Accident to the Socata - TB20 registered F-GKVZ

on 17 November 2018
at Pleslin-Trigavou (Côtes d'Armor)

Time	Approximately 15:25[1]
Operator	Private
Type of flight	Cross-country
Persons on board	Two co-owners of the aeroplane
Consequences and damage	Occupants fatally injured, aeroplane destroyed
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in May 2020. As accurate as the translation may be, the original text in French is the work of reference.	

[1] Unless otherwise stated, all times given in this report are in local time (UTC+1).

Collision with vegetation followed by the surface of the water during a non-precision approach without external visual references

1 - HISTORY OF THE FLIGHT

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

Two of the three co-owners of F-GKVZ took off at about 14:55 from Laval-Entrammes aerodrome (Mayenne), where the aeroplane was based, for an IFR flight to Dinard - Pleurtuit - Saint-Malo aerodrome[2] (Ille-et-Vilaine). The co-owner in the left seat held a private pilot licence - aeroplane and did not have an instrument rating. The co-owner in the right seat held a private pilot licence - aeroplane and an instrument rating. Throughout the flight, he maintained radio communication contact with the air traffic controllers.

[2] This aerodrome is also known as Dinard Bretagne.

At 14:58, he read back the approach controller's instruction to take a direct course to the EVREN initial approach fix (IAF) of the RNAV[3] approach procedure (GNSS) to runway 35. This path enabled him to directly join final.

[3] Area Navigation.

At 15:19, at an altitude of 3,000 ft at EVREN, he contacted the air traffic controller at Dinard aerodrome at the request of the approach controller. The air traffic controller asked him to call back at 4 NM on final approach and provided the following meteorological information:

- visibility 1,800 m, RVR[4] 35 greater than 2,000 m;
- mist and clouds, overcast at 200 ft and cloud base height 100 ft.

[4] Runway Visual Range.

The co-owner in the right seat replied that they would abort the approach and return to Laval if the weather conditions did not permit landing.

During the approach, F-GKVZ's path veered twice to the left of the centreline of runway 35. The first deviation occurred immediately after passing the IAF and was corrected after about one minute. The second began after passing the final approach fix (FAF) and was detected by the controller, who alerted the pilot to his 0.75 NM deviation to the left of the approach path to runway 35. The co-owner in the right seat announced a correction and, about forty seconds later, the tower controller noted on his radar screen the correction to the path, which was re-aligned with the centreline of runway 35. He then cleared the pilot for the option on runway 35 and indicated that the wind was 090° and 7 knots. As the lateral deviation decreased, the aeroplane's vertical speed increased to 800 ft/min between points 3 and 4 in Figure 1[5].

[5] A descent on the planned approach slope would require a vertical speed of 600 ft/min being adopted.

At 15:23:59, the co-owner in the right seat read back the instruction from the tower controller.

Shortly thereafter, the controller lost radar contact and obtained no further responses to his attempts at radio contact. He therefore gave the alert.

At the same time, witnesses located about 2 NM upstream from the threshold of runway 35 saw the aeroplane come out of the cloud layer at a very low height, strike treetops and disappear behind a copse.

The wreckage was found in a nearby lake; both occupants were fatally injured on impact.

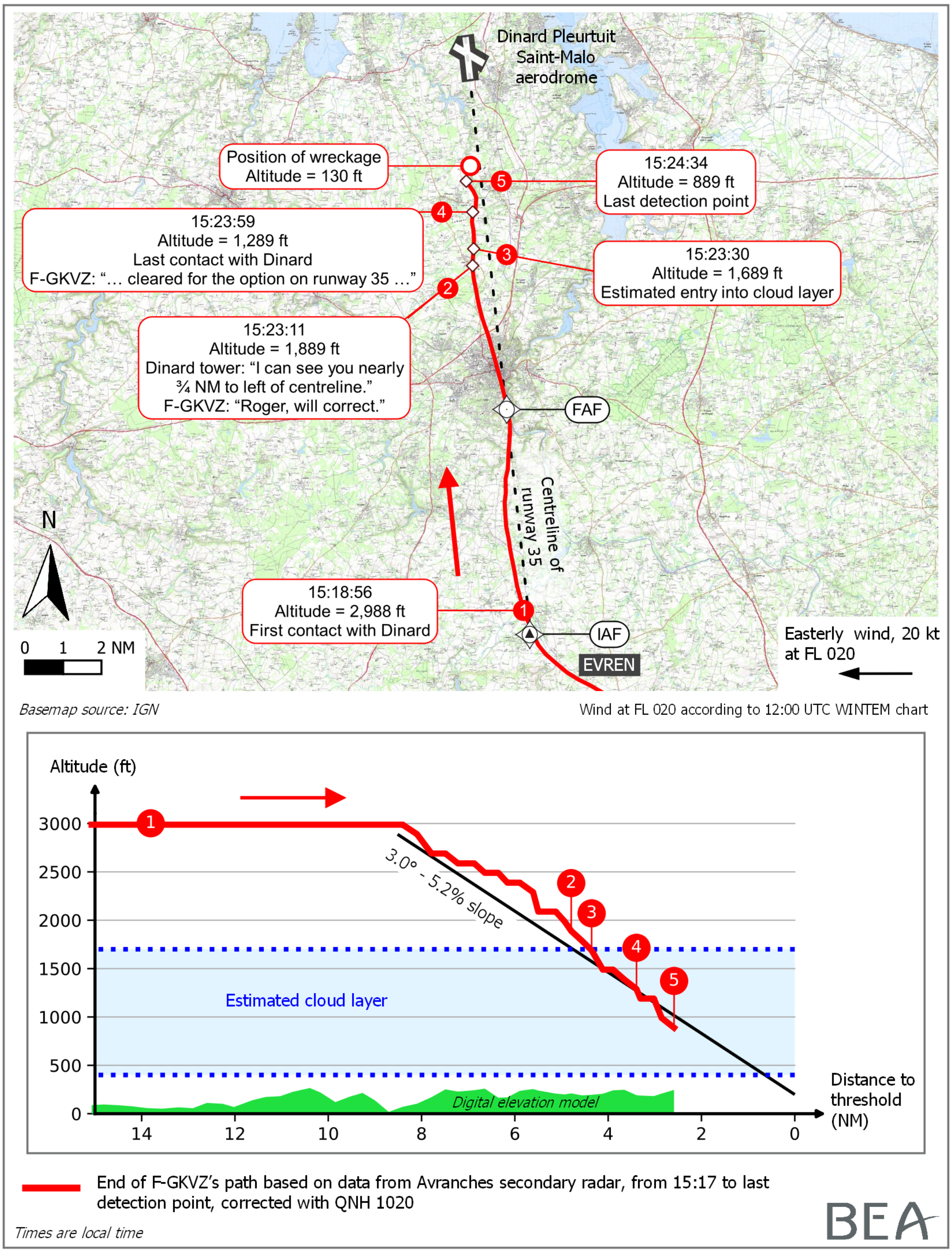


Figure 1: F-GKVZ's flight path

2 - ADDITIONAL INFORMATION

2.1 Persons on board information

2.1.1 Co-owner in left seat

The 66-year-old co-owner had held a private pilot licence - aeroplane since 1986 with an SEP (land) rating[(6)], which was valid on the date of the accident. He did not have an instrument rating.

[(6)] Single Engine Piston.

He had logged approximately 2,800 flight hours, 30 of which were in the previous three months, all on F-GKVZ, including four in the previous 30 days.

The third co-owner of F-GKVZ described the occupant in the left seat as the owner that was the most involved of the three co-owners, in the management and operation of the aeroplane. He estimated that he logged approximately 100 hours per year on this aeroplane. He added that the co-owners in the left and right seats were friends and flew together regularly.

2.1.2 Co-owner in right seat

The 71-year-old co-owner in the right seat had held a private pilot licence for aeroplanes since 1966. The licence was accompanied by a valid SEP (land) rating and a valid single-engine instrument rating (IR/SE). He had never received any training in GNSS approaches and did not have IR/PBN privileges[7].

[7] Performance Based Navigation.

He had logged approximately 2,600 flight hours in total. His last flight as pilot-in-command was three and a half months before the accident, on F-GKVZ.

The examiner who conducted his last proficiency checks described him as a ''*fair weather IFR pilot*'', i.e., a person capable of flying on instruments, but who nevertheless flew only in VMC.

Furthermore, although he deemed him to be a competent and serious pilot, he confirmed that the co-owner in the right seat was not an instructor. As a result, the examiner believed that, from the right seat, he was not competent to hold the flight controls in degraded conditions or to recover from an emergency situation, such as an unstable pitch attitude or loss of control.

2.2 Aircraft information

F-GKVZ was jointly owned and operated by three persons, who were its only pilots.

The aeroplane was equipped with the Garmin 400 avionics suite, which the manual indicates permits non-precision approaches to be flown via its on-board GPS receiver[8]. The aeroplane's autopilot was not connected to this system and therefore did not permit automatic RNAV approaches.

[8] Excerpt from *Garmin's Pilot's Guide and Reference* for GPS 400/430: "*The GPS 400 provides non-precision approach guidance using its built-in GPS receiver*".

The aeroplane was serviced at an approved workshop in Laval. A review of the maintenance records did not identify any factor that contributed to the accident.

The main navigation instruments were arranged in a configuration that only allows for optimum use from the left-hand seat. In particular, two altitude indicators equipped the left side of the instrument panel.

In the "*Crew limitations*" section, the flight manual states that the minimum crew consists of one pilot and that, in all cases, a pilot is "*required in the left seat.*"

The approach speed recommended in the flight manual is 86 to 92 knots on final.

2.3 Meteorological information

The meteorological conditions on the day in Brittany were anticyclonic. At daybreak, there was widespread stratus and localised fog. In mid-morning, the flow turned east-north-east and dried up the air mass.

Satellite imagery provided by Météo-France also shows a compact low cloud layer without any significant holes.

The height of the top of this layer can be estimated to be about 1,500 ft and the sky was clear above it.

The aerodrome at Laval was accessible.

The METAR for Dinard - Pleurtuit - Saint-Malo aerodrome for 15:30 indicates:

- easterly wind, 7 kt;
- visibility 2,500 m;
- cloud cover: presence of mist and OVC at 200 ft;
- air temperature: 7 °C and dew point temperature: 6 °C;
- QNH: 1020 hPa;
- situation improving towards CAVOK.

The information provided by the tower controller at the aerodrome during the approach was as follows:

- visibility 1,800 m and RVR greater than 2,000 m;
- presence of mist and cloud cover at 200 ft;
- height of the cloud base: 100 ft.

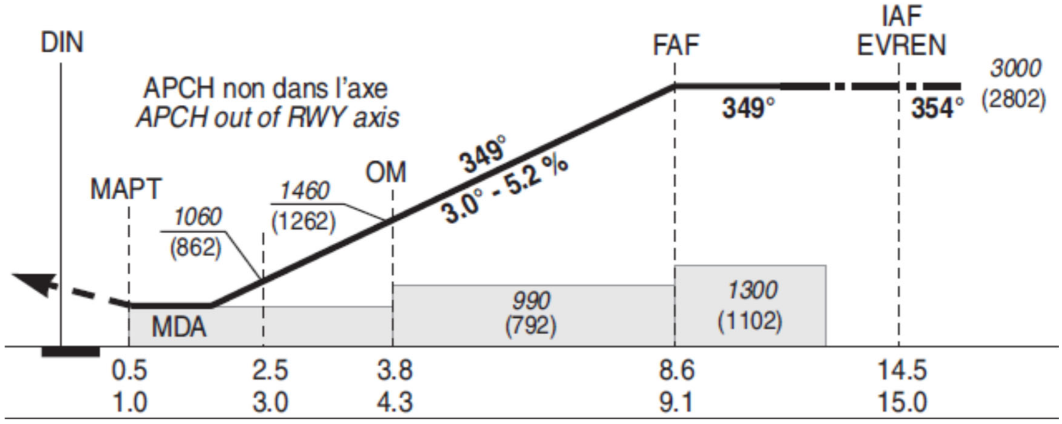
The information available before the flight was as follows:

- the WINTEM chart for 13:00 at FL 020 (980 hPa) indicated that the wind was easterly and blowing at 20 kt;
- the aerodrome METAR at 13:30 was similar to the METAR at 15:30, but with lower visibility (2,000 m). It also indicated that the situation was improving towards CAVOK.

2.4 Aerodrome information

Dinard - Pleurtuit - Saint Malo is a controlled civil aviation aerodrome open for public use. It has three runways.

On the day of the occurrence, runway 35 was in service after an RNAV (GNSS) approach. A VOR procedure was also available for this QFU with an almost identical flight path.



Source: SIA

Figure 2: Vertical profile of RNAV 35 approach

For a TB20-type aeroplane, during an LNAV category RNAV approach into this aerodrome, the MDA is 690 ft and the minimum RVR is 1,500 m. Since the aeroplane's ground speed was between 130 and 100 knots during the final descent, the recommended vertical speed was about 600 ft/min.

2.5 Site information

The wreckage was found 4,030 m (about 2.17 Nm) from the threshold of runway 35 of Dinard aerodrome. It was partially submerged in a small lake located in a narrow valley.

Several pieces of wreckage were identified upstream of the final point of impact, including:

- the right wing-tip (point 1 of Figure 3 below);
- the right section of the all-moving tail plane equipped with its elevator trim (point 3).

Debris from the right wing-tip was located on a small plateau overlooking the valley in which the wreckage was found.

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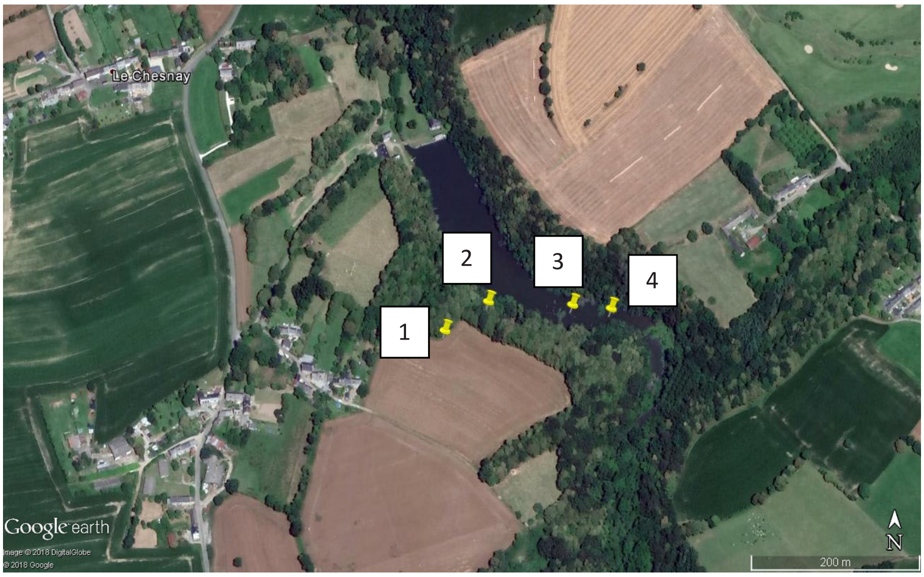

Source: BEA - Google Earth base map

Figure 3: position of the wreckage and distribution of the debris at the accident site

Key:

1: Right wing-tip

2: White paint chips

3: Right section of the tail plane

4: Wreckage

Examination of the accident site found that the aeroplane first struck treetops with the right wing-tip. It was at that point banked to the right.

The aeroplane then descended to the right until it struck the surface of the lake located at the foot of the copse, which the aeroplane had just hit. Upon impact with the water, the right wing separated from the fuselage.

2.6 Wreckage information

The aeroplane displayed damage consistent with a high-energy impact. This damage was indicative of an impact to the forward right side, particularly the right wing.

Several marks from branches or tree trunks were identified in the vicinity of the right wing-tip and on the right section of the all-moving tail plane.

Examination of the wreckage determined that, at the time of impact with the water, the flight controls were continuous and the aeroplane configuration was as follows:

- flaps retracted;
- landing gear down;
- elevator trim in a nose-up position;
- the position of the rudder trim could not be determined with certainty.

In the cockpit, the main singularity noted related to the mode selector of the directional gyroscope, which was found in the ''*FREE*'' position, which equates to a ''*free gyroscope*'' mode. In this mode, the directional gyroscope is no longer controlled by the flux valve, but is subject to precession[9].

[9] Precession: Conical motion, around an average position, of the axis of rotation of a body animated by a gyroscopic movement (Translation of definition from Larousse). In this case, it is the gradual shift in the orientation of the directional gyroscope due to the Earth's rotation.

This selector switch position is normally used temporarily when a deviation between the direction indicator and the magnetic compass is detected. This allows the pilot to manually reset the directional gyroscope before returning the control to ‘‘*SLAVE*’’(which is its normal operating position and which slaves the direction indicator (directional gyroscope) to the flux valve).

The absence of deformation or damage to the unit would suggest that this configuration was not caused by the impact. However, we cannot completely rule out the possibility that the emergency services knocked the switch during their intervention on the wreckage. An examination of the unit did not reveal any faults.

There was no external damage to the engine prior to its collision with the surface. The deformations on the propeller suggest that engine torque was being transmitted at the time of the impact.

2.7 Flight plan and flight preparation

An IFR flight plan had been filed for the accident flight. The plan included the name of the pilot-in-command, which corresponded to the pilot in the right seat.

The route described in the dedicated field included a route via Rennes, then a direct route to the Dinard VOR.

There was no mention of the PBN capabilities of the aeroplane or the preferred type of approach.

The investigation was unable to determine how the crew of F-GKVZ had prepared for their flight or what meteorological information the two co-owners had requested prior to their departure.

Several witnesses indicated that the co-owner in the left seat usually used an electronic tablet to plan his flights and to display the aeronautical information. However, this tablet was too badly damaged in the accident to be read out.

2.8 Information on GNSS approaches

PBN is a concept developed by ICAO to specify the required operational performance in an airspace, on a route or for an approach procedure.

RNAV (GNSS) approach procedures are PBN operations.

In order to carry out such operations, the following requirements must be met:

- the aeroplane must be eligible for the planned specific PBN operations and must therefore meet the corresponding performance and equipment requirements;
- the crew must meet the training and examination requirements in this field.

2.8.1 Equipment

In this occurrence, an RNAV (GNSS)-type approach procedure was used to fly into Dinard. Given the aeroplane's equipment, the only procedure that the pilot could use was a non-precision LNAV category approach.

This type of procedure uses GPS for lateral guidance, while the glide path is managed by the pilot using a continuous descent technique, i.e., by adopting an appropriate vertical speed and performing regular altitude/distance checks in respect of the runway threshold.

2.8.2 Training

In accordance with Regulation (EU) No 965/2012 (AIR OPS), in order to carry out PBN operations, pilots must have undergone appropriate training, followed by a specific flight test (including this type of procedure), which must be renewed each year. This privilege is mentioned on the pilot licence, specifying that the holder is indeed the holder of this privilege.

Note: up until 25 August 2020, it was possible in France to hold an IR licence without a PBN privilege, i.e. allowing IFR flights to be carried out without an RNAV procedure. As of 25 August 2020, the date of implementation of Regulation (EU) No 2016/539, any pilot wishing to exercise IR privileges is required to acquire PBN privileges.

2.8.3 Performing the approach

The information provided by the air traffic controller enabled the pilot to begin the approach. The RVR was greater than the published minimum RVR (1500 m). However, the ceiling was lower than the height at which the pilot should have acquired external visual references for the landing. Thus, the pilot could expect to abort the approach at the latest when the procedure minima were reached (altitude of 690 ft).

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 occupants of the aeroplane departed from Laval, where the aeroplane was based, on a flight to Dinard without any imperative to get there and with no particular time constraints. They had known each other for several years and flew together regularly.

The meteorological conditions in Brittany were improving after a cloudy morning, especially in Laval, which was accessible. However, there was still a layer of cloud over the Dinard sector.

The co-owner in the right seat was in charge of radio communications throughout the flight. Because of his position in the aeroplane, it is likely that the co-owner in the left seat was pilot flying for a large portion of the flight.

On making contact with the Rennes approach, the air traffic controller gave clearance for an RNAV 35 approach. The pilot in the right seat read back correctly without requesting an alternative to this procedure, even though neither pilot was trained for this type of operation. The investigation was unable to determine whether they were following the GNSS approach or the VOR approach.

When the pilot began his final descent, the aeroplane drifted to the left of the centreline, possibly due to the wind or heading drift caused by the position of the directional gyroscope mode selector switch. The aeroplane was at that point high on the glide path.

About two minutes later, at an altitude of about 1,500 feet, the aeroplane entered the cloud layer. The pilot appeared to be correcting the deviations from the centreline and the glide path. The aeroplane was at that point close to the published flight path. At the same time, the controller gave his clearance for landing.

The investigation was unable to determine precisely what happened between that moment and the moment the aircraft hit the treetops.

As the aeroplane came out of the cloud layer, there was not enough height available to avoid the collision with the trees.

It could not be established with certainty who was flying the aeroplane during this phase of the flight. Assuming that the co-owner in the left seat was the pilot flying, the lack of an IFR rating meant that the necessary guarantees that the approach could be flown without external visual references were not present. Assuming that the co-owner in the right seat was the pilot flying, his limited recent experience, particularly in flights without external visual references, and his position in the aeroplane made it difficult to perform a stabilized approach. Furthermore, since he was not trained in approaches using RNAV/GNSS, conducting such a procedure could have considerably increased his workload.

The investigation was unable to explain the position of the FREE/SLAVE selector.

Contributing factors

The following factors may have contributed to the collision with the vegetation:

- the fact that the co-owner in the left seat did not have an IFR rating;
- the fact that the co-owner in the right seat was not trained in PBN operations;
- the fact that the pilot with the instrument rating was in the right seat, which prevented easy reading of the flight and navigation instruments;
- the fact that the co-owner in the right seat had little experience of flights without external visual references;
- the fact that both pilots incorrectly assessed the risks and/or reciprocally overestimated their skills.

Safety lessons

RNAV (GNSS) approaches may appear to be easy. Following the horizontal profile of the flight path may indeed seem simpler. However, the pilot must still monitor the glide path and fly the aeroplane. These points as well as additional skills are covered by PBN procedure training.

In a given operational situation, ratings are a prerequisite. However, only skills, recent experience and an appropriate risk analysis can guarantee a sufficient level of safety.