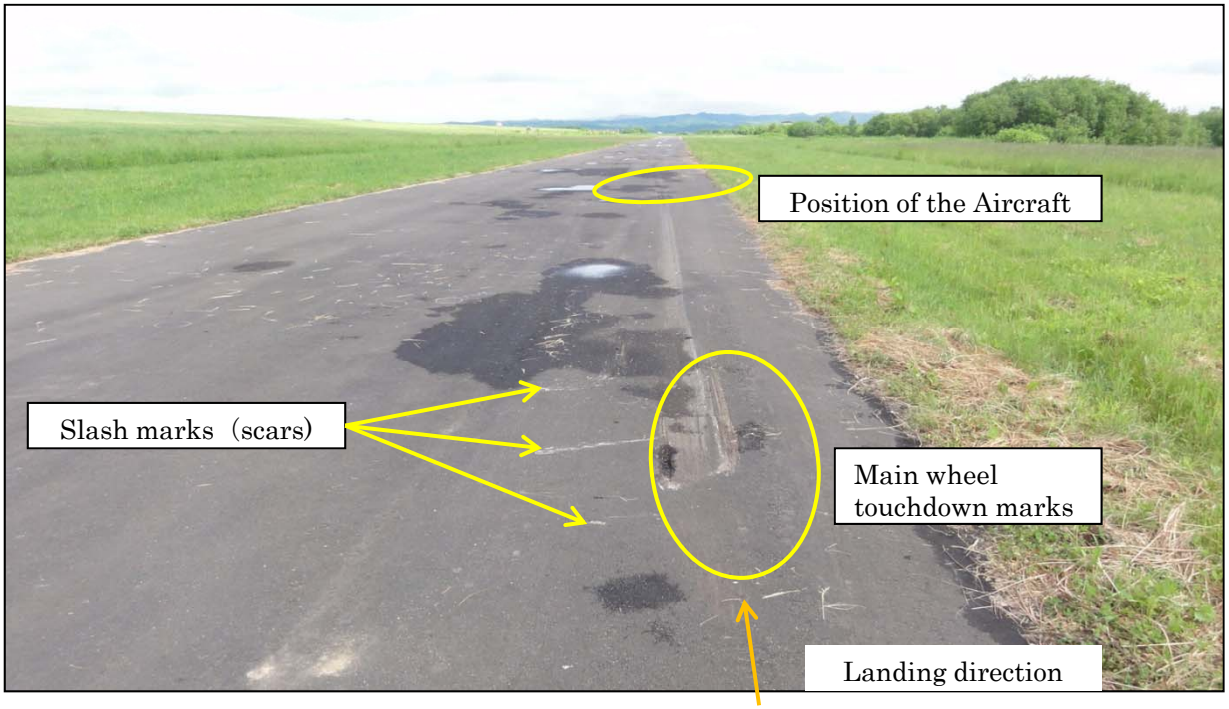
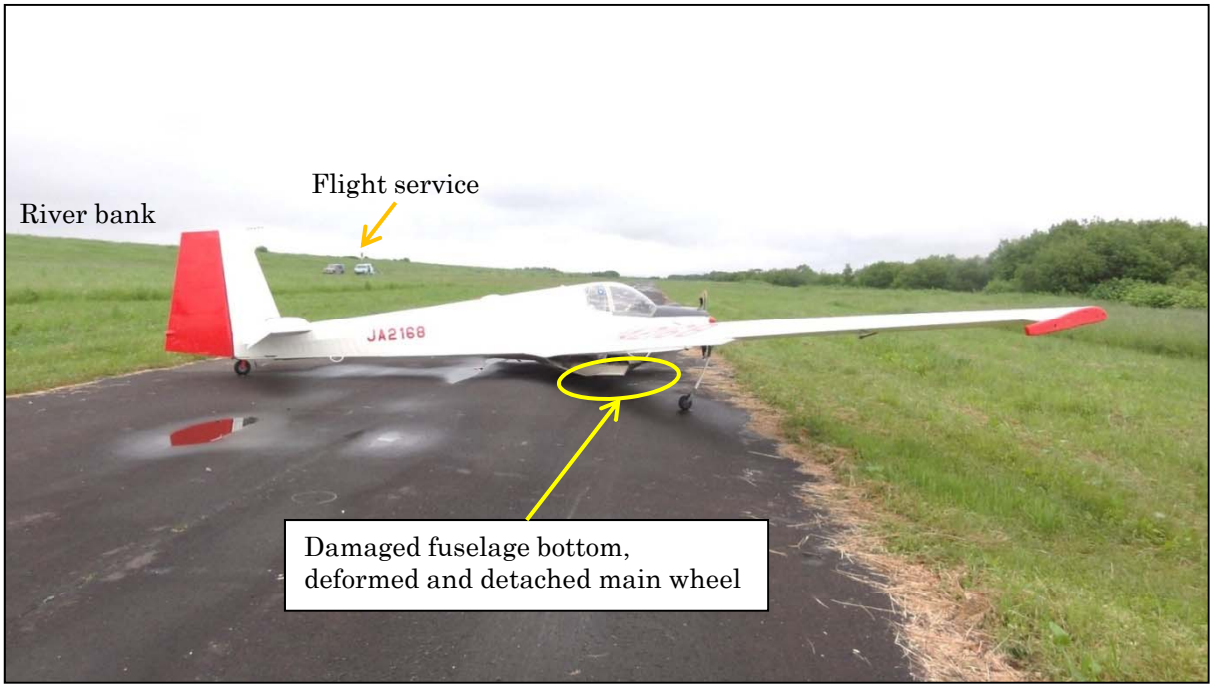
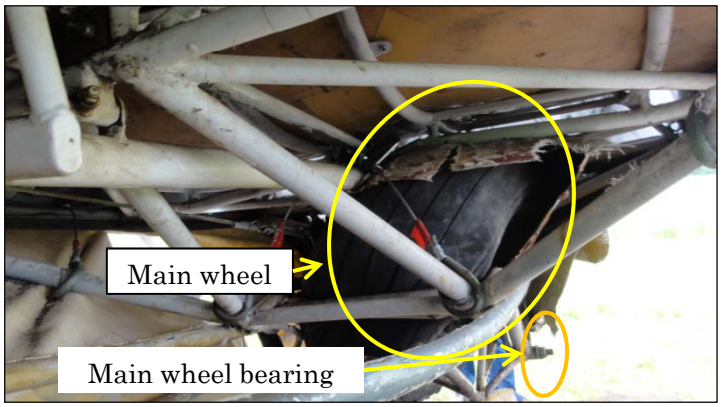


Photo 2 Accident Aircraft

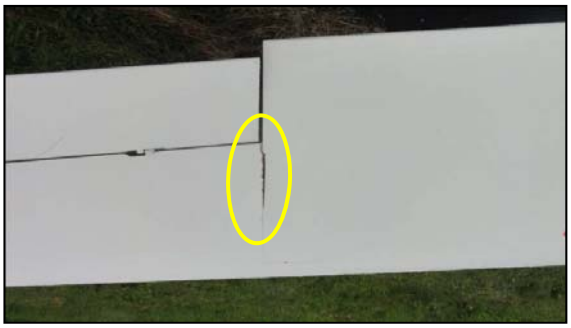


Deformed and detached main wheel



Broken propeller blades

Cracked right wing



Cracked left wing