

AA2015-7

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**PRIVATELY OWNED
JA 111L**

July 30, 2015

 **JTTSB** *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

DAMAGED TO AIRCRAFT DURING FORCED LANDING PRIVATELY OWNED

EXTRA EA300/L, JA111L

NAKANOCHINAI, IIZAKA-CHO, FUKUSHIMA CITY,

FUKUSHIMA PREFECTURE, JAPAN

AROUND 10:16 JST, MAY 12, 2014

June 19, 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

1 PROCESS AND PROGRESS OF THE INVESTIGATION

On May 12, 2014, the Japan Transport Safety Board designated an investigator-in-charge and an investigator to investigate this accident. An accredited representative of the Federal Republic of Germany, as the State of Design and Manufacture of the aircraft, participated in this investigation.

Comments were invited from parties relevant to the cause of the accident. Comments on the draft report were invited from the relevant State.

2 FACTUAL INFORMATION

2.1 History of the Flight	According to the statements of the captain, another pilot on board (hereinafter referred to as “the pilot”) and the witness, the history of the flight is summarized below: On May 12 (Monday), 2014 at around 09:42 JST(Japan Standard Time:UTC+9 hours), a privately owned Extra EA300/L, registered JA111L, with a center tank and an acro tank(refer to2.7(6)) having been fully fueled, took off from Fukushima Sky Park Temporary Air Field (hereinafter referred to as“ the Sky Park”) for familiarization flight with the captain sitting in the rear seat* and piloting the aircraft, and the pilot sitting in the
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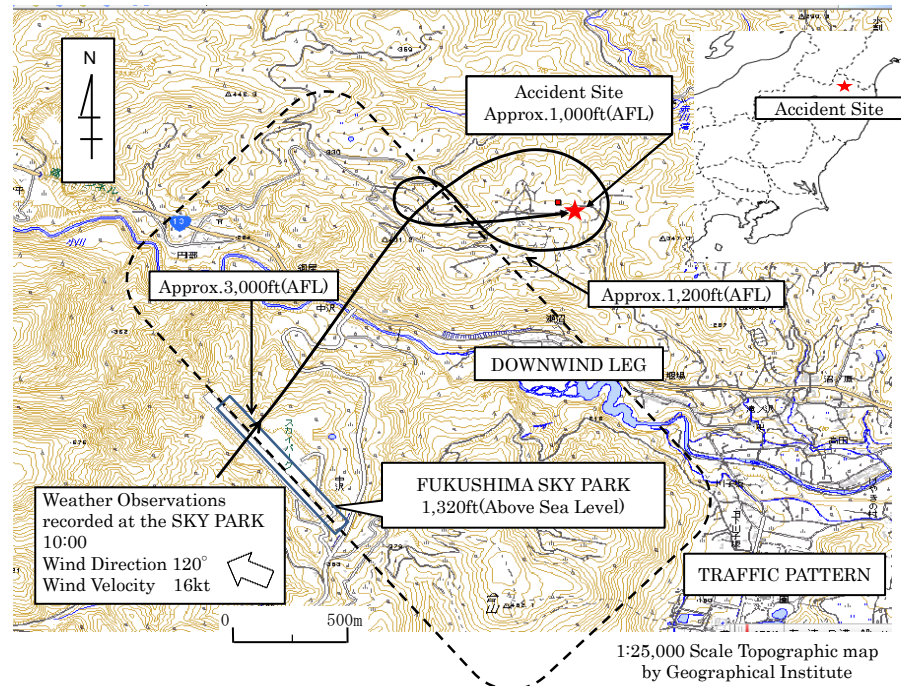


Figure1: Estimated Flight Route

front seat. While climbing, the pilot took over the piloting from the captain.

After checking the condition of the aircraft including inverted flight in the western airspace of the Sky Park, the pilot performed a series of acrobatic maneuvers called “sequence” at approximately 1,500~4,500 ft Above Field Level (hereinafter referred to as “AFL”) of the Sky Park.

Thereafter, taking over the piloting from the pilot, the captain performed the same sequence. Having finished the sequence, the captain and the pilot decided that they could perform the sequence one more time based on the elapsed time, thus taking over the piloting from the captain again, the pilot performed the third sequence of the day. There were no strange sound or foul smell and the engine was working normally during the flight.

After completing the sequence, the pilot closed the throttle and headed for the Sky Park while descending. (refer to Figure 1)

Having passed over the Sky Park at approximately 3,000 ft AFL, the aircraft flew to north-north-east while descending. Thereafter, it turned right and headed for the downwind leg of the runway 14.

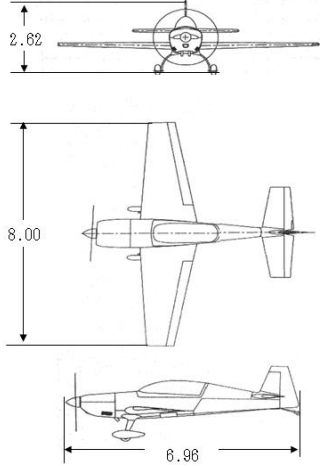
The pilot handed over the piloting to the captain when the aircraft approached the downwind leg at approximately 1,200 ft AFL.

The captain opened the throttle to increase engine power for level flight at the downwind leg, but the engine didn't respond.

The captain checked the position of mixture lever, master switch and ignition switch then he repeated opening/closing of the throttle several times but the engine power didn't increase. The captain didn't check the fuel quantity indicator at that time.

Because the captain considered that he wouldn't be able to reach the

	<p>Sky Park in that situation, he decided to make a forced landing to a peach orchard which he found by chance in the mountain area.</p> <p>At around 10:15, the captain reported to FUKUSHIMA FLIGHT SERVICE that they were in a situation of emergency.</p> <p>The aircraft flew to the peach orchard while turning left and approached there almost wing level altitude at approximately 3 m above ground level. Having the middle of its left wing collide against an iron pole which stood at the border of a peach orchard and a bamboo grass field, the aircraft made forced landing on a bamboo grass field and came to stop upside down at around 10:16.</p> <p>After the aircraft came to stop, the captain and the pilot escaped from the cockpit. When the pilot escaped, his cloths were stained with something like smoke oil for acrobatic flight, but both of the captain and the pilot did not notice fuel smell. Both of them didn't touch the switches when they escaped from the aircraft. There was no outbreak of fire.</p> <p>The captain and the pilot stated that propeller was rotating just before forced landing and the witness who was at his peach orchard near the accident site stated that he heard the weaker engine sound than usual.</p>																				
2.2 Injuries to the Persons	<p>Captain: slightly injured Pilot : seriously injured</p>																				
2.3 Damage to the Aircraft	<p>Extent of damage: Destroyed</p> <p>①The left wing was separated from the fuselage at its root and it was crushed under the fuselage. The left aileron was fallen in the peach orchard.</p> <p>②The engine was detached from its mount and it was in front of the aircraft. No anomalies were found in the spark plugs and the fuel filter.</p> <p>③All the three blades of the propeller were fractured at their shank.</p> <p>④The center tank was partly collapsed and cracked but no damage was found in the acro tank.</p> <div data-bbox="954 1032 1426 1317" data-label="Image"> </div> <p style="text-align: center;">Accident Aircraft</p>																				
2.4 Personnel Information	<p>(1) Captain Male, Age 26</p> <table border="0" style="width: 100%;"> <tr> <td style="padding-left: 20px;">Private pilot certificate (Airplane)</td> <td style="text-align: right;">December 25, 2008</td> </tr> <tr> <td style="padding-left: 40px;">Type rating for Single-engine Land</td> <td style="text-align: right;">December 25, 2008</td> </tr> <tr> <td style="padding-left: 20px;">Class 2 Aviation Medical Certificate</td> <td style="text-align: right;">Validity : June 30, 2017</td> </tr> <tr> <td style="padding-left: 20px;">Total flight time</td> <td style="text-align: right;">357 hours 16 minutes</td> </tr> <tr> <td style="padding-left: 20px;">Total flight time on the type of aircraft</td> <td style="text-align: right;">8 hours 03 minutes</td> </tr> </table> <p>(2) Pilot Male, Age 46</p> <table border="0" style="width: 100%;"> <tr> <td style="padding-left: 20px;">Private pilot certificate (Airplane)</td> <td style="text-align: right;">May 29, 1998</td> </tr> <tr> <td style="padding-left: 40px;">Type rating for Single-engine Land</td> <td style="text-align: right;">May 29, 1998</td> </tr> <tr> <td style="padding-left: 20px;">Class 2 Aviation Medical Certificate</td> <td style="text-align: right;">Validity: October 25, 2014</td> </tr> <tr> <td style="padding-left: 20px;">Total flight time</td> <td style="text-align: right;">1,070 hours 07 minutes</td> </tr> <tr> <td style="padding-left: 20px;">Total flight time on the type of aircraft</td> <td style="text-align: right;">27 hours 47 minutes</td> </tr> </table>	Private pilot certificate (Airplane)	December 25, 2008	Type rating for Single-engine Land	December 25, 2008	Class 2 Aviation Medical Certificate	Validity : June 30, 2017	Total flight time	357 hours 16 minutes	Total flight time on the type of aircraft	8 hours 03 minutes	Private pilot certificate (Airplane)	May 29, 1998	Type rating for Single-engine Land	May 29, 1998	Class 2 Aviation Medical Certificate	Validity: October 25, 2014	Total flight time	1,070 hours 07 minutes	Total flight time on the type of aircraft	27 hours 47 minutes
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<p>2.5 Aircraft Information</p>	<p>(1) Aircraft Type : Extra EA300/L Serial number : 1193, Date of manufacture : January 7, 2005 Certificate of airworthiness : No. TO-25-183 ,Validity : July 11, 2014 Category of airworthiness : Airplane, Acrobat A Total flight time : 522 hours 23 minutes Glide ratio : 1 : 6.2</p> <p>(2) Engine Type : Lycoming AEIO-540-L1B5 Serial number : L-29870-48A, Date of manufacture : September 20, 2004 Total time in service : 522 hours 23 minutes</p> <p style="text-align: right;">Units : m</p>  <p style="text-align: center;">Figure 2: Three Angle View of Extra EA300/L</p>
<p>2.6 Meteorological Information</p>	<p>The observed meteorological data of the Sky Park were as follows: 09:00 Wind direction 120°; Wind velocity 6 kt (3 m/s); Visibility 10 km or more; fine weather 10:00 Wind direction 120°; Wind velocity 16 kt (8 m/s); Visibility 10 km or more; fine weather</p>
<p>2.7 Additional Information</p>	<p>(1) Preflight Briefing The captain and the pilot made a preflight briefing concerning the process of the sequence but they didn't make detailed discussions about the flight time. The captain and the pilot had flown together five times before the accident and performed the individual acrobatic maneuver but that day was the first time for them to perform the sequence together.</p> <p>(2) Endurance The captain had calculated the fuel consumption rate by himself based on the Pilot's Operating Handbook and he estimated the endurance for a center tank and an acro tank were full at approximately 33 minutes (30 minutes for from takeoff to complete acrobatic flight, 3 minutes for return back to the Sky Park) but he had perceived that there was sufficient time to fly because he or the pilot would not always use the maximum power during the acrobatic flight. In addition, he hadn't calculated the fuel consumption rate of each flight based on the past fuel</p>

consumption results.

The pilot estimated the endurance for the flight from takeoff to landing was approximately 35 minutes based on his experience.

According to the Pilot's Operating Handbook, the endurance for the full tank (a center tank and an acro tank) is supposed as follows: Approximately 30 minutes with maximum power, approximately 35 minutes with 75% Power, approximately 48 minutes with 65% Power.

(3) Management of fuel and flight time

As the fuel quantity indicator doesn't indicate accurately during the acrobatic flight, the captain didn't have a habit of checking the fuel quantity indicator thus he managed the remaining fuel and flight time with a stopwatch. In addition, as the fuel quantity indicator is only mounted on the rear instrument panel, no one but the captain was able to check the remaining fuel.

(4) Description of the Pilot's operating Handbook concerning the fuel
Pilot's Operating Handbook Section 2 Limitations (excerpt)
2.14.2 OPERATING PLACARDS (on the rear instrument panel under fuel capacity indicator) WING TANK MUST BE EMPTY FOR ACROBATICS ACRO & CENTER TANK SHOWS "ZERO" IN LEVEL FLIGHT BELOW 11 L(2.9 US GAL) UNUSABLE FUEL 5.5 L(1.5 US GAL) (on the rear instrument panel under the acro & center tank fuel capacity indicator) THE REMAINING FUEL IN LEVEL FLIGHT CANNOT BE USED SAFELY WHEN INDICATOR READS "ZERO"

(5) Description of the Pilot's Operating Handbook concerning the cruising range and the duration

Pilot's Operating Handbook Section 5 Performance(excerpt)
5.1 GENERAL

Some indeterminate variables such as engine and propeller, air turbulence and others may account for variations as high as 10% or more in range and endurance. Therefore, it is important to utilize all available information to estimate the fuel required for the particular flight.

(6) Fuel tank

The fuel tanks of the aircraft consist of two wing tanks (60 L×2) located one in each wing, a center tank (42 L) and an acro tank (9 L) in front of the front seat .

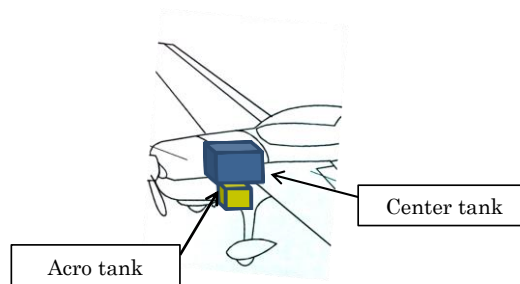


Figure 3: Fuel Tank

The center tank and the acro tank are connected directly and the fuel is provided to the engine through the acro tank.

(7) Remaining fuel

No fuel was observed in the center tank and only approximately 10 ml of fuel was observed in the acro tank.

No trace of fuel leakage was observed around the aircraft.

	<p>(8) Fuel pump and fuel injector</p> <p>Functional tests of the fuel pump (engine driven) and the fuel injector were conducted by the manufacturer in the U.S.A, but no anomalies were found in both of them.</p>
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* The Airplane is equipped with main flight instruments and switches such as fuel quantity indicator, magnetic compass, fuel flow indicator, in the rear instrument panel, thus the captain sits the rear seat when two pilots are on board. The front flight instrument panel is also equipped with flight instruments such as a speed meter and an altimeter thus the piloting is also available in the front seat. Minimum number of crew is one in the rear seat.

3 ANALYSIS

3.1 Involvement of Weather	No
3.2 Involvement of Pilots	Yes
3.3 Involvement of Aircraft	No
3.4 Analysis of Findings	<p>(1) Engine</p> <p>The engine fuel pump (engine driven), fuel injector, the spark plugs and fuel filter showed no anomalies. According to the statements, the captain and the pilot mentioned that the engine was working normally and the witness also mentioned that the engine sound had been heard.</p> <p>Therefore, it is highly probable that there were no anomalies in the engine.</p> <p>(2) Remaining fuel</p> <p>It is highly probable that the aircraft consumed more fuel than that of the captain and the pilot estimated during the three times of sequences. Since the flight time elapsed more than 30 minutes after takeoff and very little remaining fuel was detected from the acro tank, it is also highly probable that the fuel quantity indicator had read “zero” when the aircraft entered the downwind leg. As described in 2.7(4), the remaining fuel in level flight cannot be used safely when indicator reads “zero”, it is highly probable that the fuel was almost exhausted at that time, thus the aircraft couldn’t get the sufficient engine power to return back to the Sky Park.</p> <p>(3) Endurance and the fuel consumption rate</p> <p>The captain estimated endurance at approximately 33 minutes but he had perceived that there was sufficient time to fly because he or the pilot wouldn’t always use the maximum power during the acrobatic flight. On the other hand, the pilot estimated endurance at 35 minutes based on his experience. Although it was the first time for them to perform the sequence, it is probable that both of them didn’t grasp the fuel consumption rate based on the past fuel consumption results appropriately. The captain hadn’t been checking the fuel quantity indicator during the flight to the Sky Park after the pilot finished the</p>

acrobatic flight where the fuel quantity indicator didn't indicate accurately.

Therefore, it is highly probable that both of them continued flying without apprehension about fuel exhaustion in spite of that they had flown more than 30 minutes after takeoff.

As described in 2.7(5), it is described in the Pilot's Operating Handbook that "*Some indeterminate variables may account for variations as high as 10% or more in range and endurance.*"

Thus, the captain should have estimated the endurance using all the available effective information and made the flight plan with sufficient time at least more than 10% of endurance, much more when challenging the new acrobatic maneuver. He should have confirmed the remaining fuel by checking the fuel quantity indicator and landed earlier to the Sky Park before the fuel quantity indicator read "ZERO"

(4) Damage to the Aircraft

It is highly probable that the aircraft was damaged while the aircraft made a forced landing on a bamboo grass field, after collided its left wing against the iron pole which stood at the border of a peach orchard and a bamboo grass field.

(5) Possibility of gliding back to the Sky Park

The calculated glide distance based on the aircraft's glide ratio "1 : 6.2" and the altitude at the downwind leg (approximately 1,200 ft (360 m) AFL) is approximately 2.2 km.

Therefore, it is highly probable that it was difficult for the aircraft to return back to the Sky Park with gliding even though it took the shortest course from the downwind leg to the Sky Park (approximately 2.8 km).

4 PROBABLE CAUSES

It is highly probable that this accident was occurred because the aircraft consumed more fuel than the expectation of the captain and the pilot during the sequence thus the aircraft's fuel was almost exhausted when it entered the downwind leg, therefore it couldn't get the sufficient engine power to fly to the Sky Park and as a result, the aircraft was damaged during forced landing.

It is probable that the reason of the aircraft consumed more fuel than the expectation and it was almost exhausted was that both of the captain and the pilot didn't grasp the fuel consumption rate based on the past fuel consumption results appropriately and they didn't make the flight plan with sufficient time.