

AA2016-5

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**PRIVATELY OWNED
J X 0 1 4 5**

June 30, 2016

The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board and with Annex 13 to the Convention on International Civil Aviation is to determine the causes of an accident and damage incidental to such an accident, thereby preventing future accidents and reducing damage. It is not the purpose of the investigation to apportion blame or liability.

Kazuhiro Nakahashi
Chairman,
Japan Transport Safety Board

Note:

This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.

AIRCRAFT ACCIDENT INVESTIGATION REPORT

**CRASH
PRIVATELY OWNED,
ISHIJIMA MCR-01 (EXPERIMENTAL AIRCRAFT, TWO-SEATER)
JX0145
TSUKUBA CITY, IBARAKI PREFECTURE, JAPAN
AT AROUND 15:49, AUGUST 15, 2015**

May 20, 2016

Adopted by the Japan Transport Safety Board

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

1 PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident	On Sunday, August 15, 2015, a privately owned experimental aircraft, ISHIJIMA MCR-01, JX0145, took off from Akeno Sky Sport Club temporary airfield in Chikusei city, Ibaraki Prefecture, thereafter crashed at a golf course in Tsukuba city and broke. Two persons were on board and both of them suffered fatal injuries.
1.2 Outline of the Accident Investigation	On August 16, 2015, the Japan Transport Safety Board designated an investigator-in-charge and an investigator to investigate this accident. An accredited representative of French Republic as the State which provided information on request participated in this investigation. Comments were invited from the parties relevant to the cause of the accident and the relevant State.

2 FACTUAL INFORMATION

2.1 History of the Flight	<p>According to the statements of the witnesses and the pilot's relatives, the history of the flight is summarized as follows.</p> <p>On August 15, 2015, around 15:30 Japan Standard Time (JST, UTC+9 hrs), a privately owned experimental aircraft, ISHIJIMA MCR-01, identified JX0145, took off to southeast from Akeno Sky Sport Club temporary airfield in Chikusei city, Ibaraki Prefecture, with the pilot on the left seat and the passenger on the right seat, both of who wore seatbelts.</p> <p>The witness A, who got the southern view from an observatory platform (at about 800 m) near the peak of Mt. Tsukuba, saw the aircraft horizontally fly from the west to the east at lower altitude than</p>
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the point of view. The engine sound was not heard due to long distance. At around 15:49, the aircraft nosed up a little in the air above a golf course, nosed down soon, spun with four or five small circles, and crashed almost directly below. Any sounds were not heard also at crash. After the crash, the aircraft halted in a normal attitude with the nose directed to almost west and smoke or fire did not break out from the view of the binoculars. No persons were seen on board and there were no people in the surrounding. The witness A thought that it might be a model aircraft and did not report to the police.

The witnesses B and C who were near the crash site turned their faces to the sound and saw the aircraft fall with the nose in the bottom. But both of the witnesses did not report to the police, because the witness B did not think the aircraft's crash as no crash sound or smoke, and so on, and the witness C searched to the boundary of the golf course and thought if the aircraft crashed, someone of the golf course must report it.

Next morning, the aircraft, which crashed within the golf course, was discovered.

The accident occurred around 15:49, on August 15, 2015, within the golf course in Tsukuba City, Ibaraki Prefecture (36°12'19"N, 140°06'58"E).

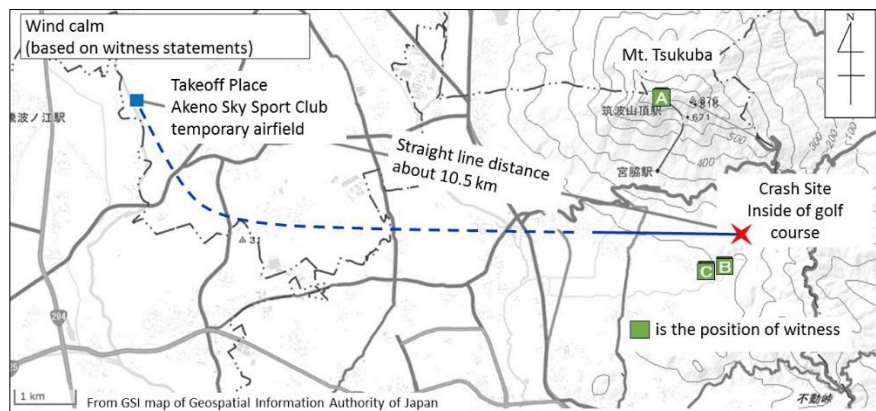


Figure 1 - estimated flight route

2.2 Injuries to Persons

Both of the pilot and the passenger were dead.

2.3 Damage

Extent of damage of the aircraft: Destroyed

- Fuselage: Crack, Deformation
 - Both main wings: Crack, Deformation
 - Propeller: Two blades were ruptured in three blades.
 - Rudder: Fall off
- No fire outbreak



Photo 1 - the aircraft

2.4 Personnel Information	<p>Pilot Male, Age 59</p> <p>Total flight time Unknown</p> <p>Total flight time on the type of aircraft Unknown</p> <p>Flight time for the last 30 days 1hr 48min (based on a memo in flight logs of aircraft crews)</p>
2.5 Aircraft Information	<p>(1) Aircraft type: ISHIJIMA MCR-01 Total flight time Unknown</p> <p>(2) Engine type: Rotax 912ULS Total flight time Unknown</p>
2.6 Meteorological Information	<p>The observations of the regional meteorological observatory 'Tsukuba' located about 17 km south from the accident site around the time of the accident were as follows:</p> <p>15:50 Wind direction Southeast, Wind velocity 3.9 m/s, Maximum instantaneous wind velocity 7.2 m/s, Temperature 29.7 °C, Rainfall 0 mm</p>
2.7 Permission under Civil Aeronautics Act	<p>Any permissions were not obtained for this flight, under the proviso of paragraph (1), Article 11, Civil Aeronautics Act (test flight etc.), paragraph (3), Article 28 (pilotage beyond scope of service), and the proviso of Article 79 (takeoff and landing place).</p>
2.8 Additional Information	<p>(1) Information on the Aircraft</p> <p>① On July 4, 2013, the aircraft obtained an identification code from Civil Aviation Bureau in application where the type is the experimental aircraft, the owner is the pilot, and the storage place is Akeno Sky Sport Club hanger.</p> <p>② According to the representative of the company which made the aircraft, the information on making of the aircraft was as follows:</p> <p>The aircraft is one of five aircrafts made in the Chinese factory of the company for display and flight in the air show held in China in 1996. One of MCR series (DynAero) was purchased from France, and the aircraft was modeled on the fuselage with a little appearance change. Although one of the five made aircrafts is held by the representative in Japan, it is not used for flight at the present. One aircraft was sold in China and other two aircrafts were sent to Japan, whose whereabouts are unknown to the representative at the present.</p> <p>The aircraft was loaded on a container in a dismantled condition and shipped to Japan on January 14, 2012, arrived at Japan about 15 days later, and was delivered to the pilot about half a year later. Afterward, though a manual of aircraft on which the aircraft was modeled was provided to the pilot and a variety of parts were sent on the pilot's request, no records were left.</p> <p>The representative had the experiences of controlling the aircraft, which was controllable after adjusting quickly the trim</p>

of the aircraft and stabilizing the aircraft even if the trim was out of place. If the trim moved to the limit in the nose-up direction, the control stick had to be pushed forward constantly with strong power. The representative used the limits of the weight and the center of the gravity (CG) position in the flight manual of the model fuselage for his flight.

- ③ According to the mechanic requested by the pilot to take application procedures for obtaining the permission under the proviso of Article 11, Civil Aeronautics Act (Test flight etc.), information on the aircraft was as follows:

The mechanic has been in charge of the aircraft since around summer in 2013. The fuselage was made of composite materials, from which different sounds come by hammering test it at the interval of about 10 cm, so that he thought the thickness was not uniform and the strength could not be assured. He requested the manufacturer to provide technical materials to demonstrate the strength, but was not able to get enough.

The aircraft had a leak of the fuel from a junction between the upper part of tank and external plate, and could not be refilled 30 l and over.

The measured results of loads on the landing gear and main dimensions with no fuel carried in the aircraft were as follows:

- Distance from spinner tip to leading-edge of main wing: 1.360 m
- Distance from spinner tip to nose landing gear: 0.770 m
- Distance from spinner tip to main landing gear: 1.840 m
- Load on the nose landing gear: 65.5 kg
- Load on the right main landing gear: 131.0 kg
- Load on the left main landing gear: 130.0 kg
- Total weight: 326.5 kg

The rear was heavy and the mechanic had thought in the weight and the CG position that it was no problem with one person on board, but it was hard with two persons on board, therefore had not decided the allowable ranges of the weight and the CG position.

- ④ According to the pilot's relatives, on August 15, 2014, the aircraft flew from the temporary airfield in Moriya City, where it was assembled, to Akeno Sky Sport Club temporary airfield, which was the storage place.

(2) Information on the Accident Site

The crash location of the aircraft was almost plain grassland at the altitude of 180 m within the golf course southeast of Mt. Tsukuba. The aircraft made the lower surface of the fuselage touch

down on the ground with the nose directed to the northwest and the landing gear damaged. Its sliding marks were hardly left on the ground. Seven marks by propellers rotating in the direction perpendicular to the shaft were left within about 1.3 m on the ground below the fuselage. The interval in the starting side was about 0.22 m. In three propeller blades, a blade B ruptured from the basis was discovered about 30 m almost right of the aircraft, a blade C also ruptured from the basis was stuck into the ground of the right lower side from about 8 cm behind the propeller hub, and an uncut blade A

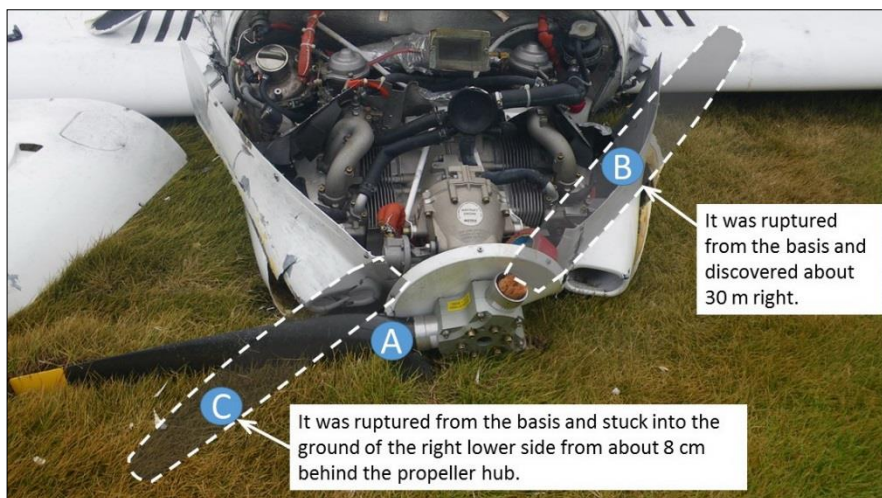


Photo 2 - condition of propellers (photographed from the forward)

was stopped in a condition of pressing the ground.

(3) Detailed Damage Situation

The spinner and the engine cowling fell off and the frame inside the engine room was bent by force from the forward lower direction. The fuel tank between the instrument panel and the engine had a hole near the fuel filler in its upper part by the strut of the nose landing gear, and the fuel outlet in the lateral lower part fell off to make a leak opening, so that no fuel was left.

The external plates of the fuselage had three cracks in each lateral side, and the right side was opened and the left side was compressed. The tail part of the fuselage was bent to the left at about 30 degrees. The lower surface of the fuselage was deformed due to pressure. The nose landing gear and both main landing gears were so deformed that the wheels were moved to the level of the lower surface of the fuselage. The leading edge of the main wing had several cracks in the longitudinal direction and the covers of anti-collision lights in the end of both wings were damaged.

The grip part of the control sticks in the left and right seats fell off and the move of the control sticks was restricted all around. Any of the rods connecting the aileron with the control stick were not ruptured. Although the rudder fell off, the cable connecting the rudder with the rudder pedal was not ruptured.

The elevator exceeded the operation limit in the nose-up direction and was fixed on the vertical tail. The elevator control rod (aluminum alloy) inside the vertical tail was bent. The elevator control rod (composite material) inside the fuselage was ruptured.

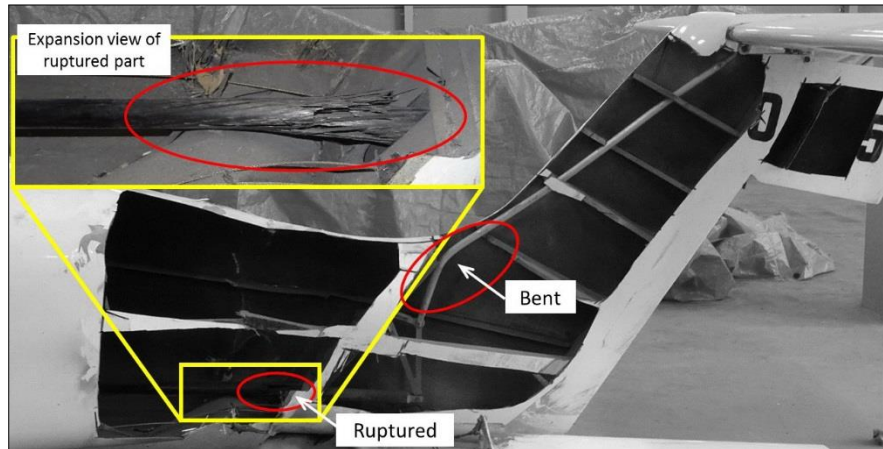


Photo 3 - condition of the elevator control rod (photographed after the external plate was cut)

The ball screw type elevator trim actuator was stopped in the limit in the nose-up direction. Rubber parts holding the control stick in the neutral position with the elevator trim were properly installed. There was no trouble with the conduction between the elevator trim actuator and the trim switch. Although there was no trouble with the function of the elevator trim switch in the center of the instrument panel, the move to come back to the neutral position was mechanically unstable, therefore the switch did not sometimes come back to the neutral position. The throttle was fixed forward (high rotation side). The instrument panel fell off from the fuselage and most of the instruments fell off from the instrument panel. All the left and right sheets made of composite materials were broken in the lower surface.

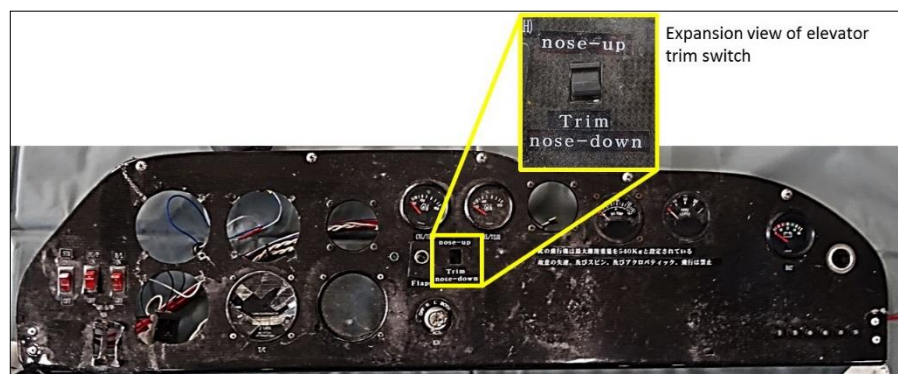


Photo 4 - the instrument panel

(4) Information on Engine

Any of the total of eight spark plugs which are installed in the upper part and the lower part of four-cylinder engine did not indicate signs of abnormal combustion. Clean gasoline was accumulated in two carburetors. The tachometer indicated 3,500 rpm (normal range

in green) and the oil pressure meter indicated 6.2 bar (higher caution range in yellow).

(5) Actuating Situation of Emergency Parachute

The aircraft was equipped with an emergency parachute (Ballistic Recovery Systems) to make a soft landing in emergency such as engine stop, and the actuating knob was pulled by 6 cm. When it was confirmed whether or not there was some trouble with the actuation, the actuating knob was heavy to pull from 16 cm, and the rocket was ignited and launched during a pull to the end (39 cm). The rocket climbed high in the sky and fell about 45 m behind the fuselage, whose parachute was normally opened.

(6) Speed Estimation at Crash

Based on the interval of three-propeller marks left on the ground (0.22 m), the indication of the tachometer (3,500 rpm), and the gear ratio of 2.43:1 in the engine and propellers, the estimation of the horizontal speed of the aircraft at the time of crash on the ground was about 60 km/h.

(7) Information on the Weight and the CG Position

According to the flight manual of DynAero MCR-ULC (the similar aircraft) which is similar to the aircraft in dimension and shape, the maximum take-off weight is 480 kg, the limit in the range of the CG position is between 22% and 40% of the mean aerodynamic chord (MAC), and the chord length is 0.96 m, and the reference line is 0.0135 m forward from the leading edge of the left main wing. The weight and the CG position are calculated for cases that one person and two persons are on board based on these values, the values calculated by the mechanic as described in 2.8(1)③ and the weight of the boarded persons. They were transferred to Figure 2 – the weight and the CG position copied into the Figure 2 in which the ranges of the weight and the CG position of the flight manual; accordingly, its results are as follows:

If one person is on board, they are within the ranges of the weight and the CG position from full-load fuel quantity to zero, during which the position of CG gradually moves rearward. If two persons are on board, the weight exceeds the limit when fuel is 11.6 ℓ and over, and the position of CG exceeds the rearward limit when fuel is 43 ℓ or less.

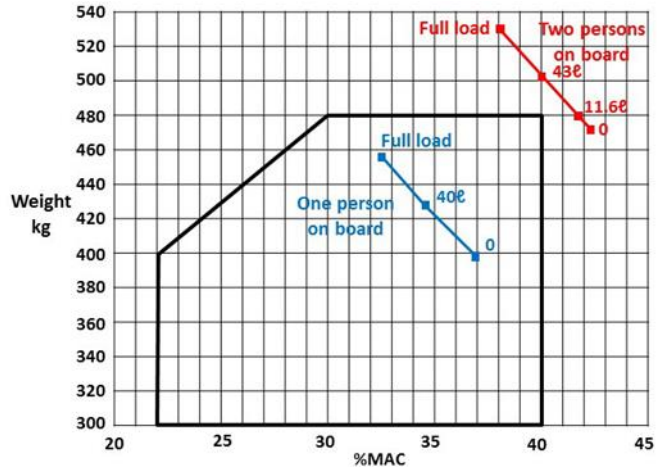


Figure 2 – the weight and the CG position

(8) Differences between the Aircraft and the Similar Aircraft

While the aircraft has windows in the rear of the canopy, the similar aircraft does not. In addition, both the air intake openings are different in shape.

3 ANALYSIS

3.1 Involvement of Weather	None
3.2 Involvement of Pilots	Unknown
3.3 Involvement of Equipment	Yes
3.4 Analysis of Findings	<p>(1) Situation in Crash</p> <p>It is somewhat likely that the aircraft had been able to fly without any problems until it nosed up in the air above the golf course.</p> <p>Based on the witness information and the damage condition of the aircraft, it is highly probable that soon after the aircraft nosed up, it took a steep nose-down attitude, made a nose-dived with spin to the right, and crashed onto the ground. Based on the situation, it is probable that the aircraft stalled and started to spin when it nosed up, and crashed without recovery. Based on the propeller marks on the ground, the scattering condition of blades, the engine situation, and the instrument indications when the aircraft crashed on the ground, it is highly probable that the engine and propellers of the aircraft rotated at high speed. It is probable that the aircraft crashed on the ground with the airspeed of about 60 km/h in the lateral direction and very fast airspeed in the vertical direction and was suddenly halted, which caused severe impact on the aircraft.</p> <p>(2) The Weight and the CG Position</p> <p>There is no flight manuals or other documents stipulating the</p>

weight and the CG position for the aircraft, and if the ranges of the weight and the CG position in the flight manual of the similar aircraft are applied to the aircraft, the weight exceeds the limit when fuel is 11.6 ℓ and over with two persons on board. Although the fuel quantity of the aircraft at the time of takeoff is unknown, it is probable that the aircraft did not load the fuel 30 ℓ and over, because it had a leak of fuel at the quantity. The CG position of the aircraft is already out of the rear limit at the takeoff and moves even more rear as fuel is consumed.

If the CG position moves to the rear, the control stick needs to be moved forward in order to keep the aircraft's attitude. If the CG position still moves to the rear even when the control stick reaches the forward limit, it is not possible to stop the move of the fuselage to nose up.

Therefore, it is somewhat likely that the pilot flied while trying to suppress the aircraft move in which the nose tended to up by moving the control stick forward, as the CG position moved to the rear with fuel consumption. It is probable that the fact that the aircraft nosed up before crash is because the CG position deviated to the rear from the normal controllable range, therefore the move of the aircraft to nose up could not be stopped. In this case, it is probable that the recovery from the stall and the spin was impossible for the aircraft which reached the control limit.

It is somewhat likely that the weight and the CG position were out of the normal controllable range from the time of takeoff.

(3) Situation of the Elevator Trim

It is somewhat likely that the elevator trim making the power to move the control stick to forward and backward direction neutral was in the nose-down direction from the start of the takeoff, and it is somewhat likely that it moreover moved to the nose-down direction as the fuel was consumed. However, the elevator trim of the aircraft after the crash was in the limit in the nose-up direction.

Regarding the fact that the elevator trim moved to the limit in the nose-up direction, because it would not expect that ball screw type trim actuator moved after the crash, it is somewhat likely that it is because a malfunction of the elevator trim switch or the pilot operation, and it is somewhat likely that this situation gave some effect on the crash.

(4) Emergency Parachute

It is highly probable that there was no trouble with the emergency parachute of the aircraft. It is probable that the pilot pulled the actuating knob for the emergency parachute while the aircraft was nose-diving with spin, but could not pull it to the end.

	<p>(5) Ensure Compliance with Laws and Regulations</p> <p>Although the pilot flew the aircraft without obtaining any permissions under Civil Aeronautics Act necessary for the flight of the aircraft which is the experimental aircraft, it is highly probable that he tried to obtain the permission under the proviso of paragraph (1), Article 11, Civil Aeronautics Act (Test flight etc.) by requesting the mechanic. However, the materials to demonstrate the strength of the aircraft were poor, there is a fuel leak from the tank and the allowable ranges of the weight and the CG position were not decided; therefore, it is highly probable that the aircraft did not reach the level of obtaining the permission.</p> <p>The pilot should not have flew the aircraft for which the necessary permissions under Civil Aeronautics Act were not obtained.</p> <p>(6) Information gathering for this investigation</p> <p>Enough information could not be gathered for this investigation, because the aircraft does not have a flight manual and does not reach the level of obtaining the permission to fly, and the pilot suffered fatal injuries.</p>
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4 PROBABLE CAUSES

<p>In this accident, it is probable that the crash was because the aircraft stalled and started to spin when it nosed up in the air, which could not be recovered.</p> <p>Regarding the fact that the aircraft nosed up and stalled, it is somewhat likely that it was caused by deviation of the CG position to the rear from the normal controllable range. And it is somewhat likely that the situation which the elevator trim moved to the limit in the nose-up direction gave some effect on the crash.</p>

5 SAFETY ACTIONS

<p>On August 28, 2015, Civil Aviation Bureau in Ministry of Land, Infrastructure, Transport and Tourism instructed a user, and so on. of an ultralight plane to surely obtain permission and report to the authority if the user came to know action that is or is likely to be in violation, through relevant parties, Tokyo Regional Civil Aviation Bureau, and Osaka Regional Civil Aviation Bureau, because there were many cases that the necessary permission for flight was not obtained in recent accidents of the ultralight plane.</p> <p>In addition, the Civil Aviation Bureau made the enhancement of audit, and so on to aero clubs, and so on, and requested managers of temporary airfields not to permit the use of the temporary airfield for a person who tries to fly without obtaining the permission under Civil Aeronautics Act and to provide information if the manager came to know action that is likely to be in violation.</p>
