BEA
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pour la sécurité de l'aviation civile

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INVESTIGATION REPORT

Accident to the Cessna 172S Skyhawk registered N615VB on 26 September 2016 at Marie-Galante (Guadeloupe)[1]

[1] On final approach to runway 09.

[2] Except where otherwise indicated, times in this report are in local time.

Time	Around 09:15[2]
Operator	Club
Type of flight	General aviation
Persons onboard	Pilot and two passengers
Consequences and damage	Aircraft destroyed and occupants fatally injured
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in February 2020. As accurate as the translation may be, the original text in French is the work of reference.	

Loss of control during final approach in thunderstorm conditions

1 - HISTORY OF THE FLIGHT

The pilot, accompanied by two passengers, took off around 08:55 from Saint-François aerodrome (Guadeloupe) bound for Marie-Galante aerodrome under a VFR flight plan. At 08:59, the pilot contacted the tower controller at Pointe-à-Pitre-Le Raizet aerodrome (Guadeloupe) who assigned him a transponder code. The radar track showed that the aeroplane flew at an altitude of 1,500 ft along the west coast of Marie-Galante.

At 09:08, the pilot closed his flight plan on the frequency although he was around five nautical miles from the aerodrome. The pilot of a military transport plane situated on Marie-Galante aerodrome specified that he heard the pilot check in on the A/A frequency when he was in the right-hand base leg for runway 09. The last radar detection was at 09:11 when the aeroplane was aligned on the axis of runway 09, at around one nautical mile from the threshold. The altitude at this point was 600 ft and corresponded to the detection floor of the Pointe-à-Pitre radar.

A witness, an aeroplane pilot, situated around four nautical miles west of the runway threshold, said that he saw the Cessna heading towards runway 09 of Marie-Galante aerodrome, at low height (azimuth reference), before losing sight of it when the aeroplane entered a squall.

The pilot of the military aeroplane, listening on the Marie-Galante aerodrome A/A frequency, heard no communication from the pilot of N615VB confirming that he was going to land. He thought that he had turned around given the meteorological conditions observed at the aerodrome.

At 18:20, the club's chief pilot, without news from the pilot, contacted the air traffic services which activated the search and rescue phases.

2 - ADDITIONAL INFORMATION

2.1 Aircraft information

N615VB was fitted with instruments for IFR flights in accordance with American regulations.

There were two emergency transmitters onboard the aeroplane:

- a 121.5/243 MHz ELT (Emergency Locator Transmitter);
- a 121.5/406 MHz PLB (Personal Locator Beacon).

Neither of these were picked up by COSPAS SARSAT at the time of the accident. These equipment items cannot transmit when they are under water.

The aircraft was not equipped with an underwater locator beacon or device (such as a 37.5 kHz ULB or a 8.8 kHz ULD). It is not a regulatory requirement.

On leaving Saint François aerodrome, N615VB had a flight range of around 2 h 20 min.

2.2 Context of flight

The pilot and passengers knew each other and worked in the civil engineering sector. They had worked together on several occasions and envisaged visiting a worksite based at Marie-Galante.

A tropical storm was forecast the day after the flight and the three occupants had to return to metropolitan France the following day.

2.3 Pilot information

The pilot, aged 65, held a Private Pilot Licence (aeroplane) (PPL(A)). It was estimated that he had logged around 400 flight hours of which 10 hours in the previous two months, all on type.

He was co-owner of the aeroplane. He did not hold an American licence. It is not a French regulatory requirement.

2.4 Club chief pilot's statement

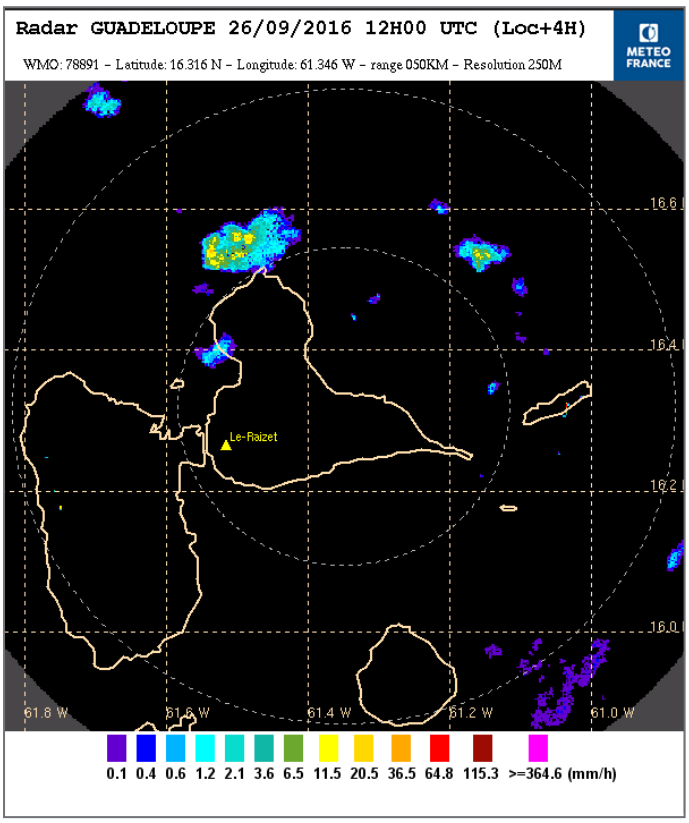
The chief pilot said that the pilot arrived at the club in the morning, at around 08:00 and that he had already obtained the TAF, METAR and SIGWX information. The pilot and chief pilot noted the probability of cumulonimbus being present (30%) but the pilot said, given this small probability, he would avoid them. They consulted the rainfall radar images available at 08:00 together. According to the chief pilot, they did not show any significant phenomenon to give concern.

The pilot had filed his flight plan by telephone, with a planned departure at 08:30. The late arrival of the passengers meant that the aeroplane was only able to take off at 08:55. This study of the meteorological conditions thus took place around one hour before the effective take-off.

The return flight plan to Saint-François had been filed with a planned departure at 11:30.

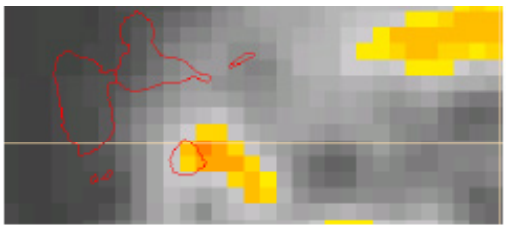
2.5 Meteorological information

At the end of the night of 25 to 26 September 2016, a cloud mass associated with a tropical wave had spread over an area immediately south of Guadeloupe. It gave rise to numerous storms north of Martinique and east of Marie Galante.

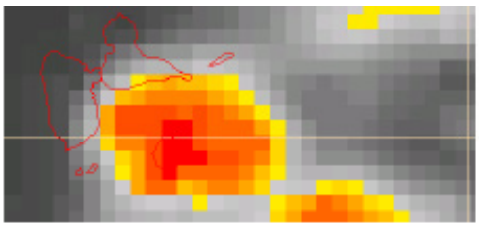


Guadeloupe weather radar image

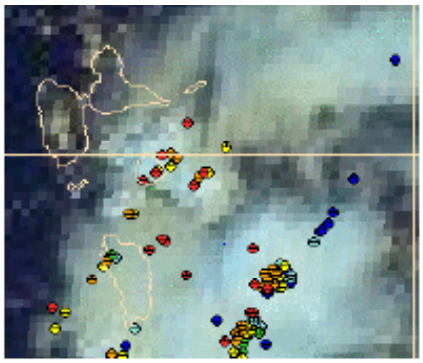
The detailed study of the satellite imagery shows that the clouds associated with this wave were heading northwards. At 08:30, the clouds had already covered Marie Galante. It can be seen that at 09:00, considerable thunderstorm activity had very rapidly developed over Marie Galante. At 09:30, this thunderstorm activity was still present and spreading towards the east coast of Basse Terre.



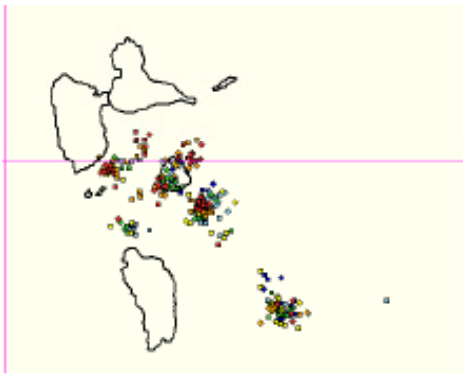
Météo France images at 09:00



Météo France images at 09:30



Lightning radar at 09:00 (15 min)



Lightning strikes at 09:10

Pointe-à-Pitre METAR

Note: The times indicated in the METAR messages are in UTC (4 hours should be subtracted).

TFFR 261200Z AUTO 34003KT 310V030 9999 ///CB 27/25 Q1014 TEMPO 1500 TSRA BECMG 10010KT=
TFFR 261230Z AUTO 00000KT 9999 NSC 28/25 Q1015 TEMPO 1500 TSRA FEW012CB SCT015TCU BECMG 10010KT=
TFFR 261300Z AUTO 00000KT 9999 SCT040/// ///TCU 29/25 Q1014 TEMPO 1500 TSRA FEW012CB SCT015TCU BECMG 10010KT=

The METAR trend mentioned the risk of storms at Pointe-à-Pitre. This trend was reflected in the TAF messages:

TFFR 261100Z 2612/2712 VRB02KT 9999 SCT025 BECMG 2612/2614 10010KT TEMPO 2612/2712 3000 SHRA SCT015TCU BKN023 PROB30 TEMPO 2612/2622 1500 TSRA FEW012CB SCT015TCU BECMG 2621/2623 VRB02KT=

A witness, an aeroplane pilot, present in the south of Marie-Galante, specified that the thunderstorm activity in the vicinity of the aerodrome was intense: squalls, reduced horizontal visibility and high electrical activity.

Another witness, a meteorologist present in the Pointe-à-Pitre weather station, said that the electrical activity in the south of Marie-Galante, was visible from Pointe-à-Pitre.

A tropical wave is generally accompanied by violent storms, intense rainfall and gives rise to violent squall lines organized by significant vertical and horizontal windshear. Locally-based pilots knew these specificities.

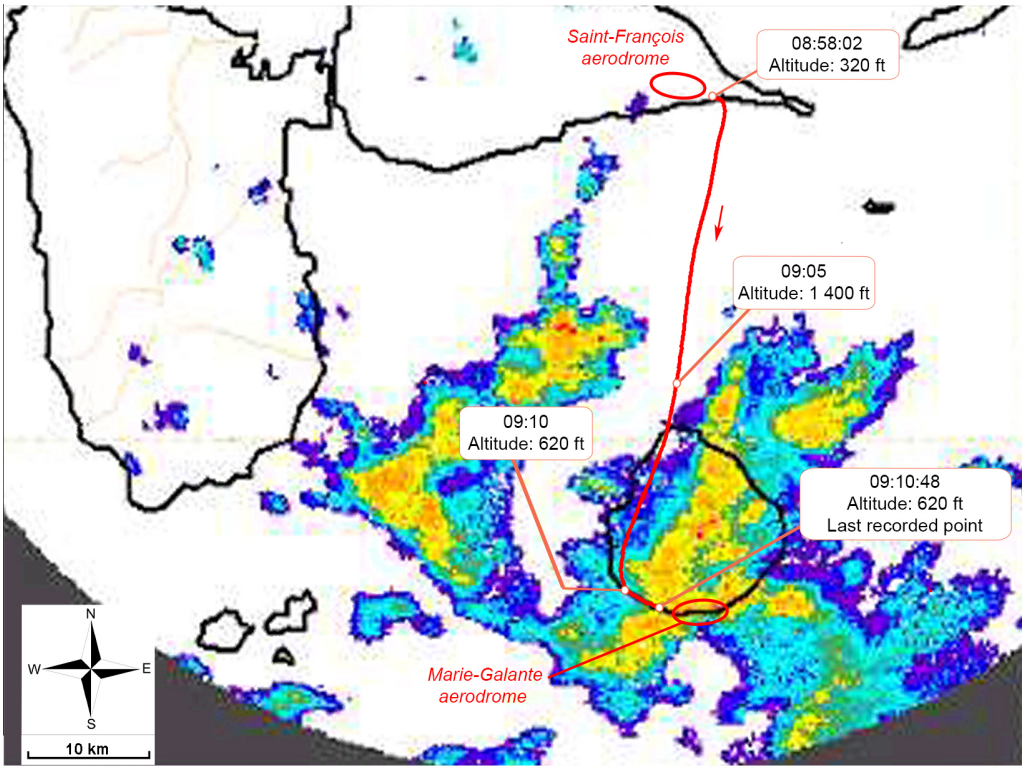
2.6 Marie-Galante aerodrome (TFFM)

Marie-Galante aerodrome is equipped with paved runway 09/27 measuring 1,240 x 30 m. It is open to public air traffic, is not controlled but has its own A/A frequency (119.3 MHz). This frequency is not recorded.

The aerodrome is operated by the Guadeloupe general council. The installations are not equipped with a telephone line and there is no permanent structure.

2.7 Flight path of aeroplane

The pilot took off for a flight of around twenty minutes, the meteorological conditions at departure being clement. He then passed between two cloud masses, heading south. The cloud mass situated to the east of his flight path, heading westwards, progressively compromised his chances of turning around. The pilot continued the flight along the Marie-Galante coastline and found himself at the heart of a second cloud mass with electrical activity and rainfall.



Flight path of N615VB based on data from the Guadeloupe secondary radar from 08:58:02 to 09:05

Meteorological data: rainfall radar image at 09:05 (source: Météo France)
Unit of rainfall scale: mm/h

The altitude data is calculated using the flight level transmitted by the transponder corrected with the local QNH of 1012 hPa
Times are local

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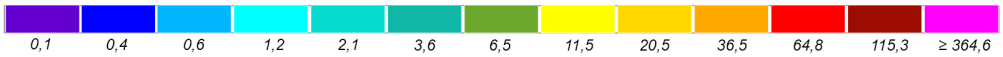


2.8 Search and rescue

2.8.1 Chronology of searches and resources

The alert was given on 26 September at 18:39 by the Pointe-à-Pitre ATS. Visual searches involving two helicopters and two boats were suspended at 22:14. They resumed the next day, reinforced by an aeroplane, from 06:56 to 17:21 (at which time they were stopped due to adverse weather), without success. The public authorities did not extend this SAR operation to search operations for the wreckage.

During these operations, the southern areas of Marie-Galante, the Canal des Saintes and the Canal de la Dominique were covered. No possible survivors were located or signs of a wreckage or floating debris found.

2.8.2 Flight plan information

When flying over the sea under VFR, the regulations (AIP CAR-SAM-NAM ENR 1.2.12 and 1.2.13) require that a flight plan is filed. This obligation makes it possible to ensure an alerting service. The rules of the air specify:

"*SERA.4020 Closing a flight plan:*

a) An arrival report shall be made in person, [...] at the earliest possible moment after landing, to the appropriate air traffic services unit at the arrival aerodrome [...].

b) [...].

c) When no air traffic services unit exists at the arrival aerodrome or operating site, the arrival report, when required, shall be made as soon as practicable after landing and by the quickest means available to the nearest air traffic services unit.

d) When communication facilities at the arrival aerodrome or operating site are known to be inadequate and alternate arrangements for the handling of arrival reports on the ground are not available, the following action shall be taken. Immediately prior to landing the aircraft shall, if practicable, transmit to the appropriate air traffic services unit, a message comparable to an arrival report, where such a report is required. Normally, this transmission shall be made to the aeronautical station serving the air traffic services unit in charge of the flight information region in which the aircraft is operated.

e) [...]."

It is recalled:

"*GM1 SERA.4020 Closing a flight plan*
ARRIVAL REPORTS
Whenever an arrival report is required, failure to comply with the provisions of SERA.4020 may cause serious disruption in the air traffic services and incur great expenses in carrying out unnecessary search and rescue operations."

The pilot had complied with this regulatory obligation to file a flight plan.

It is widely known that at low height, close to Marie-Galante aerodrome, VHF communications on the Pointe-à-Pitre flight information frequency are no longer possible and that the ground mobile phone network is unreliable. The pilot closed his flight plan at around five nautical miles from the arrival aerodrome. This is authorized by the regulations but it terminates the alerting service which the pilot and his passengers could have benefited from (SERA 10001 a) 2).

The alerting service is implemented as follows:

"SERA 10001 Application

a) Alerting service shall be provided by the air traffic services units:

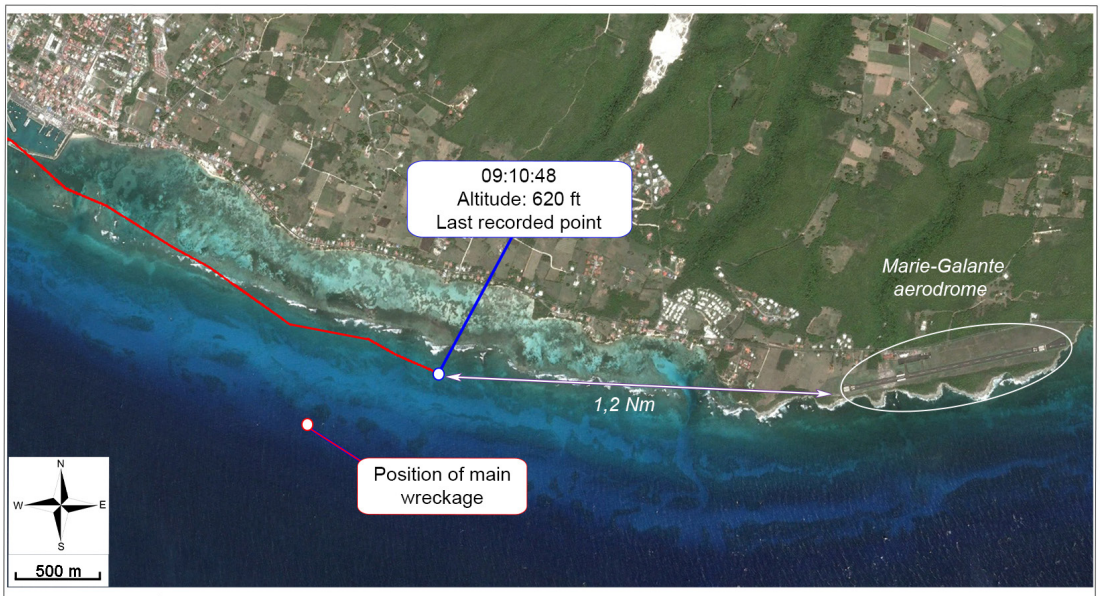
1) for all aircraft provided with air traffic control service;
2) in so far as practicable, to all other aircraft having filed a flight plan or otherwise known to the air traffic services; and
3) to any aircraft known or believed to be the subject of unlawful interference."

Nine hours elapsed between the accident and the alert being given. This period could have been shorter if the flight plan had not been closed in flight.

2.9 Search for wreckage

2.9.1 Privately funded search

When the SAR operations were stopped, searches for the wreckage were privately funded by one of the families of the victims. These searches were unsuccessful. However, the wreckage was discovered around one month after the accident, during an exercise carried out by emergency service divers, in a zone situated half a nautical mile southwest of the last radar detection. The site of the exercise had been deliberately chosen, on advice from the pilot's family based on the description of the flight path provided by a witness who had seen the aeroplane during its fall.



Basemap source: Google Earth

Flight path of N615VB based on data from the Guadeloupe secondary radar from 09:09:57 to last recorded point

The altitude data is calculated using the flight level transmitted by the transponder corrected with the local QNH of 1012 hPa.
Times are local

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2.9.2 Underwater locator beacons

ULBs[3] (37.5kHz) or ULDs (8.8 kHz) equip respectively the regulatory flight recorders (CVR and FDR) and certain aircraft carrying out commercial flights over the sea to permit their location. They are standalone units which transmit a signal as soon as they are under water. This signal can be identified by a hydrophone set to a dedicated frequency.

[3]The cost of a ULB is around $1,000 and requires no other maintenance than the replacement of the internal battery for a cost of $300 (validity indicated on its identification label, generally six years).

The BEA database contains 11 accidents on French territory (metropolitan France and overseas departments and territories) in which light aircraft disappeared and were never found.

The improvement of aviation safety in an insular zone such as the French West Indies partly relies on safety investigations being carried out into events terminating in the disappearance of an aircraft and its occupants at sea.

The carrying of underwater locator beacons would facilitate the location of light aeroplanes which have crashed into the sea and would thus increase the chances of the investigations into this type of accident being carried through to their conclusion.

After the accident, Saint-François aero-club decided to equip all its aeroplanes with ULBs.

2.10 Examination of wreckage

The examination carried out by the BEA on completion of the recovery operations found that the main damage on the aircraft structure was chiefly concentrated on its right side. The deformations were principally in a right to left direction. Observations of the wreckage determined that in all likelihood, it was the right wing of the aeroplane in a nose-down attitude that first struck the water.

The examination of the flight controls found that:

- the control surfaces (ailerons, elevator, rudder and flaps) were in position and fixed to the wing when the aeroplane collided with the water;
- the flaps were retracted;
- the aileron, rudder and elevator controls were continuous from the cockpit to the control surfaces.

The elevator trim wheel was in a nose-down position. This position was confirmed by the position of the trim on the elevators.

The end of the engine crankshaft had failed suddenly. The fracture surface displayed signs of torsional loading at the time of failure. The appearance of this fracture showed the transmission of engine torque to the propeller on impact with the water.

The position of the wreckage on the ocean floor, with respect to the last radar detection, shows that the pilot had probably abandoned the idea of landing and had started turning around by making a right turn.

The examination of the airframe, flight controls and engine made it possible to exclude any malfunction before the accident. The attitude of the aeroplane at impact is compatible with a loss of control at low height during a right turn, with engine power available.

2.11 Survivability

The nature of the impact with the surface of the water (high nose-down attitude leading to substantial deformation of the front part of the cockpit) left little chance of survival for the occupants.

3 - LESSONS LEARNED AND CONCLUSION

During the flight preparation, the pilot consulted the weather forecasts. He underestimated the impact of the forecast phenomena and the speed at which they were going to evolve and said that he could avoid them, given that their probability of occurring was considered small. He did not update his information before leaving one hour later although the phenomenon observed was very dynamic. He started his flight in favourable local meteorological conditions without realising that the conditions at his destination were quickly deteriorating. He continued towards Marie-Galante although the phenomenon was intensifying.

The pilot probably flew a missed approach due to the reduction in visibility and started turning around at a low height by making a right turn. The presence of rain, reducing visibility, combined with flight over water, in all likelihood deprived him of external visual references. The dangerous phenomena associated with the proximity of a cumulonimbus such as squall lines and windshear may have also led the pilot to lose control at low height.

The accident was the result of the pilot underestimating the danger presented by the development of a tropical wave and his decision to continue the flight when there were adverse meteorological conditions on the route and at destination. A programmed professional appointment with his passengers may have affected his discernment and incited him not to renounce carrying out the flight and to fly to destination.

The pilot filed a flight plan as required by regulations as it was a flight over the sea. He closed his flight plan with the control unit with which he was in contact in the vicinity of the destination aerodrome, as permitted by regulations. In these circumstances, he benefited from the same alert service as if he had not filed a flight plan at departure. This might lead us to question the overall consistency of these regulatory provisions.