AA2017-1

AIRCRAFT ACCIDENT
INVESTIGATION REPORT

PRIVATELY OWNED
J A 2 4 3 7

February 23, 2017

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.

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

PRIVATELY OWNED, S.N. CENTRAIR C 101B (GLIDER, SINGLE-SEATER), JA2437 CRASH BY FAILURE OF FORCED LANDING AT ASO CITY, KUMAMOTO PREFECTURE, JAPAN, AT ABOUT 14:36 JST, APRIL 10, 2016

February 10, 2017
Adopted by the Japan Transport Safety Board
Chairman Kazuhiro Nakahashi
Member Toru Miyashita
Member Toshiyuki Ishikawa
Member Yuichi Marui
Member Keiji Tanaka
Member Miwa Nakanishi

1. PROCESS AND PROGRESS OF INVESTIGATION

1.1 Summary of the Accident	On Sunday, April 10, 2016, a privately owned S.N. Centrair C 101B, registered JA2437, crashed on the cross country course (lawn) by failure of forced landing in the Aso Tourism Ranch, with a winch has failed while climbing by winch launch for a familiarization flight from runway 26 of Aso Tourism Ranch landing field. The fuselage was destroyed. The Captain was not injured.
1.2 Outline of the Accident Investigation	Japan Transport Safety Board designated an investigator-in-charge and an investigator for the accident on April 11, 2016. An accredited representative of the French Republic, as the State of Design and Manufacture of the aircraft involved in this accident, participated in the 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 statement of the Captain, the situation of the crash site, and the records of the video camera which will be described later in 2.5 (2), the history of the flight is summarized below. At about 14:35 Japan Standard Time (JST, UTC +9 hours) on April 10, 2016, the privately owned Centrair C 101B, registered JA2437 (the Aircraft), took off with winch launch from the above-mentioned landing field boarding

Photo 1 The Aircraft

with the Captain alone for familiarization flight from runway 26 (elevation 2,750 ft, about 838 m).

(1) From the lift-off until the deployment of air brakes

The towing started and the Aircraft had been climbing at a pitch angle of 30° after lift-off, but the airspeed began decreasing from about 100 km/h. This was due to the winch failure as described in 2.5(3) later, but the Captain was not able to grasp the situation immediately; therefore, he reported to the winch operator that the airspeed had been slowing down over the wireless phone. However, as the Aircraft continued decreasing to about 70 km/h (minimum value was about 55 km/h according to the records of the video camera), the Captain manipulated releasing operation of the tow line and suppressed pitch angle. At that time there was no operational feeling that the tow line was released.

The Captain, as feeling that the above ground level (AGL) was between 100 m and 130 m which was a criterion for landing straight ahead, deployed the air brakes (which are the resistance boards protruding on upper surfaces of the main wings and with which that can reduce the gliding ratio, and in the case of the Aircraft, the gliding ratio is five in the configuration of indicated speed at 97 km/h and fully extend.) Its AGL then was about 67 m, if converting the indication of about 2,970 ft barometric altimeter recorded on the video camera. The Captain stated that the reason why he was unable to accurately grasp its AGL was that the advance preparation had not been made for converting AGL value in metric units into reading the barometric altimeter that displayed the altitude value in foot units and remembering it.

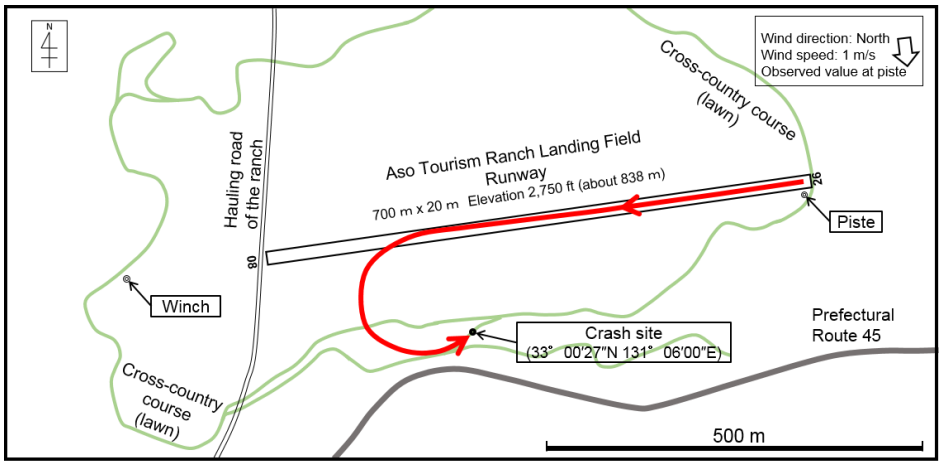


Figure 1 Estimated flight path map

(2) From the steep left turn to crash

The Captain, once tried to land straight ahead; however, from the fact that the winch appeared very near having a feeling that there was not enough distance for the landing straight ahead if the AGL when seeing the ground was more than 100 m, then changed his mind to a landing after turn, retracted the air brakes, and started a steep left turn

after looking at the display of the speedometer of 100 km/h.

Although the airspeed in the steep turn was between 95 km/h and 105 km/h according to the records of the video camera; however, the Captain performed making a slight nose down descent and 45 degrees bank of the Aircraft because he thought that the airspeed was not enough for fear of the stall at that time. The Captain, while keeping in mind of the wing tip, thought that the groves he had perceived could be avoided successfully, and had the intention to nose up after passing the groves.

Its altitude was actually lower than the visual estimation of the Captain, the Aircraft let the left wing came into contact with the groves, with this it crashed from the tail wheel while rotating counterclockwise. The crash site was a cross country course (lawn) on the south side of the landing field.

In addition, about what led to the crash, the Captain stated that it was a mistake that he changed his mind from the landing straight ahead to landing after a turn.

The accident occurred at Yamada, Aso City Kumamoto Prefecture (33°00' 27" N 131°06' 00" E), at about 14:36 on April 10, 2016.

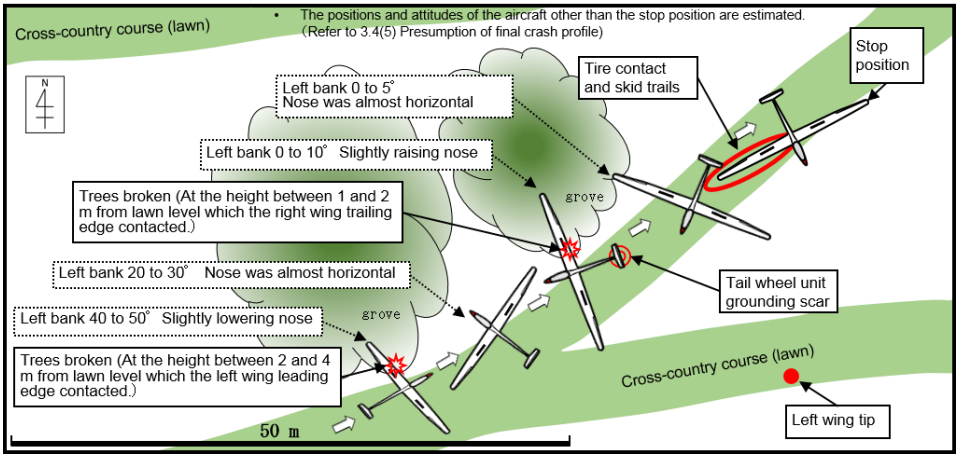


Figure 2 Crash site plan view

2.2 Injuries to Persons	None
2.3 Damage to Aircraft	

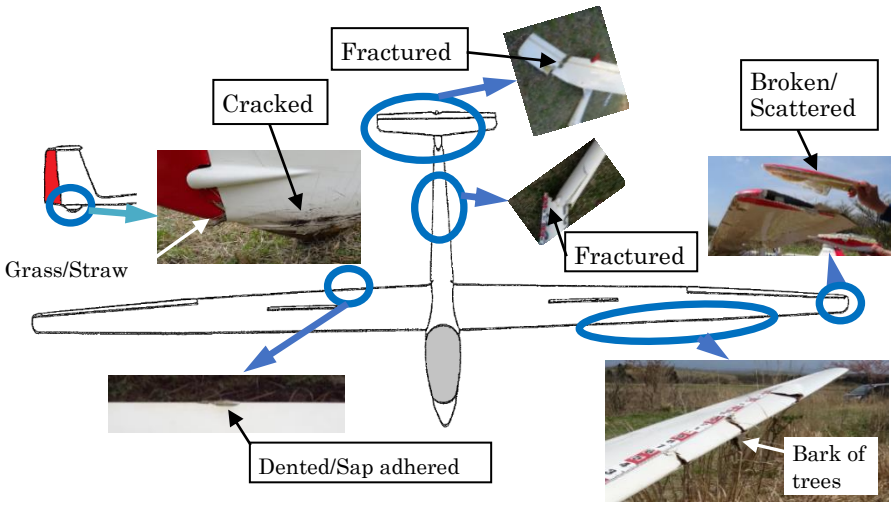
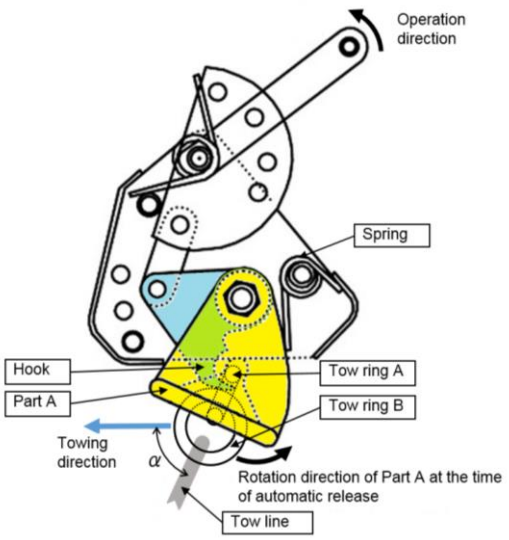


Figure 3 Airframe damage

	The Aircraft had been destroyed by the crash, the details are as follows. There were damage considered to have contacted with the groves in the left wing leading edge, and some had been caught bark. In addition, left wing tip was broken. There were dents considered to have been caused by contact with the trees and sap adhered to the trailing edge of the right wing. There was a cracking on the right side of the tail wheel, and grass and straw had gotten stuck between the rudder and vertical stabilizer. The fuselage had fractured at the intermediate portion of the rear part. The right side of the horizontal stabilizer had been fractured in the middle part.
2.4 Personnel Information	Captain: Male, Age 68 Private pilot certificate (High-class glider): February 12, 2010 Class 2 aviation medical certificate Validity: April 8, 2017 Pilot competence assessment /Confirmation – Expiration date of piloting capable period: August 11, 2017 Total flight time: 173 hr. 53 min. (310 launches) Flight time in the last 30 days: 0 hr. 20 min. (1 launch) Total flight time on the type of the Aircraft: 18 hr. 56 min.(43 launches) Flight time in the last 30 days: 0 hr. 20 min. (1 launch)
2.5 Aircraft and others Information	(1) Aircraft Type: S.N. Centrair C 101B Serial number: 101 BO 299 Date of manufacture: March 1, 1989 Certificate of airworthiness: No. 2015-11-18 Validity: August 22, 2016 Category of airworthiness: Glider Utility Total flight time: 595 hr. 57 min. Flight time since last periodical check (Check on August 8, 2015): 2 hr. 37 min. When the accident occurred, the weight and the position of the center of gravity of the Aircraft were estimated to have been within the allowable range. (2) Video camera In the cockpit of the Aircraft a simple video camera had been brought into at the time of the accident, and the airspeed indicator, vertical speed indicator, barometric altimeter and the situation of front vision had been recorded and saved in the video with sound. Records of the video camera are shown in Appendix. (3) Winch The winch had been in-house assembled by the club, to which the Captain belongs, using the parts of the truck and other things, and had been used for more than 20 years. The propeller shaft (a part for transmitting the rotational force of the engine to the tow line hoisting

	drum) was fractured at the junction. The fractured portion could not be visually observed structurally. The Winch was used until just before the accident occurred, and its operating condition was normal. In addition, design documents, manufacturing specifications and inspection records of the winch did not exist. Truck record of inspection and maintenance also could not be confirmed.   Photo 2 Winch and Propeller shaft fractured portion The tow line was a steel twisted wire.
2.6 Meteorological Information	It was cloudy, with northern wind of 1 m/s. (By the observation of the club)
2.7 Additional Information	(1) Automatic release mechanism of tow line The tow line will be released from a hook of an automatic release mechanism (manufactured by TOST GmbH, hereinafter referred to as the "Tow hook") attached to a fuselage of the Aircraft when the traction force of a tow line is weakened then its direction as viewed from an aircraft comes to be directed downward. Its schematic of the mechanism is shown on Figure 4.  Figure 4 Mechanism of the Tow hook "Part A" in Figure 4 is set not to be loosed from the "Hook" by clamping the "Tow ring A" to the towing direction by the force of the spring. From this position, when the angle "α" between the towing direction and the tow line direction becomes at 83°±7° or more if the tow line direction deviates downward, the "Tow ring B" will rotate the "Part A" backward against the force of the spring, the "Tow ring A" will be released from the "Hook" due to the own weight of tow line and others, and this is called an automatic release. When automatic release is done, "Part A" will be returned to the initial position by the force of the spring. In addition, the release of the tow line by the manipulation of the operator will be done by activating the "Tow Hook" toward the operational direction indicated on Figure 4, with which the hook will be

	displaced to be rotated forward in order that the "Tow ring A" will be disengaged from the “Hook”. (2) Usage of winches in other clubs Recently in Japan, while there are some clubs that are purchasing and using the winches appeared in the catalog buying; on the other hand, there are clubs that are using the self-built winches for many years. In addition, there are no specific provisions on the performance, durability and implementation of the periodic inspection of a winch, it has been left it to the discretion of the management of the club. (3) Information on safe flights In the winch launch, since the trouble at the time of towing including the winch failure is unavoidable, the countermeasures had been set for the case of trouble. In fact, some clubs in Japan are making clear with the coutermeasures to be taken by pilot or winch operator in case of trouble, and are conducting simulation trainings. The Captain, on the basis of the common information on safety flights of the club to which he belongs, had set up criteria of the altitude capable of the landing straight ahead and the release altitude of the Aircraft. The AGL during the winch launch had been shown in metric units; however, there was no conversion into feet in the information. At the time of this failure, there was a report from the Captain that the airspeed had been slowing down, but the report on the winch failure from the winch operator was at the time of 22"50 of the appendix; records of the video camera, when it was later than the time when the Captain took the release operation of a tow line. In the club, the common information and the radio contact procedures for the general safety with the winch launch had been known; whereas, the cognitive method, countermeasure procedures, and radio contact procedures at the time of winch failure toward the pilot and the winch operator had not been well known. There are some cases where it is difficult to recognize the winch failures just by the experience depending upon the occurrence part for pilot and winch operator; therefore, there are examples of other clubs that are specially known about this.

3. ANALYSIS

3.1 Involvement of Weather	None
3.2 Involvement of Pilots	Yes
3.3 Involvement of Aircraft	None
3.4 Analysis of Findings	(1) Winch failure It is probable that winch failure by fracture of the propeller shaft had occurred throughout climbing before the decreasing of the airspeed;

however, it was not possible to identify the time of occurrence. The Captain and winch operator did not immediately perceive the interruption of towing due to the winch failure, it is highly probable that it became a "trigger" for the accident. It is probable that the following factors have contributed to the reason for the interruption of towing was not immediately known that the tow line hosting drum did not immediately stop due to the inertia after the fracturing of the propeller shaft and that the cognitive method at the time of winch failure and the countermeasure procedures had not been informed pilot and the winch operator.

Although the design documents and manufacturing specifications could not be confirmed, it is somewhat likely that some of the materials used were believed to have been diverted parts of the truck and other things, in addition, the fractured portion of the propeller shaft was not placed in a visible location and it was a consolidated part of their parts, that it had been used for a long period of time, and that inspection is possible considered that was not done properly, it is possible that the maintenance methods of the winch had been involved in its failure.

(2) Release of the tow line

The reason for the Captain, until airspeed decreased to 70 km/h, did not correspond whatever other than reporting to the winch operator, is believed to have not been perceived the interruption of towing. If the Captain was aware that the towing had been interrupted due to the towing failure by the report from the winch operator or the airspeed had been decreased, it is probable that he could properly nose down by immediately releasing from the tow line as it was the correspondence from the low altitude and he could make landing straight ahead on the landing field, that was the best option.

Besides, the records of the video camera indicated that the wind noise of the Aircraft gradually diminished from 17 "30, and at the same time, it was recorded that the altitude had been ascended while the airspeed reduced. In addition, the Captain stated that there was no operational feeling of release when he took the release operation of the tow line.

From these matters, after the winch failure which was described in the preceding paragraph, although the tow line hoisting drum did not immediately stop due to inertia, it is probable that its own weight and the drug had been acting the tow line (steel twisted wire) as the traction was weakened. Accordingly, since the angle between the longitudinal axis of the aircraft (towing direction) continued gliding by the inertia though the airspeed decreased and the direction of the tow line reached the angle set in the Tow hook, it is possible that the tow line made an automatic release during the time after the winch failure and before the Captain manipulated releasing operation of the tow line.

(3) Decision to turn

The Captain, once tried a landing straight ahead; however, he changed his mind to a landing after a turn, retracted the air brakes, and started a steep left turn because there was not enough distance for the landing straight ahead from the fact that the winch appeared very near having a feeling and judging the altitude higher than the actual value.

According to the records of the video camera, the AGL was about 49 m and airspeed was from 90 km/h to 100 km/h at the time of retracting the air brakes, and the distance to the winch at that time was about 400 m as shown in Figure 1; accordingly, it is probable that it has been the best option at this point of time to continue the landing straight ahead by the appropriate use of the air brakes.

It is highly probable that the reason for the Captain to have judged the AGL of the Aircraft higher than the actual value was that he could not properly read the AGL from barometric altimeter indicated. In this regard, it is probable that there was a fact that not enough advance preparation to read the AGL in meter off the barometric altimeter indicated altitude in foot units by the Captain was involved. In addition, it is probable that in the background there was the fact that the common information of the club on the height during the winch launch was showing the AGL just in metric units only.

(4) Progress of Crash

The Captain, considering that the speed of the aircraft during the turn was slow, kept slightly nose down in order to gain the velocity, as described in Appendix and Figure 1, the aircraft is estimated to have continued the steep turn accompanied by a relatively large descent (a rate of approximately 3.9 m/s).

It is probable that reason for the Captain that the speed had been slow was that he was feeling the possibility of insufficiency when considering the bank in the steep turn.

The Captain, in the steep turn, while viewing the groves, it is probable that he let the Aircraft contacted the trees because misread the distance from the trees and missed the timing to lift the nose because he was devoted himself in keeping the speed.

(5) Presumption of final crash profile

It is probable that when the Aircraft came into in a state of nose down by about 45 ° bank to the left then started to rotate counterclockwise by contacting with the groves at the left wing.

It is probable that the Aircraft was further rotating at an angle of about 180 ° while proceeding for about 20 m from there, and the trailing edge of the right wing were in contact with the groves, almost at the same time tail wheel portion grounded in such a way as to stick into the lawn, at this moment the fuselage have significantly damaged and have fractured the intermediate portion of the rear part. At this time the left wing chip was broken by the first contact with the trees, which was then

	believed to have scattered by centrifugal force to the discovery point. It is probable that the Aircraft was further turned by about 90° and was once settled in the lawn from the main wheel and stopped finally after side skidding. It is probable that the right side of the horizontal stabilizer was considered to have broken by contact with the lawn after the fuselage had fractured.

4. PROBABLE CAUSES

In this accident, it is highly probable that, the winch failed while the Aircraft was climbing with winch launch, and after the release of the tow line, nevertheless there was its insufficient altitude, as the Captain tried to make landing after a turn, and it was crashed by allowing the airframe contact with the groves.

It is highly probable that the reason for the Captain tried landing after a turn although there was not enough altitude was that he could not properly read the correct AGL from the barometric altimeter and judged its value higher than the actual one. It is probably involved in the fact that the advance preparation by the Captain to read the AGL from the barometric altimeter was inadequate.

5. SAFETY ACTION

After occurrence of the accident, the club which the Captain belongs to has taken the following as preventative measures.

(i) They prepared a conversion table of the AGL value in metric units and altitude value in foot units, and publicized to the club members, and while affixing it to the inside of the cockpit, pasted an altitude degree mark capable of landing straight ahead on the outer periphery of the altimeter.

(ii) They prepared a list of points of the recognition and the countermeasures and a radio contact procedure manual for pilots and the winch operators, respectively, assuming the towing troubles including the winch failure, which was publicized to the club members. In addition, it has been defined when landing after a turn, priority will be given to it in the north area of the landing field, as there were fewer obstacles.

(iii) By modifying the propeller shaft unit of the winch, to reduce the consolidated part and to simplify the structure of the connecting part then complicated vibration is hard to generate, it has higher reliability than before and has established an inspection and maintenance items and inspection records of the winch.

Appendix: Records of the video camera

Time (seconds)	Image	Sound/Noise	Vertical speed indicator (m/s)	Airspeed indicator (km/h)	Barometric altimeter (ft)/ AGL (m)*1	Yaw string *2	Summary of events
0	Tow line hoisting - 06″ 50						
1							
2							
3							
4							
5							
6		06"50 Cue call					
7							Tow line is took up slak and Aircraft starts to move.
8		07″83 Gliding sound - 14″07					
9							
10							
11				11"57 50			
12				12"20 70			
13							
14	13"93 - Nose up (Pitch angle about 30° degrees)			13"80 80			Lift-off and climb.
15			14"80 5+	14"67 90			
16							
17		17″30 "Bang" (unclear) / 17"30 - Diminishing wind noise		17"27 100	17"97 2820 / 21		Speed began a decreasing from about 100 km/h, the altitude was ascended at the same time. The nose was travelled down, but the speed slowed yet again.
18			- 20"37		18"30 2850 / 30		
19	19"10 - Started the nose lowing	19"13 Buffet related noise - 19"80			19"20 2910 / 49		
20		19″80 "Slow speed, Slow speed!" - 20″93		19"83 80	20"30 2970 / 67		
21		21"50 Release operation of tow line		20"63 70			Releasing operation about at 70 km/h.
22	22"20 - Pitch angle 0° since then pitch angle 0° or less	– 23"50 / 22"50 Winch failure reporting voice - 25"40	22"30 +4	21"40 60	21"73 3000 / 76 - 24"20	21"77 Skid - 28"47	As nose down and the ground came into view, the speed once diminish to 55 km/h and therof get up again.
23			23"43 +3	22"77 55 / 23"43 60			
24		23"50 Increasing wind noise	24"57 +2	24"43 70	24"83 2970 / 67		The air brakes were once deployed, but they were retracted simultaneously when the left bank was established.
25		25″03 Air brake was deployed - 25″50					
26	26″27 Started left bank		26"27 +1	26"30 90	26"67 2940 / 58		
27			27"27 0				
28	28″03 Left bank 10°	27"97 Air brake retructed - 28"30		28"70 100	28"00 2910 / 49	28"47 Slip - 30"47	
29	29″87 Left bank 30°		29"07 -1				
30				30"30 105	30"10 2880 / 40	30"47 Skid - 34"73	The speed was about 100km/h, though left turn was continued with nose down.
31				31"67 100			
32	32″73 Left bank 40°			32"30 95			
33							The bank became 40° to 45 ° as lost the altitude, but continued to turn. The average rate of descent between 28"00 and 35 "13 was about 3.9m/s.
34	34″00 Left bank 50°						
35			35"03 -2	34"97 100	35"13 2820 / 21		
36	36″30 Left bank 45°	36"28 Impact noise - 40"05					The altitude of the Aircraft fell down and crashed.
37							
38							
39							
40							

*1 AGL (m) is obtained by converting the values in feet units to those in metric units, after subtract 2,750 ft (elevation of the landing field) from the readings of the barometric altimeter.

*2 Yaw string is one of the instruments of glider, which detects its slip and skid by pasting a piece of yarn on the outside of the canopy.