

Accident to the Beechcraft Bonanza A36 registered OO-JBM

on 9 August 2019

in the Golf of Girolata (Corse-du-Sud)

⁽¹⁾Except where
otherwise indicated,
times in this
report are local.

Time	Around 15:30 ⁽¹⁾
Operator	Private
Type of flight	Cross country
Persons on board	Pilot and passenger
Consequences and damage	Pilot and passenger injured, wreckage not recovered
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in December 2020. As accurate as the translation may be, the original text in French is the work of reference.	

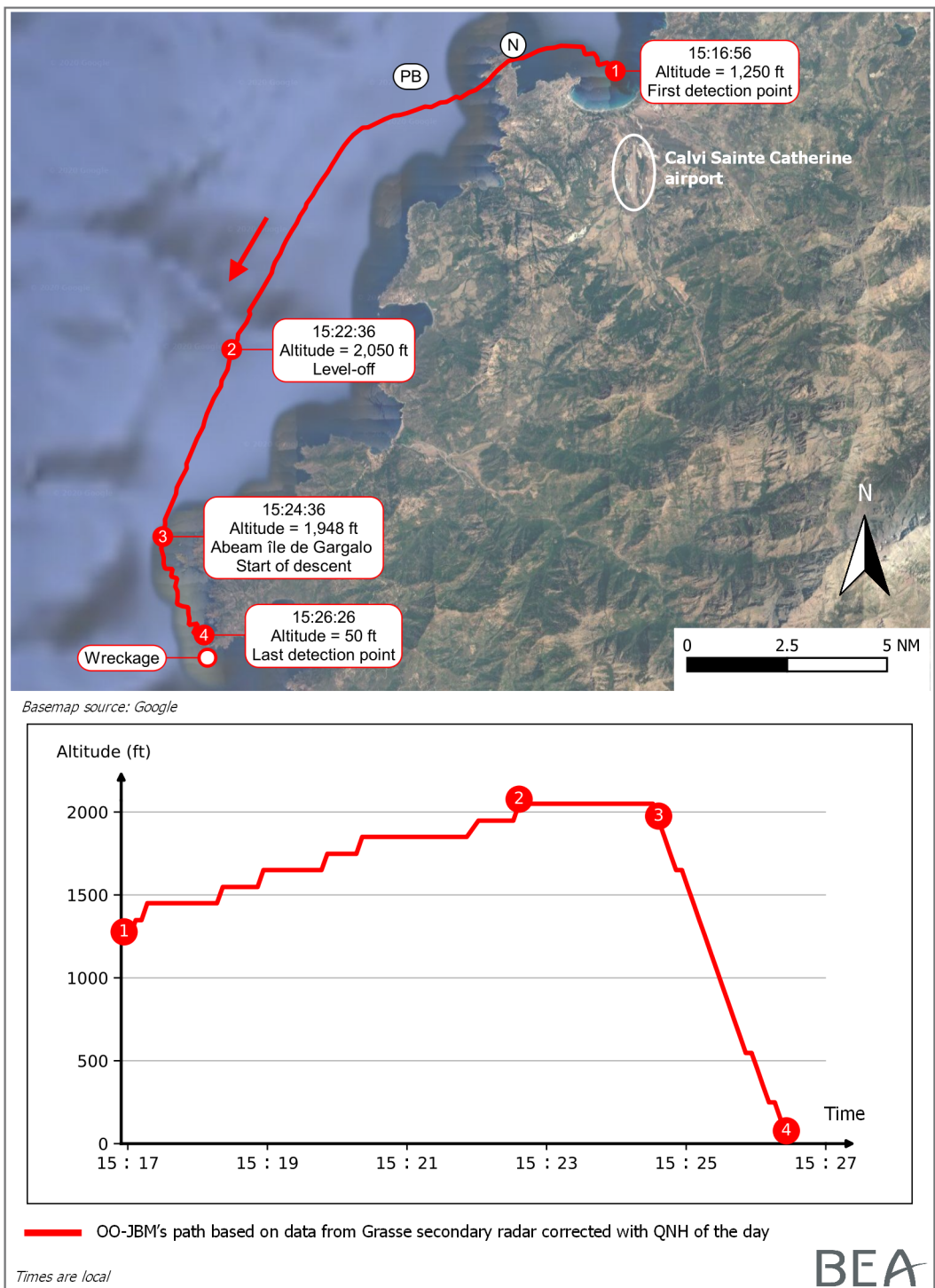
Engine shutdown in flight, stall during flare to ditch

1 - HISTORY OF THE FLIGHT

Note: The following information is principally based on statements, radio communication recordings and radar data.

On 8 August, the day before the accident, the pilot took off from Grimbergen aerodrome (Belgium), accompanied by a passenger, for a flight bound for Olbia airport (Sardinia). After a stopover at Castellet airport (Var) for the night, they took off for a flight to Calvi-Sainte-Catherine airport (Haute-Corse) where they landed at around 12:30 for a new stop. After refuelling and topping up with 0.5 l of oil, they took off at 15:14 under a VFR flight plan to the final destination. The cruise altitude was around 2,000 ft (Point ② - [see illustration](#)) and the path south roughly followed the Corsican coast, at 4 km to the west.

At 15:24, two "bangs" were heard at an interval of around 15 seconds. The aeroplane's manifold pressure and speed decreased. Around 30 seconds later, when the aeroplane was around 2 km off the île de Cargalo (Corse-du-Sud), the engine shut down (Point ③ - [see illustration](#)). The pilot tried to restart the engine but to no avail (selection of right fuel tank, power lever to full power, check of position of mixture control, electric pump on and action on starter). He adopted the best glide speed of 110 kt while the passenger made two distress calls on the Ajaccio information frequency, which went without response. At an altitude of 1,200 ft, as the engine had still not started, the pilot decided to ditch with the landing gear and flaps retracted. He headed towards the coast with the intention of ditching as close as possible to pleasure boats.



Reconstructed flight path

He turned to ditch parallel to the coast. While he was getting ready to start the flare with the flaps and landing gear retracted, the aeroplane stalled around ten metres above the water. The aeroplane's right wing and then its nose collided with the surface of the sea. The aeroplane then came to a stop for a few seconds with a nose-down attitude of around 45°, the forward section of the fuselage half submerged in the water. Under the weight of the engine, the aeroplane then rapidly sunk as several pleasure boats arrived to assist the occupants. The latter, who were not wearing life jackets, released their seat belts as water started to fill the cockpit. The passenger succeeded in opening the door when the cockpit was sufficiently full of water. The two occupants successfully evacuated the aeroplane and rose to the surface. They then swam to the boats where they were immediately taken care of by the amateur sailors.

⁽²⁾ The logbooks belonging to the two pilots were in the aeroplane and were not recovered.

⁽³⁾ The aeroplane flight manual specifies that the operation of the stall warning should be checked before each flight. The pilot and passenger checklists did not include this instruction.

⁽⁴⁾ The oil level was low but within the limits set by the manufacturer (between 9 and 11 l).

2 - ADDITIONAL INFORMATION

2.1 Persons on board information⁽²⁾

2.1.1 Pilot

The pilot held an aeroplane Private Pilot Licence (PPL(A)) issued in 2003 and an instrument rating (IR) obtained in 2009. He had logged around 645 flight hours at the time of the accident including 37 hours on the OO-JBM in the previous three months.

He indicated that during the preflight inspection at Calvi, he had got the interior of the aeroplane ready while the passenger inspected the exterior. He specified that at no moment did they check the operation of the stall warning⁽³⁾. After the engine shutdown, he checked that the alternator and battery selectors were indeed set to ON. He indicated that he did not touch them subsequently.

The pilot explained that he wanted to get as close as possible to the coast. He chose to leave the flaps retracted to limit the rate of descent and in order to better manage the flare for ditching. He did not think to squawk 7700 on the transponder or to manually trigger the emergency locator transmitter before ditching. He did not remember if it was activated after impact with the surface of the water. He indicated that he was occupied with the management of the aeroplane's flight path and that he thus did not have time to take his checklist which was stowed between the two front seats.

The aeroplane stalled before the flare above the water. The pilot did not remember feeling vibrations or having noticed sluggishness in the controls (symptoms of the buffeting phenomenon presaging an imminent stall) and did not remember having heard the stall warning. He confirmed that he did not know by heart the clean-configuration stall speed of the aeroplane.

He indicated that he was a good swimmer and could have swam without a life jacket for another hour. He was wearing a polo shirt and jeans which did not hamper him for swimming. He broke his jaw in the impact with the surface of the water.

2.1.2 Passenger

The passenger, holder of an aeroplane Private Pilot Licence PPL(A) since April 2017, had logged 1,388 flight hours of which at least 22 hours in the previous month.

During the pre-flight inspection carried out before the take-off, he indicated that he had checked the oil level. He had observed that the left injectors were correctly attached and in position and had not seen any signs of oil under the cowling and on the cylinder heads. He specified that there had been 9.5 litres of oil and that he had added 0.5 litres⁽⁴⁾. He was not certain that the stall warning had been checked during the pre-flight inspection at Calvi. He indicated that he did not hear this warning sound before the stall. He had not felt any aeroplane vibrations before the stall.

During the descent with a view to ditching, the passenger took charge of managing the radio to reduce the pilot's workload. He unlocked the handle of the forward right door at the pilot's request and then held the door half-open until contact with the water surface.

The passenger sustained first-degree burns when he swam into a fuel slick. According to one of the people who got him out of the water, he was drowning and was nearly unconscious when he was laid in the boat. He was not suffering from hypothermia. The passenger explained that he was not a very good swimmer and did not know how long he would have been able to swim without a life jacket. His clothes did not hamper him for swimming.

2.2 Site and wreckage information

The aeroplane sank 500 m south of the Girolata headland where the sea floor is at a depth of 60 m. The wreckage was not located during an exploratory dive carried out in December 2019.

The witnesses who provided assistance immediately after the accident noticed a strong smell of fuel on the surface of the sea which, associated with the passenger's burns, seems to indicate that there was a non-negligible amount of fuel in the tanks at the time of the accident.

2.3 Aircraft information

2.3.1 General

The aeroplane is equipped with a single door on the forward right side of the cockpit and a right-hand double cargo door to the aft. In addition to these doors, the aeroplane has windows which can be opened on the pilot's side and passenger's side for emergency evacuations.

2.3.2 Engine maintenance history

The aeroplane was equipped with a Continental IO-550-B six-cylinder engine installed in 1999. The latter had logged around 1,388 hours at the time of the accident.

On 22 November 2017, the three rocker-cover seals on the right side of the engine were replaced due to oil marks observed on the right side of the fuselage. On 27 April 2018, the seals on the left side were also replaced due to an oil leak. As these seals are not symmetric, they can be installed the wrong way round and cause oil leaks.

According to the engine maintenance documents and the statements from the aeroplane's owners, oil marks were present on the left side of the fuselage on several occasions, 13 June, 3 July and 13 July 2019, each time after flights of at least three hours.

An annual or "100-hour" inspection was carried out in May 2019. The engine had logged 1,322 hours.

On 17 July 2019⁽⁵⁾, the three rocker-cover seals on the left side of the engine were replaced again. According to the mechanic from the approved maintenance organization who carried out the work, the seals were dry and drops of oil were present under each of the three rocker covers. The pilot and passenger indicated that they had not observed an overconsumption of oil or oil marks on the plane during the flights made between this maintenance operation and the accident.

⁽⁵⁾ The engine had logged 1,369 hours.

On 2 August 2019, a minor maintenance operation was carried out on the plane which had then logged 1,378 hours. During this operation, the “50-hour” inspection which notably includes an oil change and which was due at 1,375 hours was not carried out. It had still not been carried out at the time of the accident. The pilot indicated that he had not identified that the limit for the 50-hour inspection had been exceeded.

When the engine shut down in flight, the pilot and the passenger did not observe any oil splashes on the canopy and the propeller continued to spin due to the relative wind.

The investigation was not able to determine the cause of the recurrent oil leaks but the absence of a notable overconsumption suggests that these leaks were minimal. The hypothesis that the rocker-cover seals were incorrectly installed, although this is possible, cannot, however, be given preference in the absence of an engine examination.

Likewise, it is not possible to associate the engine shutdown with the fact that the last required inspection was not carried out.

The examination of the maintenance documentation did not identify other anomalies which might have contributed to the engine shutdown.

2.3.3 Centre of gravity and stall speed

The centre of gravity of the aeroplane was within the envelope defined by the manufacturer.

The aeroplane flight manual indicates that the aeroplane’s maximum lift-to-drag ratio is around 10 with the flaps retracted and a speed of 110 kt. It recommends a speed of 85 kt if landing without the engine, and once the landing has been assured, extending the flaps to 30°, extending the landing gear according to the landing site and setting the battery and alternator selectors to OFF. There is no specific ditching procedure in the flight manual.

The pilot’s checklist did not include a ditching or forced landing procedure. It did not mention the approach speed or the stall speed in the clean configuration⁽⁶⁾. It only mentioned an indicated airspeed of 81 kt to carry out a landing but without specifying in what configuration. The passenger’s checklist mentioned a speed of 90 kt with the flaps and landing gear retracted.

The aeroplane was equipped with an audible stall warning which is inoperative if the alternator and battery switches are set to OFF. In the absence of an examination, it was not possible to check the position of the switches at the time of the accident.

2.4 Meteorological information

The meteorological conditions estimated by Météo-France at the accident site were the following: southerly to westerly wind, 4 to 8 kt, visibility greater than 10 km, clear sky, slight turbulence, temperature +26°C.

There was a slight sea with a swell of a maximum height of 60 cm, travelling from 275° to 095°, the water temperature was +24°C.

⁽⁶⁾ According to the manufacturer’s flight manual, the stall speed is 68 kt in the clean configuration (flaps and landing gear retracted, engine in idle).

2.5 Survival Aspects

2.5.1 Survival equipment on board the aeroplane

The aeroplane was equipped with an emergency locator transmitter. A six-person life raft was positioned between the first and second row of seats and two life jackets ready for use were placed on the second row of seats.

Note: Annex VII (Part NCO) of regulation (EU) No 965/2012 (AIROPS) requires that single-engined aeroplanes hold a life jacket or equivalent individual floatation device for each person on board, stowed in a position that is readily accessible when flying over water beyond gliding distance from land.

The two occupants indicated that they had put on their life jackets for the crossing between the continent and Corsica. They had not put them on for the last flight between Calvi airport and Olbia airport as they were flying along the coast. They explained that in Belgium, out of habit, they did not wear them as there were large sandy beaches along the coast on which they could land. When the engine shut down, they realised that the coast's steep and rocky environment would not allow them to land. They considered that the management of the failure and flight path by the pilot and the radio by the passenger did not leave them time to put on their life jackets. They added that they did not think to grab them before evacuating the aeroplane.

The two occupants had fastened their three-point seatbelts which probably limited the seriousness of their injuries.

2.5.2 Organization of rescue

The pilots sent two distress messages over the radio which were not heard on the Ajaccio flight information frequency. The radio coverage in the Golf of Girolata is limited to 2,000 ft which means that it is not certain that there will always be continuous bilateral contact. The emergency locator transmitter was not heard. It was not possible to know if it had been activated.

The alert was given at 15:30 by an amateur sailor who called the CROSS MED⁽⁷⁾ by VHF. At the same time, the Ajaccio traffic control service initiated a DETRESFA phase after having simultaneously lost radio and radar contact.

The two occupants were immediately taken care of on one of the boats on which there was a doctor and an emergency services officer. They were quickly taken to Girolata where they were taken charge of by a SAMU medical team which had arrived by helicopter at 16:10.

2.6 Ditching due to engine shutdown

The recommendations for the management of a ditching due to an engine shutdown are specific to each type of aircraft and may be described in certain flight manuals (CIRRUS SR22, SOCATA TB20, CESSNA F 172N, etc.).

⁽⁷⁾ Centre Régional Opérationnel de Surveillance et de Sauvetage en Méditerranée (Regional Operational Centre for Monitoring and Rescue).

⁽⁸⁾ <https://www.casa.gov.au/file/104881/downloadtoken=WvEm5wBC>

In April 2003, in response to a recommendation made by the Australian Transport Safety Bureau (ATSB), the Australian Civil Aviation Safety Authority (CASA) distributed a publication⁽⁸⁾ about ditching in order to help pilots and light aircraft operators plan and perform this manoeuvre. This document also provides advice about survival after ditching while waiting for rescue.

It specifies that the chances of surviving a ditching are high and that 88 % of controlled ditchings result in few injuries. There is a greater risk of drowning due to hypothermia and exhaustion. Wearing a life jacket in the aeroplane greatly improves survival prospects.

It states that it is preferable to impact the surface of the sea as slowly as possible, with wings level, keeping full control of the aeroplane and making sure that it does not stall. If one wing touches the water first, this will cause a violent and uncontrollable slewing action.

In the absence of a precise ditching procedure in the aeroplane flight manual, it is recommended to:

- Don a life jacket if time permits.
- Ensure the landing gear is up.
- Consider possible airframe distortion on impact and plan through which opening the evacuation will be made.
- Control speed and rate of descent for as long as possible.
- Ditch into the wind if possible, otherwise parallel with the swell.
- Set flaps to a medium position to ensure the slowest speed on impact, this also lowers the angle of attack on approaching the stall speed.

The document also explains that one of the most difficult things to get right is judging the height for the flare, particularly when the water is calm.

As the occupants will have very little time to evacuate the aeroplane, it is essential that they have been briefed during the descent with respect to the actions to be taken and their role. It is preferable to have unlocked a door or opening before impact in case the possible distortion of the aeroplane due to the impact with the sea prevents this subsequently. It is recommended, if possible, to always wear a life jacket in the aeroplane as it will prove difficult to put on in a confined space in the event of an emergency. The document reminds the reader that the life jacket should never be inflated inside the aeroplane.

An article published by the DSAC on 18 October 2013 in issue 18 of the “*Objectif SECURITE*” review also covers the preparation for and ditching technique in a light aeroplane and the survival techniques after ditching. This article was updated on 17 April 2020 and published on the light aviation safety portal⁽⁹⁾. The article is based, in particular, on the feedback from the pilot and passengers who had to ditch on 12 October 2009 in the Gulf of Girolata (Corse-du-Sud) in a Cessna T210⁽¹⁰⁾. The article advises notably to:

- Fly as high as possible according to the meteorological conditions in order to:
 - Fly for as long as possible in the event of an engine failure.
 - Have more time to identify the cause of the failure and try to restart the engine.
 - Prepare for the ditching.
- Flare at the lowest speed possible while making sure that you do not pass below the stall speed.
- Approach with the highest nose-up attitude possible so as to touch the water with the aircraft’s tail.

⁽⁹⁾ <https://www.securite-desvols.aero/productions/culture-aero/amerrissage-en-avion-leger>

⁽¹⁰⁾ <https://www.bea.aero/docspa/2009/n-sf091012/pdf/n-sf091012.pdf>

3 - CONCLUSIONS

The conclusions are solely based on the information which came to the knowledge of the BEA during the investigation. They are not intended to apportion blame or liability.

Scenario

The pilot was flying at around 2,000 ft above the sea, off the west coast of Corsica when the engine shut down. The engine did not restart despite the pilot's attempts. Given the altitude of the aeroplane, the distance to the coast and its features, the pilot was obliged to prepare to ditch. He chose to ditch with the landing gear and flaps retracted, close to pleasure boats in order to be rescued quickly. The aeroplane stalled at low height. The stall can be explained by the pilot's attention being principally focused on the aeroplane's flight path in order to avoid the boats, to the detriment of controlling the speed, by a lack of knowledge of the stall speed in the clean configuration or by the stall warning not being detected in an emotionally-charged flight phase. The choice to ditch with the flaps retracted meant that the aeroplane stalled at a higher speed than with the flaps in a medium position. At a low height and without engine power, the pilot could not recover control of the aeroplane whose right wing and forward fuselage collided with the surface of the sea.

The cruise altitude of 2,000 ft did not leave sufficient time for the two occupants to don their life jackets during the emergency descent. Ditching close to pleasure boats nevertheless meant that the occupants of the aeroplane were immediately rescued and did not spend too much time in the water.

The unlocking of the forward right door by the passenger, before ditching, enabled it to be opened when the aeroplane was in the water. If this had not been done, the possible deformation of the aeroplane's structure and the pressure exerted by the water would have probably not made this possible.

In the absence of an engine examination, it was not possible to explain the engine shutdown based solely on the examination of the maintenance documents.

Safety lessons

As a general rule, it is recommended to cruise at the highest altitude possible according to the meteorological conditions in order to have more time to manage the engine failure and the flight path. The pilot should always be prepared for a ditching, even if flying close to the coastline as it is possible that no suitable terrain on land will be found in due time. In the event of ditching, contact with the sea surface must be made at the lowest speed possible, with the wings kept horizontal, while maintaining control of the aeroplane and avoiding stalling.

In the absence of a precise ditching procedure in the aeroplane flight manual or user manual, it is recommended to:

- Always wear, if possible, a life jacket as it may prove difficult to put it on in a confined space in the event of an emergency (the life jacket is inflated once outside the aeroplane).
- Fasten and adjust the belts or harnesses.
- Carry out a briefing during the descent to ditch, recalling the actions to be carried out which include the preparation or unlocking of emergency exits, the passenger briefing to adopt the brace position before impact and the role of each occupant.
- Secure and/or stow cockpit loose items.
- Ditch with the landing gear retracted and with the flaps in a medium position in order to have a lower speed before coming into contact with the surface of the sea.
- Maintain the lowest speed possible while making sure that it remains above the stall speed.
- Ditch, if possible, into the wind or if not, parallel to the swell.