



Serious incident to the PILATUS PC12
registered **N668TW**
on Tuesday 16 January 2024
on Saint-Barthélemy airport

Time	Around 12:45 ¹
Operator	Tradewind Aviation
Type of flight	Ferry flight
Persons on board	Captain (PF ²) and co-pilot (PM)
Consequences and damage	Aeroplane slightly damaged
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation. As accurate as the translation may be, the original text in French is the work of reference.	

Destabilisation during final approach, vegetation strike

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on data downloaded from the on-board avionics systems, statements and an airport video recording.

The crew were carrying out a ferry flight without passengers between Luis Munoz de San Juan international airport (Porto Rico) and Saint-Barthélemy airport. The captain was the PF and the co-pilot was the PM. While flying over the Col de la Tourmente (the highest vertical point on Figure 1) during the approach to runway 10 at Saint-Barthélemy airport, less than 300 m from the runway threshold, the aeroplane was destabilised by turbulence and suddenly rolled to the left-hand side. The left-hand wing sheared the branches of a tree. The PF countered this left-hand bank by making right-hand stick inputs which resulted in bringing the right-hand wing to within approximately two metres of the ground. He continued the approach and landed without further incident.

¹ Except where otherwise indicated, the times in this report are in local time. Four hours should be added to obtain UTC time and five hours to obtain the legal time applicable in Metropolitan France on the day of the occurrence.

² The glossary of abbreviations and acronyms frequently used by the BEA can be found on its [Website](#).

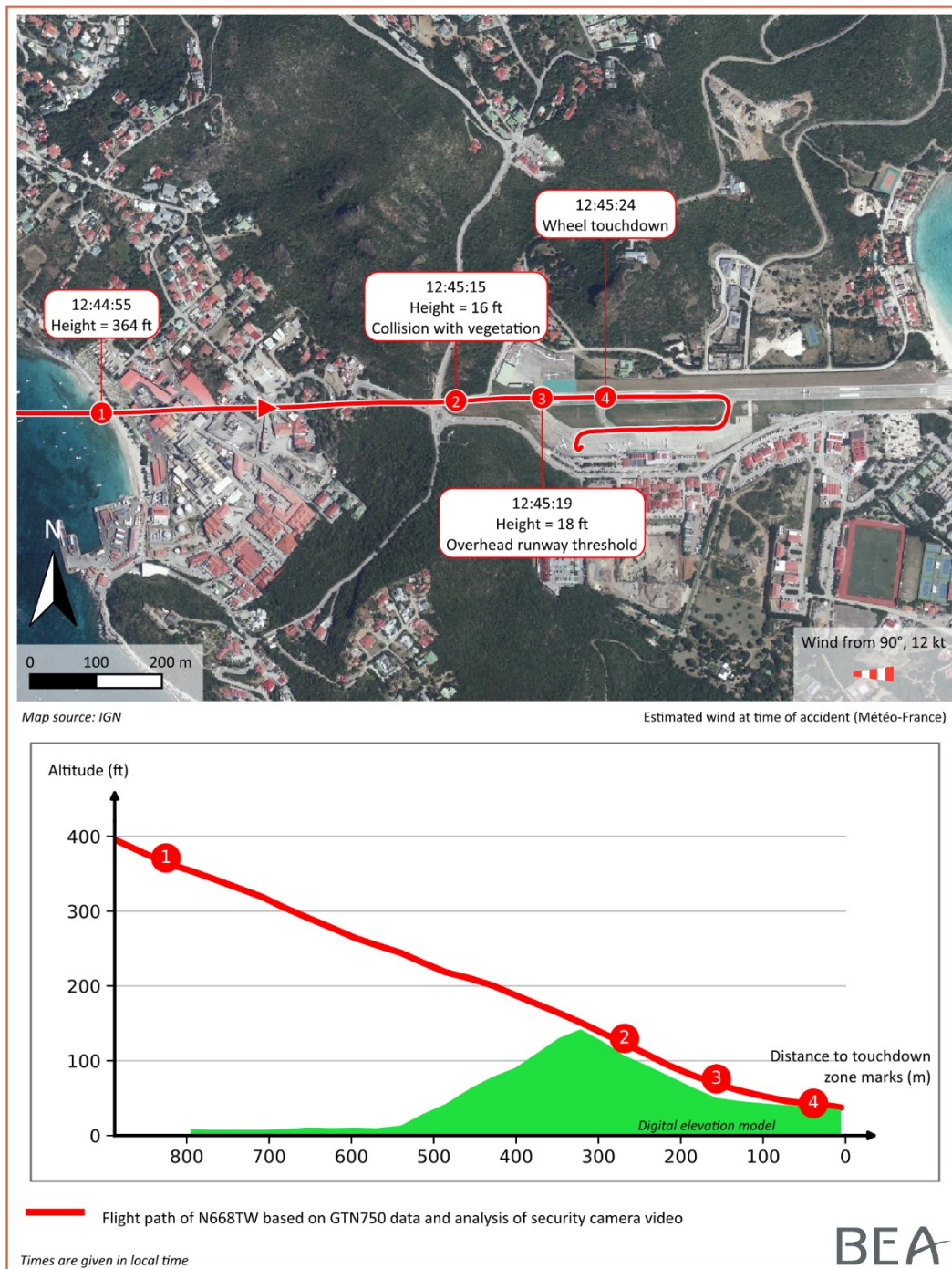


Figure 1: flight path and vertical profile followed by N668TW (source: BEA)

2 ADDITIONAL INFORMATION

2.1 Airport information

Saint-Barthélemy airport has a paved runway 10/28, measuring 646 m long and 18 m wide. The runway 10 threshold is at an altitude of 49 ft and threshold 28 is at an altitude of 7 ft. The mean longitudinal slope of the runway is 2%.

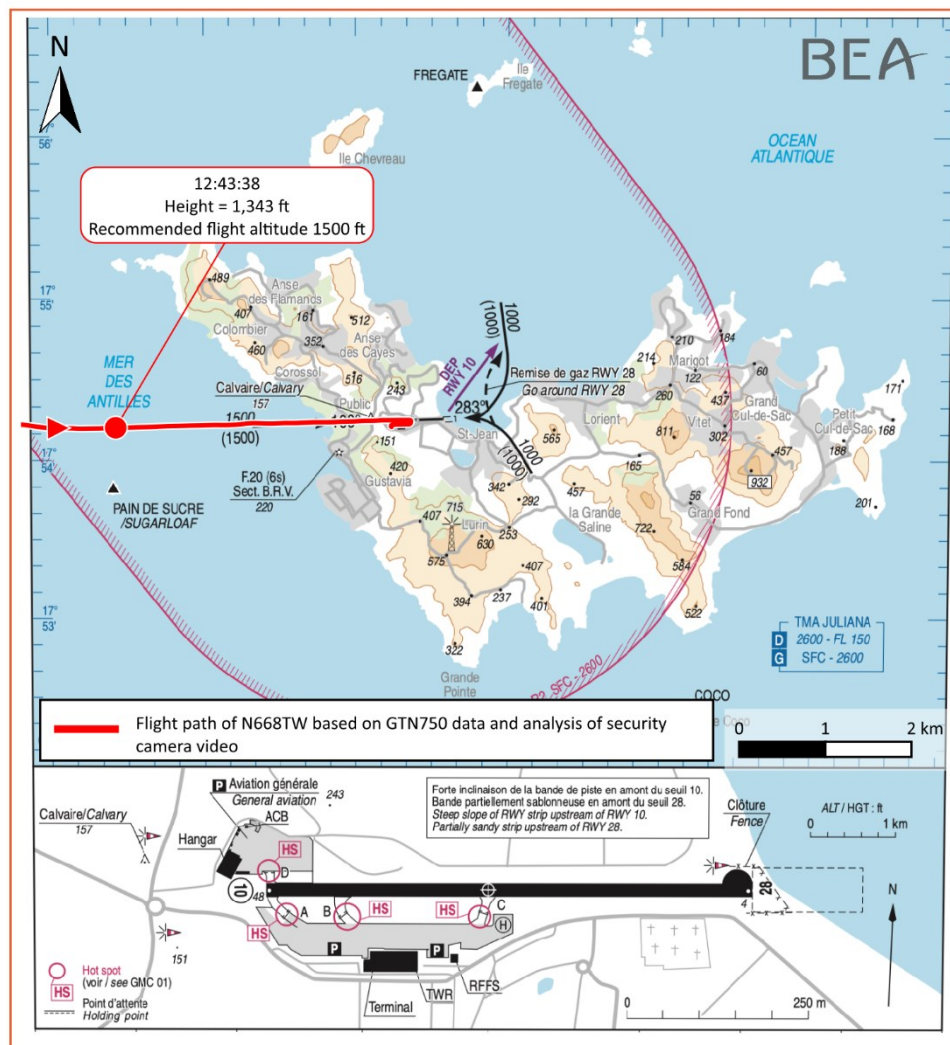


Figure 2: excerpt from Saint-Barthélemy airport VAC (source: SIA, annotations BEA)

The airport is reserved for authorised pilots and aircraft with appropriate characteristics and performance. The AIP³ indicates that commercial air transport operators must submit a file demonstrating that the landing performance of their aircraft is compatible with the runway length available. This file must then be approved by the DSAC. This use restriction is due to the airport's geographical specificities: there is high ground to the north, west and south-east of the airport and to the east, the runway is limited by the coast.

The approach path to runway 10 passes over Col de la Tourmente pass situated at an altitude of around 130 ft⁴. The pass is situated at 310 m from the touchdown zone markings which are at an altitude of 34 ft. Due to this particular topography, the pilot has to follow a steep final approach slope. A wayside cross is situated near the pass reaching an altitude of 157 ft as indicated on the VAC.

³ Available for consultation in the media library on the page dedicated to this safety investigation.

⁴ In the occurrence, the aeroplane flew over the pass at an altitude of between roughly 140 and 150 ft.

According to the AIP and the information provided by Météo France, the surrounding high ground causes turbulence on the approach to runway 10. The airport's weather sensor is situated at threshold 28. The AFIS officer also has wind information obtained by another Météo France station situated level with the pass. As this station is not certified, its wind data is not communicated to the pilots.

2.2 Meteorological information

The 12:30 METAR indicated that the wind direction was variable between 60° and 120° for a mean wind at 12 kt from 90°. Visibility was greater than 10 km, with few clouds and a cloud base higher than 3,000 ft. The temperature was 28°C.

The detailed examination of the wind measurements made by Météo France over the period of the incident showed that at that time, the mean wind over a 10-minute period was 90° to 100°, varying between 70° and 100°. The wind strength was around 14 to 15 kt, with gusts of 16 to 21 kt.

2.3 Aircraft information

The PC12 is a single-engine aeroplane certified for single-pilot operation. It can also be operated with multiple pilots, which was the case for the operator in this incident. It can carry up to nine passengers. It is equipped with a Pratt & Whitney Canada turboprop engine delivering 1,200 hp and has a maximum take-off weight of 4,100 kg. The PC12's approach speed with flaps at 15° is 95 kt and its landing speed is 78 kt.

In addition to the usual airspeed indicator, the PC12 of the incident has an angle of attack (AOA) indicator on its EFIS. This tape, controlled by the AOA measurement system, is composed of a pointer indicating if the speed of the aeroplane is too fast (close to F indication) or too slow (close to S indication). If the pointer is in the middle of the tape, the aeroplane is flying at 1.3 times the stall speed⁵.

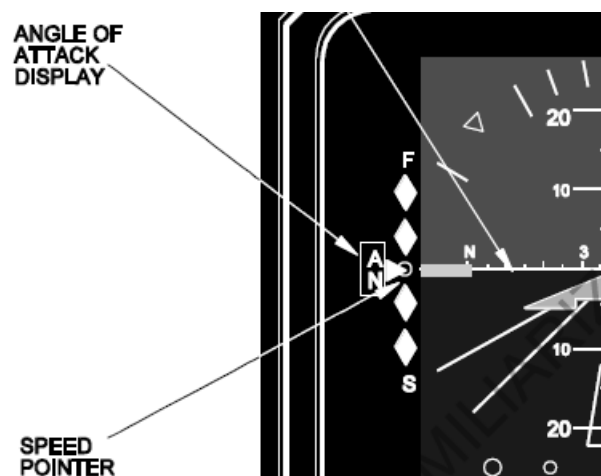


Figure 3: AOA indicator

2.4 Crew information

For the incident flight, the PC12 was operated by a captain and a co-pilot in accordance with the operator's procedures. The captain was the PF and the co-pilot was the PM.

⁵ The calculation of the stall speed takes into account the configuration of the aeroplane.

2.4.1 Captain's experience and statement

The 22-year-old captain held an aeroplane commercial pilot licence (CPL (A)) along with the PC12 SET class rating and the IR rating. At the time of the incident, he had logged approximately 1,660 flight hours, including 660 hours on the PC12. He had landed 68 times at Saint-Barthélemy as PF, all on the PC12 and in the 3 months preceding the serious incident. His last flight to Saint-Barthélemy was the day before.

The captain indicated that on the final approach, when passing over the coast, the aeroplane had flown through the usual updrafts. The captain specified that he had then expected to encounter downdrafts but the latter were stronger than he had anticipated. He indicated that he corrected the flight path. He explained that after Col de la Tourmente pass and as he was reducing power to land, he perceived another downdraft which brought the aeroplane below the approach slope, to the left-hand side of the runway axis and with a left-hand bank. He then heard a noise on this left-hand side. He indicated that he then increased power and intercepted the runway axis before continuing the approach and landing.

2.4.2 Co-pilot's experience and statement

The 30-year-old co-pilot held a CPL (A) along with the PC12 SET class rating and the IR rating. At the time of the serious incident, he had logged 1,120 flight hours, including 550 hours on the PC12. He had landed 75 times at Saint-Barthélemy as PM, all on the PC12 and in the three months preceding the incident. His last flight to Saint-Barthélemy was on 7 January 2024.

The co-pilot indicated that the wind was strong on the day of the incident. On final, when passing over the coast, the aeroplane flew through the usual updrafts and then downdrafts. He considered that the downdrafts were strong. The captain held the flight path by increasing power. The co-pilot indicated that when passing over the pass, the aeroplane banked to the left-hand side. He then saw the PUSHER CAWS warning illuminate indicating that the stall protection system (*stick-pusher*)⁶ had become inoperative⁷. The co-pilot added that the visual AOA limit warning illuminated intermittently. On the ground, he and the captain saw on the left-hand wing, that the AOA sensor was cracked and the leading edge scratched.

2.5 Operator's approach procedures for Saint-Barthélemy airport

In its operations manual, the operator defines a stabilised approach for Saint Barthélemy airport as: full flaps, landing gear down, aeroplane trimmed to fly with the angle of attack indicator between the centre position (recommended approach speed) and the first low speed mark (diamond).

According to the operations manual, only captains may be PF during a landing at Saint Barthélemy.

⁶ System designed to protect the aeroplane from stalling by generating a nose-down order before the AOA becomes too high.

⁷ Very probably due to the damage to the AOA sensor caused by the collision with vegetation. The AOA sensor measures the AOA of the aeroplane.

At the time of the serious incident, the operations manual mentioned the following points for the approach to runway 10:

- the aeroplane must pass abeam the “sugarloaf” in the approach configuration, stabilised and at 1500 ft;
- the approach must be made at a constant attitude and the minimum clearance height with respect to the terrain is 25 ft;
- the touchdown must take place before the “special lateral markings”⁸. In addition, reverse thrust and normal braking must be applied before passing taxiway C;
- it is prohibited to try to stop before taxiway C.

Furthermore, the operations manual indicates in the specificities of Saint Barthélemy airport that the approach slope for runway 10 is between 6° and 8°, i.e. a slope between 10.5 and 14%.

During the operator's training in the use of Saint Barthélemy airport, the instruction given for following the final approach is to ensure that taxiway B is always visible and slightly above the pass.

2.6 Pilot training information

The VAC specifies that a pilot may only land at Saint Barthélemy airport if they can demonstrate proficiency on the type or class of aeroplane in question, recognised by an instructor, prior to flying to the airport. In commercial transport, the regulations stipulate that the training programme must be defined by the operator and then approved by the oversight authority.

At Tradewind, co-pilots follow a one-day theoretical training course on the particularities of Saint Barthélemy airport. This is followed by practical training consisting of a landing and a go-around. Tradewind does not allow its co-pilots to act as PF on flights to Saint Barthélemy.

Captains also follow training consisting of 15 to 25 landings in instruction without passengers. After this initial training, the captain must perform 25 landings with an instructor during commercial flights in order to obtain the authorisation to carry passengers to Saint Barthélemy airport. Recurrent training is also provided annually to all pilots flying in and out of Saint Barthélemy.

2.7 Analysis of collected data

The data recorded by the Garmin GTN 750 navigation system made it possible to determine the aeroplane's flight path and ground speed. The sampling frequency for this data is one point per second.

The flight data was compared with data from three flights made with the same aeroplane landing on runway 10 at Saint Barthélemy airport in wind conditions comparable to those at the time of the incident. These flights took place after the incident and were not necessarily flown by the same pilots. The wind direction and speeds at landing for these flights are summarised in the table below.

⁸ Markings on runway at 267 m from threshold 10. These are not standard markings but a specificity of Saint-Barthélemy airport.

	Approach	Mean wind direction (°)	Mean wind speed (kt)	Maximum gust speed ⁹ (kt)
1	11/02/2024 09:22	50	12	20
2	11/02/2024 14:19	50	19	22
3	11/02/2024 17:27	60	14	20

The Météo-France data (see [Paragraph 2.2](#)) indicates that at the time of the incident, the mean wind was 090/100° with a mean speed of 14 kt to 15 kt. Gusts varied in direction between 70° and 110° with speeds of 16 to 21 kt. A comparison of the different approach slopes and ground speeds is shown in the figure below.

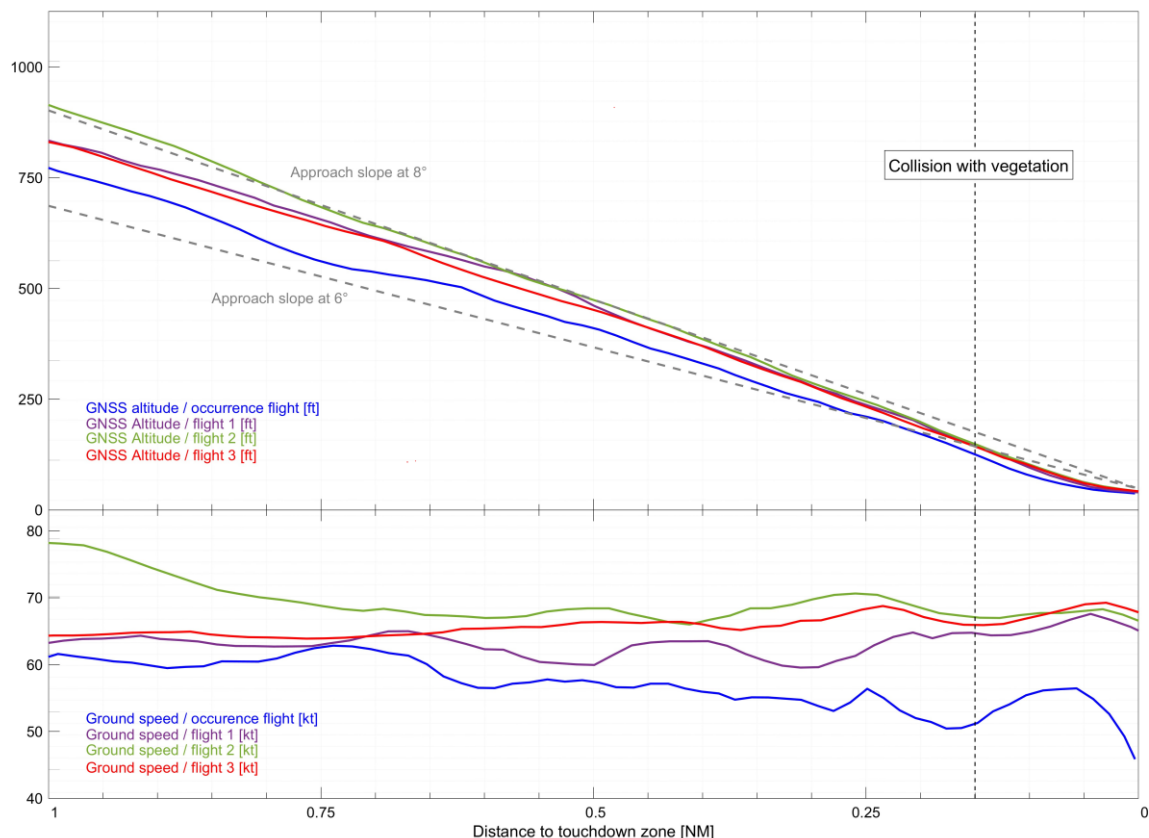


Figure 4: comparison of approach slopes and ground speeds for different flights¹⁰ (source: BEA)

These comparisons highlight that the lowest of the flight paths studied is that of the serious incident.

Based on the ground speed, heading and mean wind over ten minutes data provided by Météo-France, airspeed values on final were estimated for the various flights studied. These estimates indicate that, when passing over Col de la Tourmente pass, the airspeed of the incident flight was approximately 10 kt lower than that of the other flights.

⁹ Maximum wind speed over 1 minute at the time of touchdown +/- 1 min.

¹⁰ The origin of the measurement is the middle of the touchdown zone on runway 10.

3 CONCLUSIONS

The conclusions are solely based on the information which came to the knowledge of the BEA during the investigation.

Scenario

During the approach to runway 10 of Saint-Barthélemy airport, the aeroplane flew in a turbulent environment caused by a gusty easterly wind. The flight followed a lower approach path with very probably a lower airspeed than those taken by other flights in comparable wind conditions.

When flying over Col de la Tourmente pass, the captain encountered strong gusts. The aeroplane banked to the left-hand side when it was at a low height and the left-hand wing tip struck a tree. The crew continued the approach and landed without further incident.

Measures taken by the operator

Following this serious incident, TradeWind updated its theoretical training and its operations manual in order to detail the approach procedure for runway 10. The following information was added:

- the descent slope must be increased when the headwind component exceeds 15 kt;
- the minimum altitude overhead the large islet (islets situated around 0.5 NM before the coast) is 500 ft AML;
- the minimum altitude overhead the coast is 250 ft AMSL;
- the aeroplane must fly over the pass at an altitude equal to or higher than the wayside cross (i.e. 157 ft AMSL);
- if at any time windshear destabilizes the approach, a go-around must be initiated.

The BEA investigations are conducted with the sole objective of improving aviation safety and are not intended to apportion blame or liabilities.