

AA2019-1

**AIRCRAFT ACCIDENT  
INVESTIGATION REPORT**

**PRIVATELY OWNED  
JA3447**

**January 31, 2019**

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

## DAMAGE TO AIRCRAFT DUE TO OVERRUNNING AFTER REJECTED TAKE-OFF SEMINE TEMPORARY AIRFIELD KURIHARA CITY, MIYAGI PREFECTURE, JAPAN AT ABOUT 16:00 JST, OCTOBER 8, 2017

PRIVATELY OWNED BEECHCRAFT E33, JA3447

December 21, 2018

Adopted by the Japan Transport Safety Board

Chairman	Kazuhiro Nakanishi
Member	Toru Miyashita
Member	Toshiyuki Ishikawa
Member	Yuichi Marui
Member	Keiji Tanaka
Member	Miwa Nakanishi

### 1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident	<p>On Sunday, October 8, 2017, a privately owned Beechcraft E33, registered JA3447, overran the runway after rejecting the take-off at Semine Temporary Airfield in Kurihara City, Miyagi Prefecture. It rolled over to a paddy field and suffered damage to its airframe.</p> <p>One passenger was seriously injured.</p>
1.2 Outline of the Accident Investigation	<p>On October 8, 2017, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and an investigator to investigate this accident.</p> <p>An accredited representative of the United States of America, as the State of Design and Manufacture of the aircraft involved in the accident, participated in the investigation.</p> <p>Comments were invited from parties relevant to the cause of the accident and the Relevant State.</p>

### 2. FACTUAL INFORMATION

2.1 History of the Flight	<p>According to the statement of the pilot, the history of the flight is summarized below.</p> <p>On October 8, 2017, a privately owned Beechcraft E33, registered JA3447, was scheduled to make a familiarization flight for the pilot, with a total of four persons consisting of the pilot and three passengers on board the Aircraft, at Semine Temporary Airfield (hereinafter referred to as “the</p>
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Airfield”) in Kurihara City, Miyagi Prefecture.

On the day of the accident, the Aircraft flew two times in total, one time each in the morning and the afternoon at the event held at the Airfield, with only the pilot on board, the weather was fine and there was no problem with the Aircraft.

Although before departure the pilot did not calculate the take-off distance according to the take-off distance\*1performance charts (hereinafter referred to as “Performance charts”) as in the flight manual, assuming that the take-off weight of the Aircraft would be about 3,000 lb or less by calculating from the weight of onboard fuel and the number of persons on board, and judged from his previous experience that the Aircraft would be able to lift off with a take-off roll for about 400 m.

At about 15:58 Japan Standard Time (JST; UTC + 9 hrs), the pilot determined there was almost no wind by checking the windsock at the Airfield, commenced a take-off roll with flaps up and full throttle from the end of the take-off and landing zone (hereinafter referred to as “the Runway”) 33 according to the take-off procedures in the flight manual. (See I. in Figure 1) About the time when the Aircraft passed halfway of the Runway (halfway line) (see II. in Figure 1), the airspeed indicator showed 50 kt but, about the time when exceeding that speed, the acceleration was getting worse. As not seeing any abnormality in the engine output, the pilot suspected that changing to a tail wild might have an effect on it, while wondering whether to reject the take-off for a few seconds, the Runway end was looming ahead. (See II. To III. in Figure 1) The pilot decided to reject the take-off when the Aircraft passed around the target landing point (touchdown point) (III. in Figure 1), hastily positioned the throttle lever to idle and applied brakes, but the Aircraft overran (see IV. in Figure 1) the Runway.

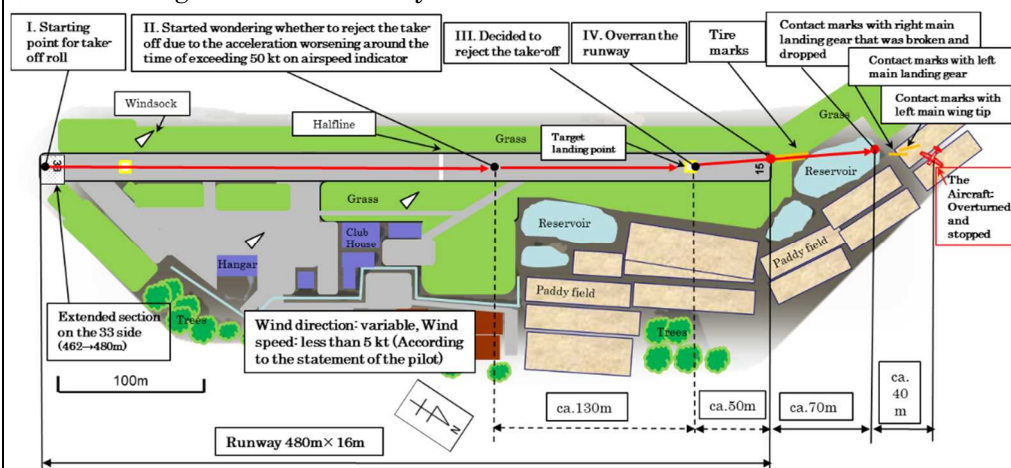


Figure 1 The Airfield layout and Estimated Flight Route

The pilot did not remember accurately the airspeed at the time when he decided to reject the take-off, but thought that it would have exceeded 60 kt.

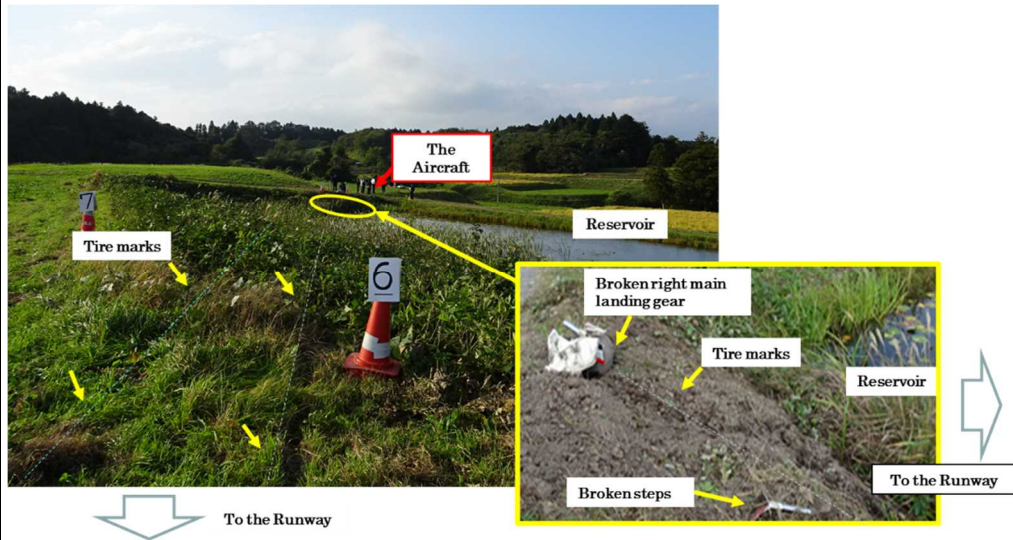
The pilot maneuvered to have the Aircraft escaped to the grass area on

\*1 “Take-off distance” means a horizontal distance required to takeoff and climb to a specified height (15 m [50 ft] for Normal , Utility and Acrobat Category). (To be described in Figure 3, 2.8.)

	<p>the left side of the Runway, but the Aircraft was heading toward the reservoir (hereinafter referred to as “the Reservoir”) ahead of the Runway end. The pilot maneuvered to veer to the left side so as not to fall into the Reservoir, but the Aircraft passed over the Reservoir and touched down on the edge of the Reservoir, after that he did not know what was going on, and when he realized, he found the Aircraft upside down with its engines stopped. The two persons seated in the front evacuated to the left side of the Aircraft, and the two persons seated in the aft to its right side.</p> <p>According to the statements of rescue workers who rushed to the accident site, there was almost no wind in the vicinity of the end of the Runway 33.</p> <p>This accident occurred at about 16:00 on October 8, 2017, at Semine Temporary Airfield in Kurihara City, Miyagi Prefecture (38° 40’ 56” N, 141° 01’ 08” E).</p>																											
2.2 Injuries to Persons	One passenger was seriously injured.																											
2.3 Damage to Aircraft	<p>Extent of damage: Destroyed</p> <ol style="list-style-type: none"> <li>1. Nose section: <ul style="list-style-type: none"> <li>Propellers: Damaged, Nose gears: Damaged,</li> <li>Engine mount and Keel: Damaged</li> </ul> </li> <li>2. Both main wings: Damaged</li> <li>3. Right main landing gear: Broken</li> <li>4. Fuselage and Cockpit: Damaged</li> <li>5. Vertical stabilizer: Damaged</li> </ol>																											
2.4 Personnel Information	<table border="0" style="width: 100%;"> <tr> <td>Pilot</td> <td>Male, Age 54</td> <td></td> </tr> <tr> <td>Private pilot certificate (Airplane)</td> <td></td> <td>December 13, 2000</td> </tr> <tr> <td>Pilot competence assessment Expiry of practicable period for flight</td> <td></td> <td>November 22, 2017</td> </tr> <tr> <td>Type rating for Single-engine (land)</td> <td></td> <td>December 13, 2000</td> </tr> <tr> <td>Class 2 aviation medical certificate</td> <td></td> <td>Validity: November 10, 2017</td> </tr> <tr> <td>Total flight time</td> <td></td> <td>834 hours 22 minutes</td> </tr> <tr> <td>Flight time in the last 30 days</td> <td></td> <td>9 hours 27 minutes</td> </tr> <tr> <td>Flight time on the same type of aircraft</td> <td></td> <td>143 hours 47 minutes</td> </tr> <tr> <td>Flight time in the last 30 days</td> <td></td> <td>9 hours 27 minutes</td> </tr> </table>	Pilot	Male, Age 54		Private pilot certificate (Airplane)		December 13, 2000	Pilot competence assessment Expiry of practicable period for flight		November 22, 2017	Type rating for Single-engine (land)		December 13, 2000	Class 2 aviation medical certificate		Validity: November 10, 2017	Total flight time		834 hours 22 minutes	Flight time in the last 30 days		9 hours 27 minutes	Flight time on the same type of aircraft		143 hours 47 minutes	Flight time in the last 30 days		9 hours 27 minutes
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2.5 Aircraft Information	<p>(1) Type: Beechcraft E33  Serial number: CD-1221, Date of Manufacture: May 21, 1969  Airworthiness certificate No. To-28-384  Validity November 24, 2017</p> <p>(2) Weight and balance</p> <p>When the accident occurred, the weight of the aircraft was estimated to have been 2,996 lb and the position of the center of the gravity (CG) was estimated to have been 85.9 in, it is highly probable that both of which were estimated to have been within the allowable range (the maximum take-off</p>																											



Photo 1 the Aircraft seen after the accident

	weight: 3,050 lb and CG range of 81.5 to 86.7 in corresponding to the weight at the time of the accident).									
2.6 Meteorological Information	<p>(1) According to the statement of the pilot, the weather conditions at the Airfield on the day of the accident were as follows:  Weather: fine, Wind direction: variable, Wind speed: less than 5 kt  Temperature: 15°C</p> <p>(2) According to the records at Tsukidate Automated weather station, Japan Meteorological Agency located about 7 km north-northwest from the accident site, the weather conditions around the accident site on the day of the accident were as follows: (The wind velocity was converted from m/s into kt.)</p> <table border="1"> <thead> <tr> <th>Time</th> <th>Wind direction</th> <th>Wind speed kt</th> </tr> </thead> <tbody> <tr> <td>15:50</td> <td>South-southeast</td> <td>0.5 kt</td> </tr> <tr> <td>16:00</td> <td>South</td> <td>1.5 kt</td> </tr> </tbody> </table>	Time	Wind direction	Wind speed kt	15:50	South-southeast	0.5 kt	16:00	South	1.5 kt
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2.7 Accident Site	<p>The Airfield is located about 60 km north of Sendai Airport, with an elevation of 171 ft, having the Runway 15 / 33 of 480 m in length and 16 m in width.</p> <p>There were no brake marks confirmed on the Runway. The tire marks continued from the grass area in front of the Runway end to the area short of the Reservoir.</p> <p>There were contact marks with the right main landing gear on the Reservoir edge, over which it was found that the broken right main strut and boarding steps dropped. A little ahead from there, the contact marks with the left main landing gear and the left main wing tip were found. (See Figure 1 and Figure 2.)</p>  <p>The photograph shows a grassy area next to a reservoir. A yellow circle highlights the location of the aircraft. Yellow arrows point to 'Tire marks' on the grass. A red and white traffic cone is labeled '6'. A yellow box provides a close-up of the 'Broken right main landing gear' and 'Broken steps' on the ground. A blue arrow points 'To the Runway'.</p>									
2.8 Additional Information	<p>(1) Aircraft examination result  The combustion state of engine spark plug was good, there was no clogging of the pitot and static line systems, and no foreign material inclusion.</p> <p>(2) The pilot's experience of take-off from a short runway  The pilot usually uses the 600 m runway and has experience to take off with the maximum take-off weight of about 3,050 lb, but the Runway length in the Airfield is 480 m that was the shortest runway he had ever used.</p>									

The pilot has participated in the annual event held at the Airfield since four years ago, and has experience of taking off and landing at the Airfield; however, it was the first time for him to take off from the Airfield with nearly the maximum take-off weight.

(3) Take-off speed

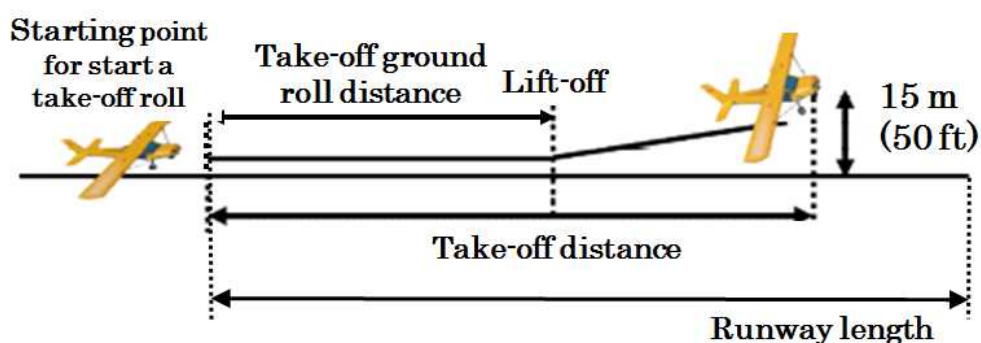
According to the flight manual of the Aircraft, the takeoff speed is 68 kt at ground roll distance (lift-off) and 74 kt at the total distance over a 50ft obstacle (take-off distance). According to the pilot, he was going to initiate the nose-up operation when reaching around 70 kt.

(4) Confirmation before departure and take-off weight

The take-off weight is one of matters that must be confirmed by the pilot in command pursuant to Article 73-2 of the Civil Aeronautics Act (Act No. 231 of 1952) and Article 164-14 of the Act ordinance for Enforcement of the Civil Aeronautics Act (Ordinance of the Ministry of Transport No. 56 of 1952).

The take-off weight of the aircraft greatly affects its take-off performance, and the more the weight increases, the longer the runway length for take-off is required. Other factors affecting the take-off performance include ambient temperature, altitude and wind conditions of the airport.

Figure 3 shows the relation between take-off distance, take-off run<sup>2</sup> and runway length.



It must be  $\text{Take-off distance} \leq \text{Runway length}$

Figure 3 Take-off distance

According to the Performance charts of the flight manual of the Aircraft, when calculating the maximum value (hereinafter referred to as “Reference take-off weight”) for the take-off distance that could be within the Runway length of the Airfield, under the following conditions; the Runway length is 480 m, the elevation is 171 ft, the ambient temperature is 15°C at the time of the accident, and in a no-wind condition, the Reference take-off weight is 2,700 lb or less. This case is referred to as “(A) No-wind during take-off with the Reference take-off weight”.

According to the Performance charts of the flight manual of the Aircraft, when the take-off ground roll distance and the take-off distance are obtained at the take-off weight of 2,996 lb at the time of the accident under the same

\*2 “Take-off ground roll distance” means a horizontal distance from the starting point to start a takeoff to the takeoff point.(Normal , Utility and Acrobat Category).

conditions as above and in a no-wind condition, the take-off ground roll distance is around 397 m and the take-off distance is around 595 m, respectively. This case is referred to as “(B) No-wind during take-off with the weight at the time of the accident”.

In addition, according to the Performance charts, if there is a tail wind effect, a tail wind of 1 kt increases take-off run and take-off distance by about 8 m, respectively. As shown in 2.6 (1), the wind speed was less than 5 kt at the time of the accident, the case assuming that the Aircraft took a tail wind of 3 kt is referred to as “(B+) Tail wind 3 kt during take-off with the weight at the time of the accident” (+8 m/kt x 3 kt).

The table in Figure 4 shows the required distance under each take-off condition, calculated according to the Performance charts. The graph in Figure 4 shows the cases where the take-off speed can be attained within the required distance under each take-off condition.

The graph in Figure 4 shows that the more the take-off weight increases, the gentler the climb gradient of the line on the graph becomes, the worse the acceleration becomes, and the longer the take-off run and the take-off distance become. The example shows that the effects of take-off weight increase on the take-off performance of the Aircraft are greater than the effects caused by taking a tail wind of 3 kt.



<u>Required distance under each take-off condition</u>	Take-off weight (lb)	Take-off ground roll distance (m)	Take-off distance (m)
(A) No-wind during take-off with Reference take-off weight	2700	305	480
(B) No-wind during take-off with the weight at the time of the accident	2996	397	595
(B+) Tail wind 3 kt during take-off with the weight at the time of the accident	2996	421	619

Graph's horizontal axis (I.) to (IV.) correspond to the numbers on the estimated rolling route shown in Figure 1.

- I. Starting point for take-off roll
- II. Started wondering whether to reject the take-off due to the acceleration worsening around the time of exceeding 50 kt on airspeed indicator
- III. Decided to reject the take-off
- IV. Overran the runway

**Take-off speed**

- Lift-off speed: 68kt
- Over 50ft obstacle speed: 74kt

- (A) No-wind during take-off with Reference take-off weight
- (B) No-wind during take-off with the weight at the time of the accident
- (B+) Tail wind 3 kt during take-off with the weight at the time of the accident

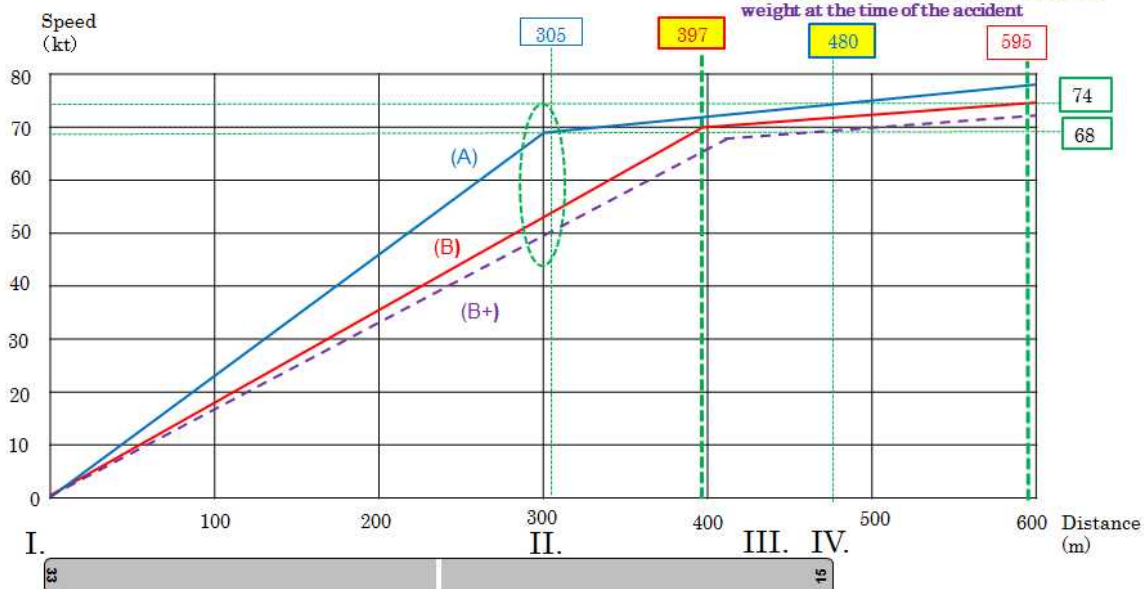


Figure 4 Required distance under each take-off condition and take-off speed

(5) Safety training

The pilot regularly participated in safety operations seminars organized by the Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism and safety trainings provided by the Japan Aircraft Pilot Association. According to the pilot, in the recent seminars and trainings in which he had participated by November 2016, he received explanations on accident cases where the take-off weight affected the take-off performance, however, he did not consider it by reflecting on his own flight.

(6) Safety measures for pilots of small aircraft and its information dissemination

Based on the recommendations the Japan Transport Safety Board(JTSCB) made on July 18, 2017 concerning the aircraft accident registered JA4060, a privately owned Piper PA-46-350P, the Japan Civil Aviation Bureau(JCAB) notified the relevant organizations of the following matters related to confirmation before departure and others on the same day.

	<p>1. To comply with the maximum take-off weight and its CG limits.</p> <p>2. To make sure to meet the performance requirements stipulated in the flight manual.</p> <p>On October 6, 2017 the safety promotion leaflets for describing and notifying the above have been posted on the JCAB website for small aircraft pilots, and at the time of pilot competence assessment, the JCAB requested skill judge to inform the pilot of the small aircraft about the contents of the leaflet and intensively examine it.</p> <p>The JCAB also issued the documents to the small aircraft operators and affiliates organization. The JCAB request to the competence assessment auditor for their membership, distribute the leaflets to small aircraft pilots and make sure that the content of leaflet is understood and conducting secure audits.</p> <p>In addition, creating a safety promotion video for small aircraft pilots as a countermeasure to prevent the accidents of small aircraft which have increased in recent years, the JCAB has released the video on the following internet video upload site since April 13, 2018.</p> <p><a href="https://www.youtube.com/user/mlitchchannel/videos?disable_polymer=1">https://www.youtube.com/user/mlitchchannel/videos?disable_polymer=1</a></p>
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### 3. ANALYSIS

3.1 Involvement of Weather	None
3.2 Involvement of Pilot	Yes
3.3 Involvement of Aircraft	None
3.4 Analysis of Findings	<p>(1) Judgments taken by the pilot before departure</p> <p>It is somewhat likely that the pilot judged from his previous experience that the Aircraft would be able to lift off with a take-off roll for about 400 m on the Runway in the same way as he would take off from the 600 m runway that he normally uses; however, if there was no wind at the time of the accident, it is probable that the Aircraft would not be able to have safely taken off from the 480 m Runway at the Airfield unless the take-off weight of the Aircraft was 2,700 lb or less, as shown in (A) No-wind during take-off with the Reference take-off weight in Figure 4.</p> <p>(2) Aircraft condition</p> <p>From the statement of the pilot and the aircraft examination result, it is highly probable that there weren't any abnormalities in the aircraft and its engines.</p> <p>In addition, in Figure 4 based on the Performance charts of the flight manual of the Aircraft, the speed at position (II) of the "(B) No-wind during take-off with the weight at the time of the accident" is 52 kt, and the speed at position (II) of the "(B+) Tail wind 3 kt during take-off with the weight at the time of the accident" is 50 kt. It is probable that the Aircraft accelerated as the performance in the flight manual of the Aircraft because the airspeed indicator</p>

readings were at about 50 kt at the positions of (II) in Figure 1 and Figure 4 according to the statement of the pilot, and they are within almost same range. (3) Situation leading up to the airframe damage from the commencement of take-off

It is somewhat likely that the pilot assumed from his previous experience at the Airfield that the Aircraft would exceed 60 kt and reach close to the take-off speed around the position passing the halfway line (II of Figure 1 and Figure 4). It is also somewhat likely that although the Aircraft's airspeed indicator readings were still at around 50 kt around that position, he was not well aware of the Aircraft's overweight affecting the take-off performance, therefore he did not come up with the effects of overweight even though its acceleration was insufficient, and mistakenly took it that a tail wind affected the Aircraft.

The effects of tail wind on acceleration is as shown in Figure 4. According to the weather conditions in the vicinity of the accident site and the statements of rescue workers, when the accident occurred, it is unlikely that there was a tail wind that would significantly affect the take-off performance of the Aircraft.

As shown in "(B) No-wind during take-off with the weight at the time of the accident" in Figure 4, based on the Performance charts of the flight manual of the Aircraft, the take-off run is 397 m that is less than 480 m (the Runway length at the Airfield), but the take-off distance is 595 m that is greatly over the Runway length at the Airfield.

It is probable that the pilot did not accurately grasp the fact that the take-off distance of the Aircraft greatly exceeded the Runway length at the Airfield, and continued take-off rolling by assuming that the Aircraft would be able to lift off within the remained distance on the Runway, leading to a delay in making a decision of rejecting the take-off.

It is probable that as the remained distance to the Runway end was reduced, the pilot judged it as difficult to continue the take-off procedures and decided to reject the take off when the Aircraft passed around the target landing point (III in Figure 1 and Figure 4). It is highly probable that the remained distance to the Runway end was about 50 m and its speed exceeded 60 kt at this position (III in Figure 1 and Figure 4), at which according to the pilot, the Aircraft' speed also exceeded 60 kt; therefore, the Aircraft was not able to stop within the Runway and overran the Runway.

It is highly probable that running on the grass land at a speed of over 60 kt, the Aircraft continued to run with the airframe contacting with the rough surface such as steps of the Reservoir and others while being broken, rolling over to a paddy field in front of the Runway end, and suffered damage to its airframe.

#### (4) Prevention of similar accidents

Do not depart without the confirmation by the pilot in command before departure that is essential for the safety. This lesson was also given in the safety operations seminars that the pilot regularly participated in, however, he did not consider it by reflecting on his own flight, and not confirm before

	<p>departure that the weight of the Aircraft should meet the performance requirements stipulated in its flight manual. As described in 2.8 (6), the JCAB has disseminated the information related to ensuring the confirmation before departure to small aircraft pilots in order to prevent similar accidents. It is desirable for those pilots to follow these advices, as well as to understand these precautions by reflecting on their own flights and to improve their expertise and pilotage when participating in the safety operations seminars.</p>
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#### 4. PROBABLE CAUSES

It is highly probable that in this accident, the Aircraft overran the runway after rejecting the take-off, rolled over to a paddy field, and suffered damage to its airframe.

It is also highly probable that the reason why the Aircraft overran the Runway was because the weight of the Aircraft exceeded the weight with which the Aircraft would be able to safely take off within the range of the Runway length at the Airfield, and the remained distance to the Runway end was reduced, leading to a delay in making a decision of rejecting the take-off.