AA2012-1

AIRCRAFT ACCIDENT
INVESTIGATION REPORT

SHOWA AVIATION Co., Ltd.

J A 8 8 2 8

January 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

SHOWA AVIATION CO., LTD.
FAIRCHILD SWEARINGEN SA226-AT, JA8828
ON THE RUNWAY OF YAO AIRPORT, JAPAN
AROUND 14:39 JST, FEBRUARY 18, 2011

January13, 2012
Adopted by the Japan Transport Safety Board

1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident

On February 18 (Friday), 2011, a Fairchild Swearingen SA226-AT, registered JA8828, operated by Showa Aviation Co., Ltd., had its airframe damaged when it landed at Yao Airport around 14:39 Japan Standard Time (JST: UTC+9h, unless otherwise stated all times are indicated in JST on a 24-hour clock).

The captain, the co-pilot and two passengers were on board the aircraft, but nobody was injured.

The aircraft sustained substantial damage.

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

On February 18, 2011, the Japan Transport Safety Board (JTSB) designated an Investigator-In-Charge and another investigator to investigate this accident.

1.2.2 Representative from Relevant Authorities

The JTSB notified this accident to the United States of America, the State of Design and Manufacture of the aircraft, but no accredited representative was designated.

1.2.3 Implementation of the Investigation

February 19, 2011	Aircraft Examination and Interviews
March 16 to 25, 2011	Analysis of ATC Communication Records and Meteorological Data

1.2.4 Comments from 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 Related State

Comments on the draft report were invited from the related State.

2. FACTUAL INFORMATION

2.1 History of the Flight

On February 18, 2011, the Fairchild Swearingen SA226-AT, registered JA8828 (hereinafter referred to as "the Aircraft"), operated by Showa Aviation Co., Ltd. (hereinafter referred to as "the Company"), took off from Yao Airport for a test flight around 14:11 with the captain seated on the left pilot seat, the co-pilot seated on the right pilot seat and two passengers in the cabin. After flying over Osaka City and Kobe City, the Aircraft landed at the Airport around 14:39. The Aircraft ramped in as usual, but damage to its airframe was found in a post-flight check.

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

Flight rules:	Visual flight rules (VFR)
Departure aerodrome:	Yao Airport
Estimated off-block time:	14:00
Cruising speed:	200 kt
Cruising altitude:	VFR
Route :	Kobe, Osaka
Destination aerodrome:	Yao Airport
Estimated flight time:	1 h30 min
Fuel load expressed in endurance:	2 h00 min
Person on board:	4

The history of the flight up to the time of the accident after the takeoff from Yao Airport is summarized as below, based on the ATC communication records and the statements of the captain, the co-pilot and an air traffic controller.

2.1.1 History of Flight on the ATC Communication Records

About 14:11	The Aircraft took off from Yao Airport
14:34:51	The Aircraft reported to Yao Aerodrome Control (hereinafter referred to as "Yao Tower") that it was approaching PL*1 (reporting point).
14:34:56	The Aircraft received the information from Yao Tower; "Wind 330° at 14 kt, Maximum 24 kt" It was also asked by Yao Tower which runway to use, 27 or 31.
14:35:06	The Aircraft responded to Yao Tower saying that it would use runway 27.
14:37:47	The Aircraft reported to Yao Tower on left base.
14:37:50	The Aircraft received a landing clearance as well as an information of "Wind010 ° at 16 kt".
Around 14:39	The Aircraft landed at Yao Airport.

2.1.2. History of Flight based on the Statements of Captain and Other Persons

(1) Captain

The captain cancelled the flight in the morning because of cloud cover and strong winds. But because there were openings in the clouds and the wind velocity declined below the crosswind limitation of 20 kt, which is registered in the flight manual, he filed a flight plan to fly over Kobe and Osaka.

When the Aircraft was approaching on a final path after finishing a test flight, winds were blowing from the direction of 330° at 15 kt. Air was turbulent.

*1 PL denotes a reporting point located 5.7 nautical miles south of Yao Airport, according to AIP JAPAN.

The target speed*2 was 106 kt. Therefore, when the captain received a call-out of "Speed 110" from the co-pilot, he thought that the situation was rather favorable in view of the turbulent air and approached following the PAPI*3 indication.

When the aircraft had a large dip after passing the runway threshold, he slightly added the power believing that the pitch-up correction would be in time. But the touchdown was felt to be slightly rough. He slightly pulled the control wheel when it touched down.

But he did not feel the Aircraft had sustained damage because he had experienced even harder landing in the past training.

When winds blow from the north at Yao Airport, the runway is subjected to turbulent air generated by upwind buildings. Therefore, he usually checked power on the instruments while paying attention to changes in the airspeed.

Because the Aircraft landed on the downwind side landing gear first, he thought the Aircraft banked deeper blown by the winds, however, he didn't think the degree of wind was so big.

The Aircraft has an aerodynamic characteristic of easily receiving the fuselage interference during a landing under crosswind condition. Due to this characteristic its handling sometimes becomes difficult. Therefore, he usually started taking a wing low*4 attitude slightly in front of the runway threshold and aligned the aircraft axis to the runway center line.

There was no pre-flight briefing because the Aircraft is a single pilot operable-model. He had no discussion with the co-pilot on the possibility of making a go-around or using the crosswind runway.

(2) Co-Pilot

The Aircraft is a single-pilot operable model, but the Company made it mandatory to fly it with two pilots. He was the co-pilot on the Aircraft. His main duties were radio commnication, engine power setting and call-outs for final approach.

The wind information which Yao Tower provided for the approach was 330° 14 kt. The co-pilot thought that there would be no problem because the wind velocity was within the sidewind limitation of 20 kt.

Around the time when the Aircraft flew over the runway threshold after establishing a wing low posture, it dipped unexpectedly. The co-pilot reflexively pulled the control wheel, however, the Aircraft made a touchdown with a shock. But it was not stronger than his former experienced ones. The runway threshold airspeed was 110 kt and torque was about 600 lb-ft. Under normal situation with this landing configuration, the Aircraft could have flared. Because the large dip suggests the possibility that the Aircraft's speed was suddenly reduced before touchdown, the co-pilot thinks that the captain banked the Aircraft to the leeward when he pulled the control wheel reflexively to halt the dip.

When the runway 27 is used under north wind condition, buildings to the north of

*2 The target speed means a reference speed when an aircraft passes over the runway end for landing and it is an airspeed obtained from the chart which can be estimated from the aircraft weight.

*3 PAPI stands for the Precision Approach Path Indicator and it means an approach path indictor which shows an appropriate approach angle to the pilot.

*4 The wing low means a process for approach while gliding sideways by lowering the windward wing in order to get the longitudinal axis of the aircraft in line with the centerline of the runway in a final step of approach.

the runway, such as a hanger and other facilities (a height of 9 to 11 meters and an area of about 250 m by about 50 m) generate turbulent air on the leeward and affect the landing operation. But in view of the availability of a longer stopping distance than that of the runway 31, he preferred the runway 27.

(3) Air Traffic Controller at Yao Tower

When the Aircraft landed, there were no other planes flying around the airport. There were no reports of the wind shear*5 from other aircraft, either. The controller supposed that the touchdown point of the Aircraft appeared to be nearer than usual , somewhere in the middle between the aiming point marking and the runway threshold.

The accident occurred around 14:39 on the runway of Yao Airport (Latitude 34°35'48" N, Longitude 135°36'02" E).

(See Figure 1 Estimated Accident Point, Figure 3 The Instantaneous Wind Direction and Wind Velocity)

2.2 Injuries to Persons

No one was injured.

2.3 Damage to the Aircraft

2.3.1 Extent of Damage

Substantial damage

2.3.2 Damage to the Aircraft Components

(1) L/H Engine Nacelle Box Structure	Deformed
(2) L/H Engine Nacelle Cowling on Both Sides	Dented
(3) L/H Engine Nacelle Main Landing Gear (MLG) Well Stringer	Deformed
(4) L/H MLG Strut	Cracked
(5) Right Side Fuselage Outer Skin	Cracked

(See Figure 5 Engine Nacelle Structure, Photo 1 Accident Aircraft, Photo 2 Right Side Damage of L/H Engine Nacelle, Photo 3 Left Side Damage of L/H Engine Nacelle, Photo 4 Left Side Damage of L/H MLG Well, Photo 5 Right Side Damage of L/H MLG Well)

2.4 Other Damage

None

2.5 Personnel Information

(1) Captain	Male, Age 50
Commercial pilot certificate (airplane)	April 28, 1993
Type rating for multi-engine (land)	January 23, 1996
Class 1 aviation medical certificate	
Validity	October 8, 2011
Total flight time	2,479 h 44 min
Flight time in the last 30 days	17 h 05 min
Total flight time on the type of aircraft	96 h 56 min

*5 The wind shear means a meteorological condition which is unfavorable for takeoff and landing with differences seen in the wind direction or velocity, horizontally or vertically.

Flight time in the last 30 days	5 h 15 min
(2)Co-Pilot Male, Age 62	
Airline transport pilot certificate (Airplane)	November 9, 1989
Type rating for multi-engine (land)	November 9, 1989
Class 1 aviation medical certificate	
Validity	April 7, 2011
Total flight time	13,151 h 40 min
Flight time in the last 30 days	16 h 20 min
Total flight time on the type of aircraft	225 h 00 min
Flight time in the last 30 days	1 h 40 min

2.6 Aircraft Information

2.6.1 Aircraft

Type	Fairchild Swearingen SA226-AT
Serial number	AT-016
Date of manufacture	February 6, 1974
Certificate of airworthiness	Dai-2010-472
Validity	November 24, 2011
Category of airworthiness	Airplane, Normal N or Special X
Total flight time	6,200 h 33 min
Flight time since last periodical check (checked on October 11, 2010)	9 h 20 min

(See Figure 2 Three Angle Views of Fairchild Swearingen SA226-AT)

2.6.2 Weight and Balance

At the time of the accident, the Aircraft's weight is estimated to have been 11,605 lb and the center of gravity (CG) is estimated to have been 261.6 in aft of the reference line, both of which are estimated to have been within the allowable range (the maximum landing weight of 12,500 lb and the CG range of 257.6 to 277.1 in corresponding to the weight at the time of the accident).

2.6.3 Flight Permission Regarding the Flight at the Time of the Accident

The Company installed a new camera into a cabin and its maintenance work, which does not require an official Inspection of Aircraft Repair/Alteration, was completed. The resultant maintenance work did not change its outer configuration with no protruding body parts. The post-maintenance test flight permission was obtained and at the time of the accident the Aircraft was terminating the test flight.

2.7 Meteorological Information

2.7.1 Weather information issued by the Osaka District Meteorological Observatory for Osaka Prefecture at 12:01 on the day of the accident was as follows.

((“Caution should be paid for strong winds and high waves in Osaka Prefecture until the evening of February 18”))

“Clouds cover spreads over Kinki area due to the effects of a trough.”

“In Kinki area today, cloud cover will spread mainly in the northern part due to the trough and cold air. But it should gradually become sunny in the afternoon due to an expected high pressure.”

2.7.2 The aerodrome routine meteorological report (METAR) at Yao Airport around the time of the accident was as follows:

14:00 Wind direction: 340°, Wind velocity: 15 kt,
Wind direction fluctuation: 320° to 340°, Visibility: 30 km
Cloud: Amount: FEW*6, Type : Cumulus, Cloud base: 2,500 ft
Temperature: 10 °C, Dew point: 2 °C
Altimeter setting (QNH): 29.98 inHg

15:00 Wind direction: 010°, Wind velocity: 13 kt,
Maximum instantaneous wind velocity: 23 kt
Visibility: 30 km
Cloud: Amount: FEW, Type: Cumulus, Cloud base: 2,500 ft,
Amount: SCT*7, Type: Cumulus, Cloud base: 4,500 ft
Temperature: 9 °C, Dew point: 3 °C
Altimeter setting (QNH): 29.99 inHg

2.7.3 Information about Instantaneous Wind Direction and Wind Velocity

Regarding the instantaneous wind direction and wind velocity at Yao Airport, observed data around the time of the Aircraft landing indicates that up until around 14:36 the wind directions were fluctuating between about 310° and about 335° while the wind velocity was fluctuating between 9 kt and 19 kt with the average velocity of about 14 kt.

After around 14:36, the wind direction shifted eastward. The wind direction changed rapidly to an average of about 020°. The wind velocity was changing in a range of about 10 kt to about 20 kt.

Around 14:39, the time when the Aircraft is believed to have touched down, the wind direction was about 020°, while the wind velocity ranged from a maximum of about 20 kt to a minimum of about 10 kt.

(See Figure 3 The Instantaneous Wind Direction and Wind Velocity, Figure 4 Asia-Pacific Surface Analysis Chart)

2.8 Condition of Accident Site

2.8.1 Condition of Runway

No abnormalities were found in the post-accident runway check done by the Yao Airport Office of the Osaka Regional Civil Aviation Bureau.

2.8.2 Details of Damage

The whole left hand engine nacelle was deformed. The stringer inside the left hand engine nacelle MLG well was deformed. Cowlings of the left hand engine nacelle (from F.S*8 254 to F.S. 269) was bent on both sides.

Fine cracks were confirmed on the left hand MLG strut and outer skin on the right side of the fuselage near the right wing front spar.

(See Figure 5 Engine Nacelle Structure, Photo 1 Accident Aircraft, Photo 2 Right Side

*6 FEW means cloud amounts of 1/8 to 2/8.
*7 SCT means cloud amounts of 3/8 to 4/8.
*8 F.S. stands for Fuselage Station and means a longitudinal distance from the base line in the aircraft side view.

Damage of L/H Engine Nacelle, Photo 3 Left Side Damage of L/H Engine Nacelle, Photo 4 Left Side Damage of L/H MLG Well, Photo 5 Right Side Damage of L/H MLG Well)

2.9 Additional Information

2.9.1 Information on Yao Airport

Yao Airport has two runways. Runway A, 1,490 m long and 46 m wide, has a magnetic direction of 93°/273°. Runway B, 1,200 m long (1,100 meters of this distance is used for landing on runway 31) and 30 m wide, has a magnetic direction of 133°/313°.

Approach angles indicated by the PAPIs installed at Yao Airport are 4.5° for the runway 27 and 4.0° for the runway 09.

The standard approach angle indicated by the PAPI is 3°, but the approach angle at Yao Airport has been set as above due to existing obstacles.

2.9.2 Landing Distance of the Aircraft

According to the flight manual for the Aircraft, the landing distance is decided in accordance with the aircraft weight, the pressure altitude and the outside air temperature (OAT) as well as the wind direction and velocity. The landing distance at the time of the accident corresponding to the aircraft weight of 11,605 lb and the OAT of 10 ºC was estimated as below (the flaps: full down).

The target speed for the conditions mentioned above was about 108.3 kt, when calculated in line with the flight manual.

(1)When runway 27 is used

a. For the wind 020° at 20 kt

Head wind component: −5.85 kt, Landing distance: about 3,625 ft (about 1,105 m)

b. For the wind 010° at 16 kt

Head wind component: −1.95 kt, Landing distance: about 3,400 ft (about 1,037 m)

(2)When runway 31 is used

a. For the wind 020° at 20 kt

Head wind component: +7.81 kt, Landing distance: about 3,150 ft (about 961 m)

b. For the wind 010° at 16 kt

Head wind component: +8.71 kt, Landing distance: about 3,150 ft (about 961 m)

2.9.3 Engine Nacelle Structure

The Aircraft's engine nacelle has a semi-monocoque construction consisting of stringers, frames and cowling. It supports the engine and propellers load while storing the MLGs. The engine weighs 358 lb and the propeller weighs 129 lb. The distance from the attaching point of the left MLG to the CG of the engine is 97 in, while that of the propellers is 124 in from the same point.
(See Figure 5 Engine Nacelle Structure)

2.9.4 Condition of the Aircraft Based on Statements of the Company's Mechanic

A pre-flight check on the day of the accident revealed no anomalies. The Aircraft had been maintained by the Company's mechanics since it was imported to Japan. The left hand engine nacelle is believed to have been deformed in the flight on the day of the accident.

There has been no record of hard landing for the Aircraft, but before it was purchased by the Company, it had made belly landing in the United States of America. A major repair record as of the Aircraft import carries an entry of the replacement of its structural members.

3. ANALYSIS

3.1 Qualification of Flight Crew

The captain and the co-pilot both held valid airman competence certificates and valid aviation medical certificates.

3.2 Airworthiness Certificate

The Aircraft had a valid airworthiness certificateon the day of the accident the Aircraft made a test flight to confirm its performance with a new camera installed, after obtaining test flight permission. The maintenance work was the one which does not require an official Inspection of Aircraft Repair/ Alteration.

The camera had no relevant parts which protrude outside the aircraft and it had no influence on the flight performance of the Aircraft. Therefore, it is highly probable that the installation of the camera had no bearing on the occurrence of the accident.

The aircraft had been maintained and inspected as prescribed.

3.3 Meteorological Conditions

As described in 2.7, when the Aircraft landed at Yao Airport, it was under prevailing winter pressure pattern with no precipitation but with large fluctuation of wind direction and velocity.

As described in 2.1.1, Yao Tower provided the Aircraft with the wind information about five minutes before landing – 330° 14 kt with maximum velocity of 24 kt. About two minutes before landing, the wind direction had changed to 010° 16 kt. It is highly probable that the wind direction was changing fast from the head wind to the tail wind under the strong cross wind condition where winds were blowing from around 360°– right angle cross wind to runway 27.

3.4 Runway Length and Target Speed at Time of Accident

As described in 2.9.2, both runways at Yao Airport (27 and 31) were long enough for the Aircraft's landing at the time of the accident.

As described in 2.1.2 (1), the captain stated the Aircraft's approach speed was 110 kt for the target speed of 106 kt.

As described in 2.9.2, the target speed calculated from the flight manual was about 108.3 kt. It is considered probable that the difference between the calculated target speed from the flight manual and the target speed thought by the captain came from a shortened flight time. Considering the turbulent air and wind fluctuations it was desirable for the captain to slightly increase the speed. Therefore, it is highly probable that the Aircraft did not have as much speed allowance as believed by the captain.

As described in 2.1.1, when the captain was asked by Yao Tower which runway he preferred, he chose the longer runway 27 (runway length: 1,490 m). It is considered probable that the captain did not choose runway 31 considering the margin of runway length.

3.5 Approach Angle Indicated by PAPI and Rate of Descent

Assuming the ground speed at 110 kt, when an aircraft approaches with an approach angle of 4.5° as indicated by the PAPI for runway 27, the rate of descent becomes about 877 fpm, about 1.5 times larger than that of 584 fpm provided by the standard 3° PAPI. The approach configuration for

this rate of descent will require reduced power and pitch attitude.

As described in 3.3, it is considered highly probable that the tail wind was blowing at the time of the accident. Therefore, it is considered probable that the captain had to further reduce the pitch angle and the power for approach in the situation.

According to 2.1.2 (1), the captain stated that the Aircraft descended on 4.5° approach angle indicated by the PAPI. Therefore, it is considered probable that the angle of descent when the Aircraft had a large dip near the runway threshold was larger than the PAPI approach angle of 4.5°.

3.6 Aircraft Dipping Near Runway Threshold

As described in 2.7.3, around the time of the Aircraft's landing, winds were blowing from the direction of about 020° at a maximum velocity of about 20 kt and at a minimum velocity of about 10 kt. It is considered highly probable that the winds had a tail wind component of about 2 to 6 kt for landing on runway 27. It is considered probable that the air was turbulent due to changes in the wind velocity.

According to 2.1.2 (2), the co-pilot stated that the Aircraft had a large dip when it passed the runway threshold. Therefore, it is considered probable that its airspeed was reduced with the reduction of a head wind component following quick changes in both the wind direction and velocity at a low altitude just before touchdown, generating a quick aircraft lift deprivation. Because the Aircraft was banked to the left under the fluctuation of the wind velocity near the runway threshold as well as the inappropriate flight operation to correct the effects of its shift from crab to wing low method, it is considered probable that the Aircraft touched down violently from the left MLG, causing the deformation on the left hand engine nacelle.

3.7 Responses to Aircraft Dipping

According to 2.1.2 (1), the captain stated that the Aircraft had a large dip after passing the runway threshold but that he slightly added the power because he believed the operation would be in time if the pitch would be increased. Therefore, it is considered probable that he tried to correct the situation.

However, the added power was not enough for recovering from the quickly reduced airspeed situation as described in 3.6. The captain increased the pitch by pulling the control wheel, but it is highly probable that due to lack of sufficient altitude for attitude and descent rate recovery, the Aircraft made a violent touchdown. As described in 3.5, because the Aircraft had approached with an approach angle of 4.5°, it is probable that the large rate of approach to the runway contributed to the occurrence of the accident.

3.8 Awareness about Damage upon Landing

According to 2.1.2 (1), the captain stated that the Aircraft's landing was slightly rough but that he did not feel that the Aircraft had sustained damage because he had experienced even harder landing before. According to 2.1.2 (2), the co-pilot says that there was a shock upon landing, but that it was not stronger than his former experienced ones.

As a result, it is considered highly probable that neither the captain nor the co-pilot were aware that the shock was violent enough to damage the Aircraft. Therefore, it is highly probable that both of them did not realize the occurrence of the accident until the time when damage was found in a post-flight check.

3.9 Reoccurrence Prevention of Similar Accidents

(1) As described in 2.7, weather around Yao Airport was under a wintry atmospheric pressure pattern when the Aircraft landed. Therefore, it is highly probable that the wind direction and velocity were changing greatly. As described in 3.4, it is considered probable that the Aircraft did not have as much speed allowance as believed by the captain. Therefore, the captain should have confirmed the precise aircraft weight and set corresponding approach speed before starting the approach for landing.

(2) It is highly probable that this accident occurred when the Aircraft tried to land without having a before-landing briefing between the pilots on execution of a go-around, use of cross wind runway or responses to changes in the wind direction/velocity during its approach, its lift was partially lost resulting in a hard landing. It is considered probable that changes in the wind direction and velocity as well as the pilots' operations to control the Aircraft contributed to the fast decline in the lift.

Crew members should exchange theirs intentions and avoid landing without having a before-landing briefing on the necessary matters.

(3) When an aircraft approaches with an approach angle of 4.5° as indicated by the PAPI for runway 27, the rate of descent becomes larger than usual. This requires the pilot to reduce the power and lower the nose for approach. Considering these requirements, it is considered probable that the captain should have chosen a go-around as quickly as possible when the Aircraft started a large dipping at any moment after passing the runway threshold.

4. PROBABLE CAUSE

It is probable that this accident occurred because the increment of tailwind component by quick changes in both wind direction and velocity around the time it passed over the runway threshold, causing a quick lift deprivation followed by left banking and dipping, the Aircraft landed violently with the left MLG and sustained damage.

It is considered probable that in addition to be blown to the left by velocity changing right crosswind, the inappropriate flight operation to correct the effects of its shift from crab to wing low method contributed to the banking to the left.

Figure 1　Estimated Accident Point

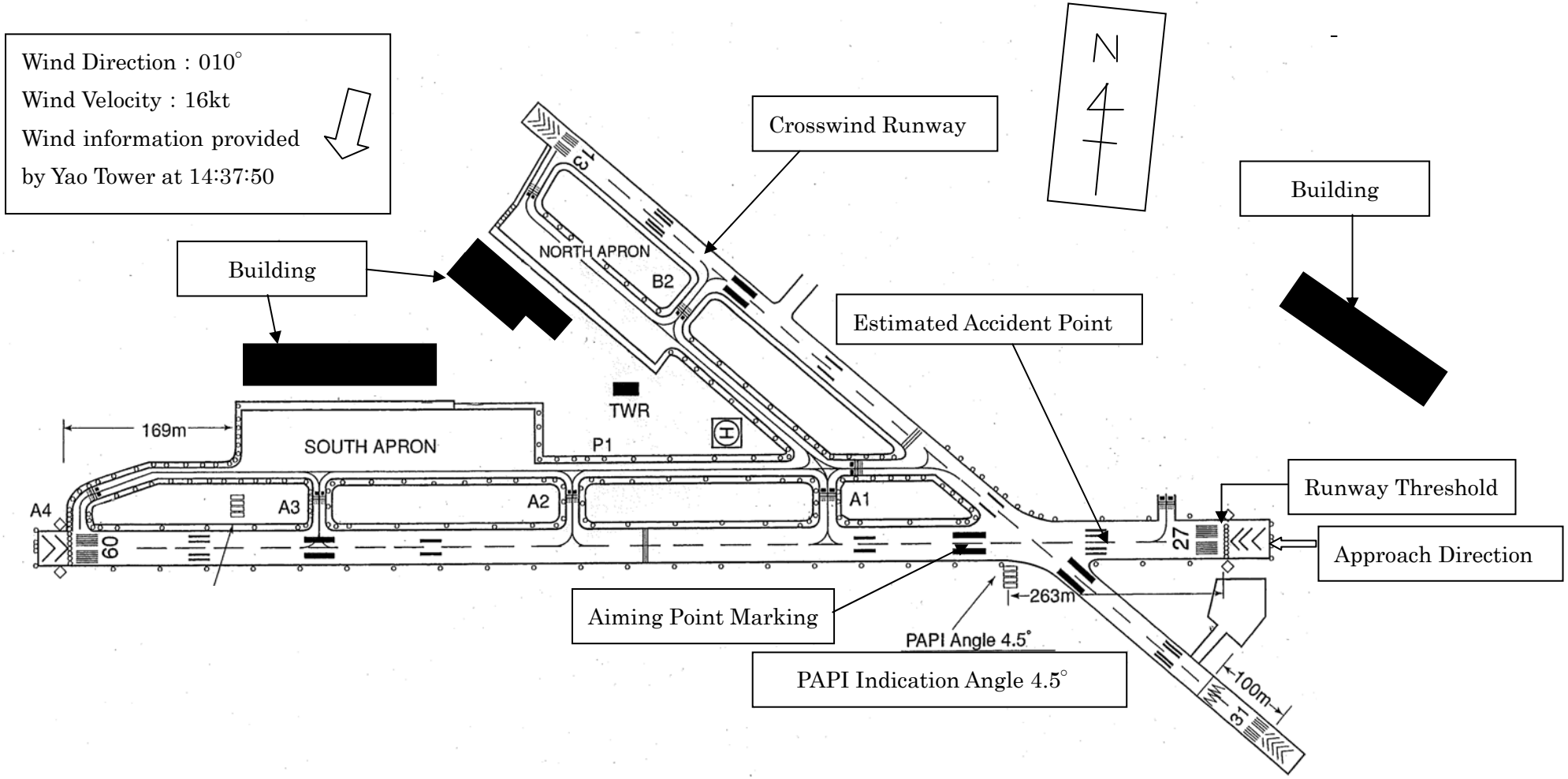


Figure 2　Three Angle View of
Fairchild Swearingen SA226-AT

Unit : m

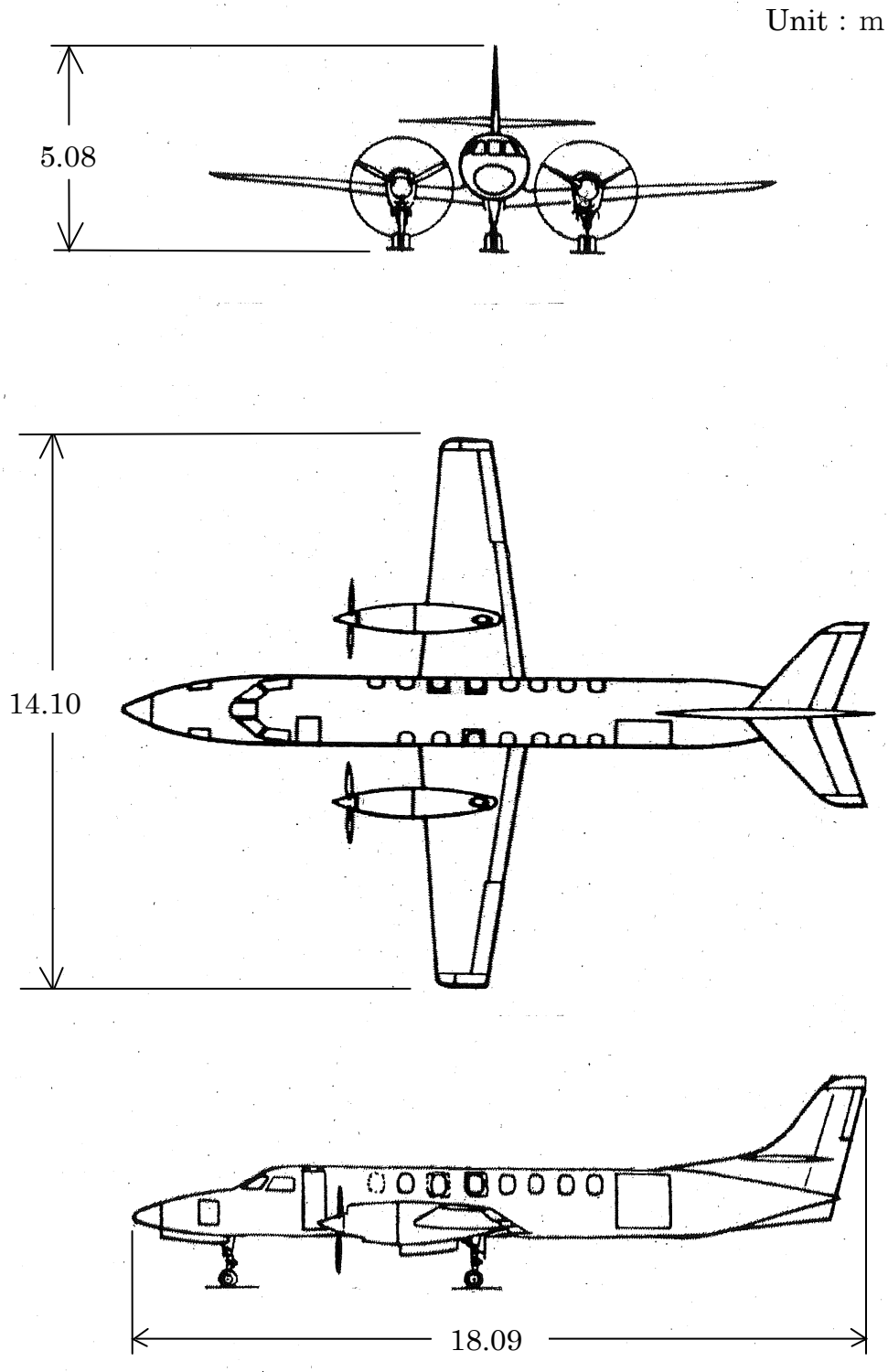


Figure 3　The Instantaneous Wind Direction and Wind Velocity

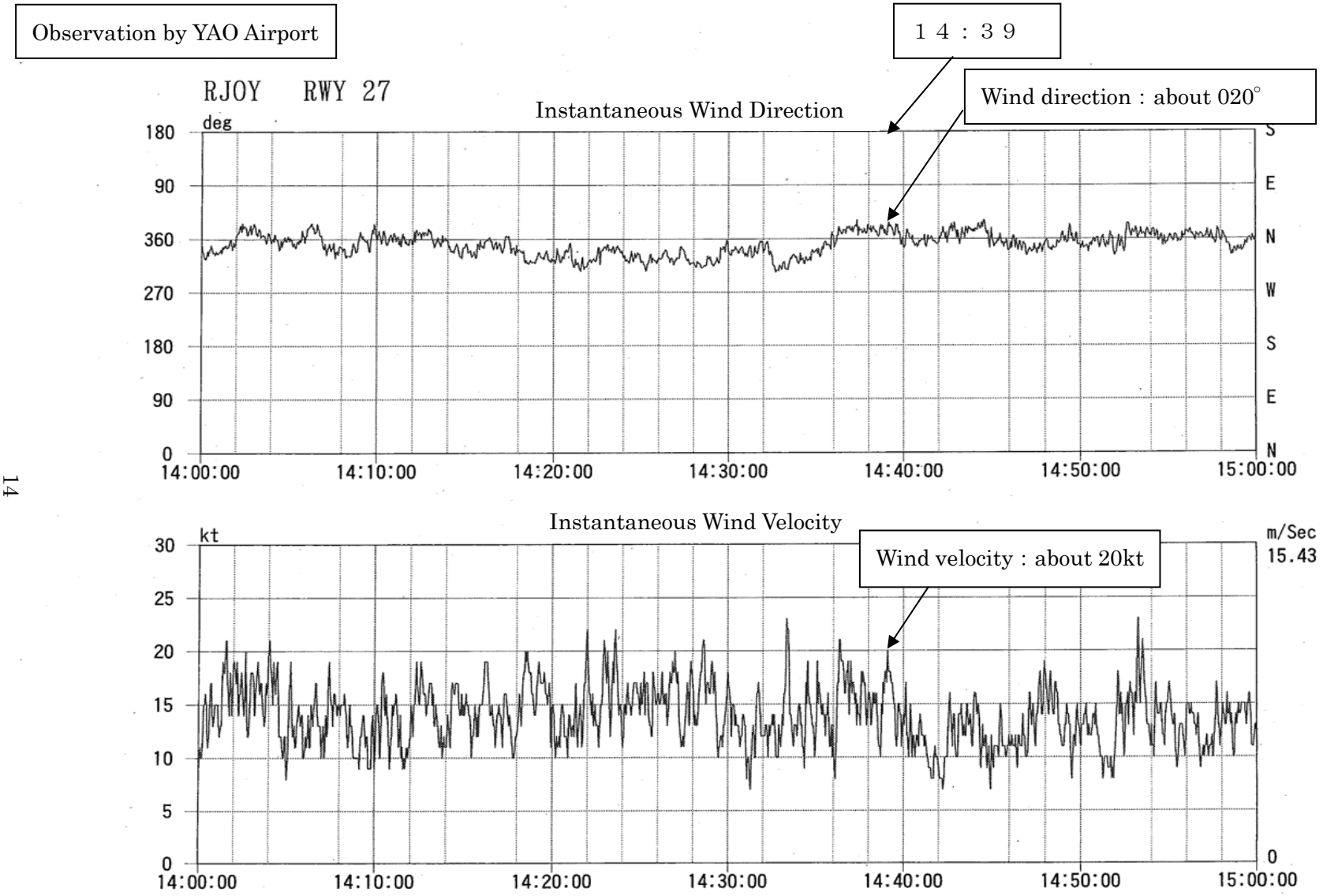


Figure 4　Asia-Pacific Surface Analysis Chart

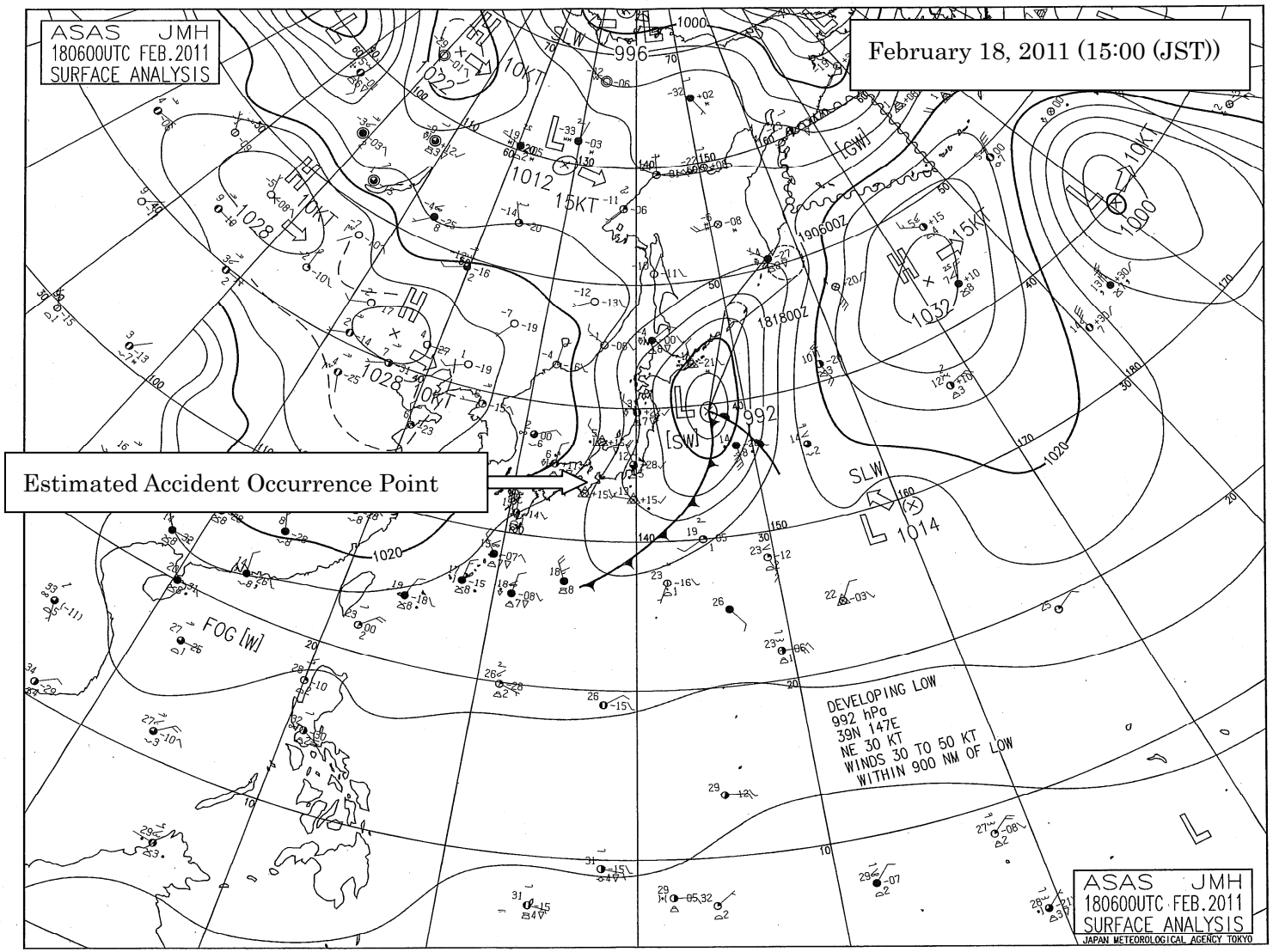


Figure 5　Engine Nacelle Structure

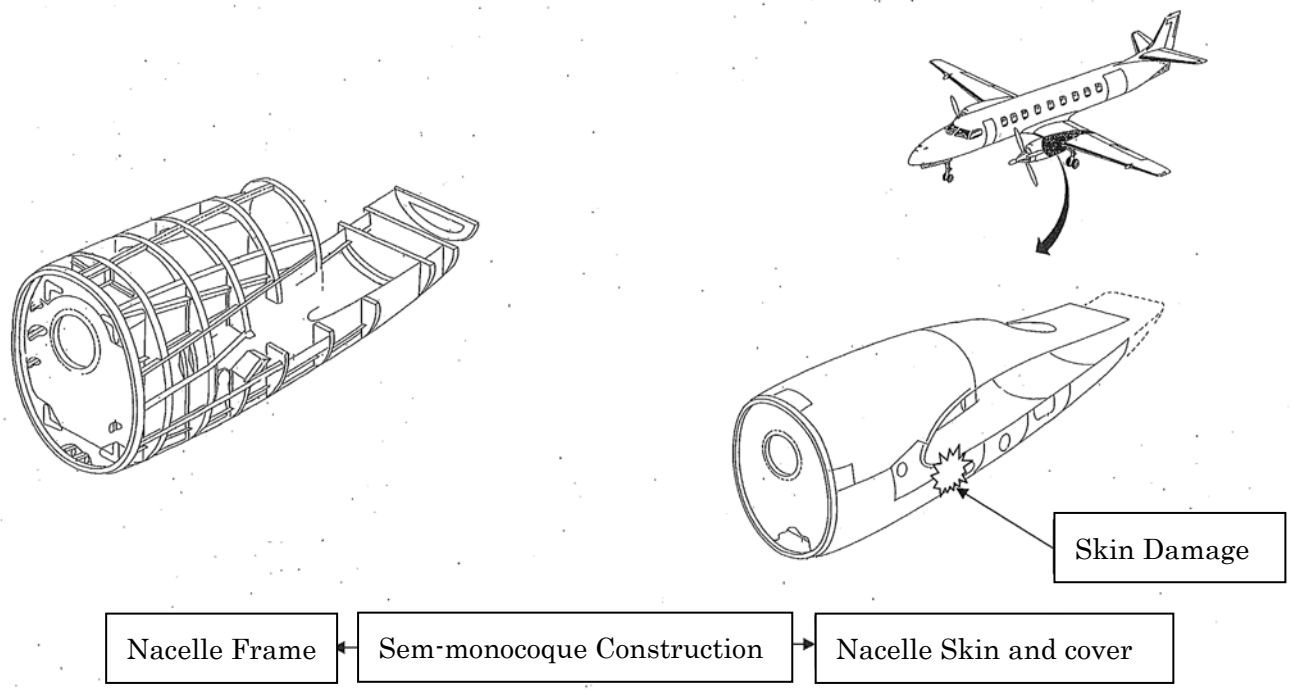


Photo 1　Accident Aircraft

Photo 2　Right Side Damage of L/H Engine

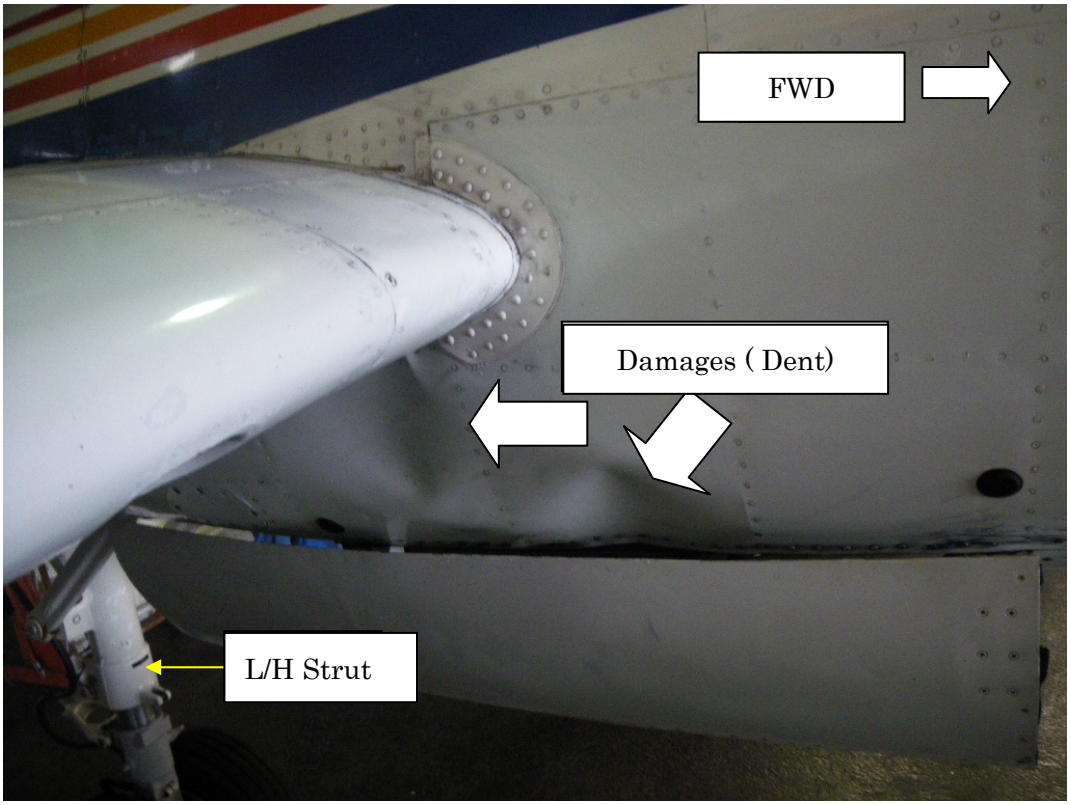


Photo 3　Left Side of L/H Engine Nacelle

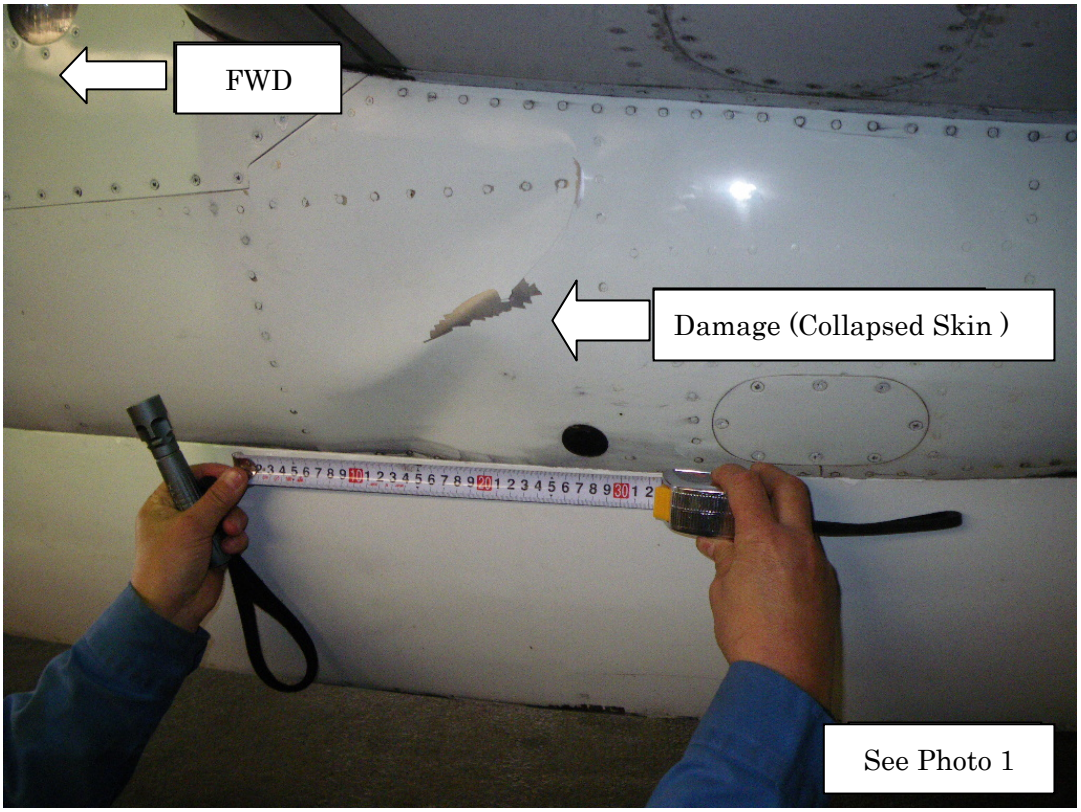


Photo 4　Left Side Damage of L/H MLG Well

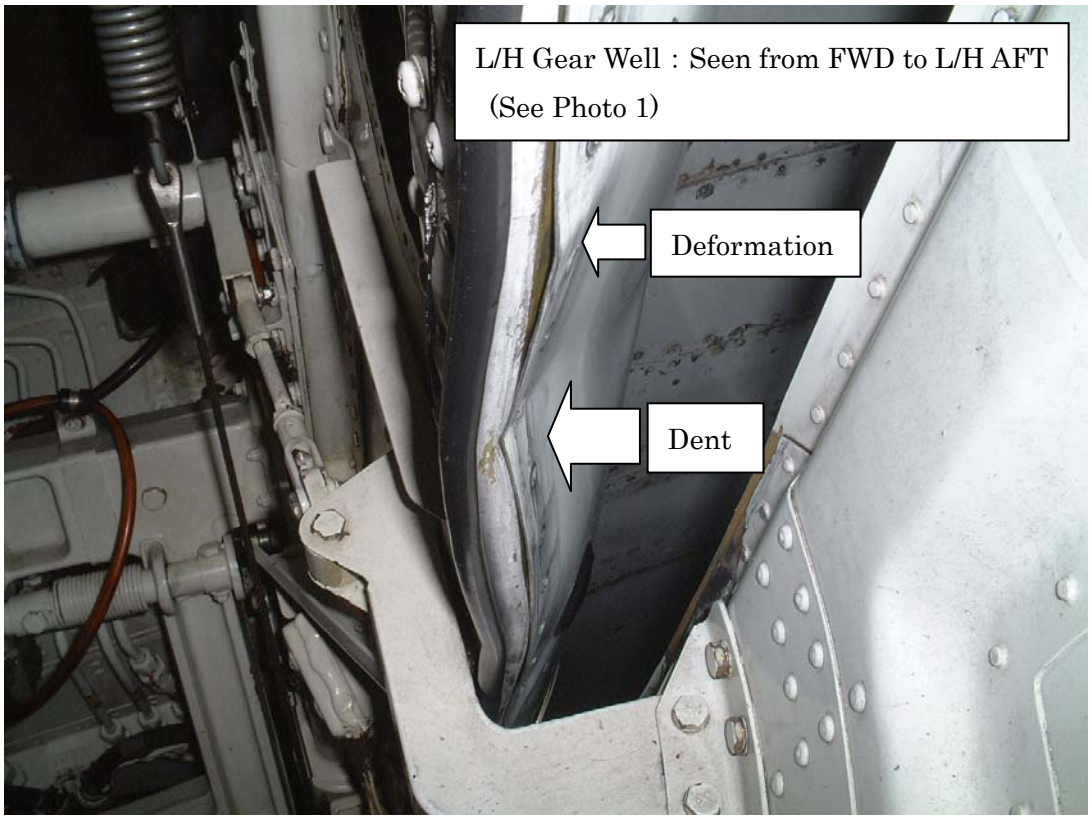
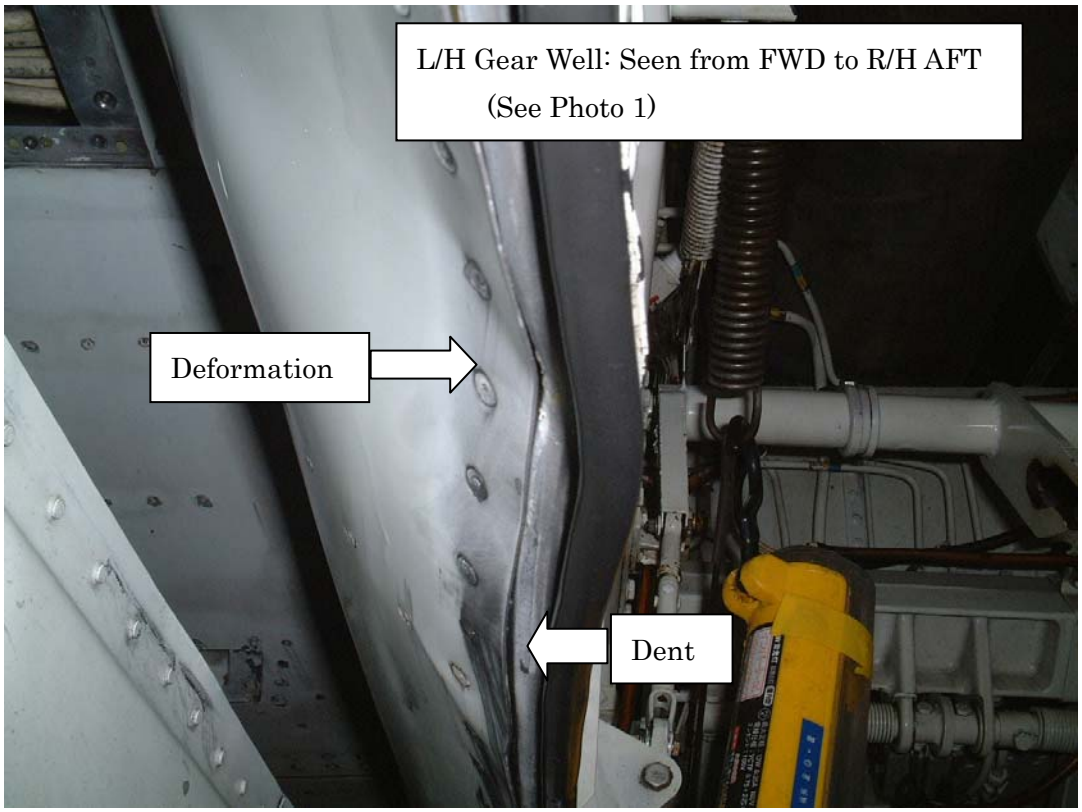


Photo 5　Right Side Damage of L/H MLG Well



Abbreviation

ＶＦＲ　：Visual Flight Rules
ＰＡＰＩ：Precision Approach Path Indicator
ＦＥＷ　：Few
ＳＣＴ　：Scattered
Ｆ．Ｓ．　：Fuselage Station

Unit conversion

１lb	：０．４５３６kg
１ft	：０．３０４８ｍ
１lb･ft	：０．１３８３kg・ｍ
１kt	：１．８５２km/h
１nm	：１．８５２km
１inHg	：３３．８６hPa