

Accident to the PIPER PA23 "Aztec" registered N539EG

on 22 February 2016
at Saint-François (Guadeloupe)

⁽¹⁾Except where otherwise indicated, the times in this report are local. Five hours should be added to obtain the legal time applicable in Metropolitan France on the day of the event.

Time	Around 15:00 ⁽¹⁾
Operator	SOTRADOM
Type of flight	Ferry flight
Persons on board	Pilot
Consequences and damage	Aeroplane destroyed

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.

Loss of control in initial climb during a post-maintenance ferry flight

1 - HISTORY OF THE FLIGHT

Note: the following information is principally based on data from an onboard computer and statements.

The pilot, the only person on board, took off from Saint-François airport for a VFR flight bound for Pointe-à-Pitre-Le Raizet airport (Guadeloupe). He had to ferry the aeroplane following a scheduled maintenance inspection.

Shortly after retracting the landing gear and flaps, he turned right and quickly noticed that the aeroplane had a tendency to nose down. He made inputs on the electrical pitch trim control without success. He then felt for the manual pitch trim control with his right hand, but was unable to find it. As the altitude of the aeroplane had started to decrease, he placed both hands on the wheel in order to have more strength to counter the nose-down moment. Subsequently, as the load on the control column increased, he had to keep both hands on the wheel.

He was unable to prevent the aeroplane descending and continued the right turn over Saint-François bay to avoid boats and dwellings. Witnesses saw the plane violently strike the surface of the lagoon and then sink.

The pilot was ejected from the cockpit with his seat during the impact with the water's surface. After the impact, the pilot released the seat harness. He clung to the seat which was floating until he was rescued by a pleasure boat.

2- ADDITIONAL INFORMATION

2.1 Context of flight

The day of the accident, the pilot flew to the Saint-François maintenance workshop on board a Piper PA32 that he ferried over for maintenance operations.

Once there and having regularly flown N539EG in the past, the operator of this aeroplane asked him to fly it back to Pointe-à-Pitre.

N539EG was programmed for an own-account flight at 16:00 the same day from Pointe-à-Pitre to Dominica. The pilot was informed of the need to arrive at Pointe-à-Pitre sufficiently early so that the take-off to Dominica would be on time.

2.2 Aerodrome information

Saint-François airport has a paved runway 11/29 measuring 600 m long and 20 m wide. It is situated on the south side of Guadeloupe, at about 300 m from the coast. The published procedure on the VAC chart for a take-off from runway 11 requires the pilot to hold the runway centreline up to 500 ft before making a right turn in climb to 1,000 ft to avoid flight over a residential area situated along the coast on the runway centreline.

2.3 Meteorological information

The automatic METAR for Pointe-à-Pitre-Le Raizet airport, situated at 27 km from Saint-François, indicated at 15:00, a south-easterly wind of 10 kt, visibility greater than 10 km and scattered clouds at 3,400 ft.

The weather conditions were compatible with a flight under Visual Flight Rules (VFR) to Pointe-à-Pitre.

2.4 Wreckage and impact information

The wreckage was found in the sea, on a bed of sand, at a depth of around nine metres. It was lying at the bottom of a channel around 1,200 m from the threshold of runway 29 of Saint-François airport.



Source: Gendarmerie nationale – Brigade Nautique de Pointe-à-Pitre

Figure 1: main group of debris

It was composed of four main groups of debris:

- The tip of the right wing (see [Figure 2](#), point **a**).
- The left engine (see [Figure 2](#), point **b**) 14 m to the east of point **a**.
- The main group of debris 28 m to the north-east of point **b** (see [Figure 2](#), point **c**). It was composed of the upper part of the fuselage including the seats and rear bench-seat, the tail unit, the right wing root with its main landing gear and its power plant, the left wing root with its main landing gear and just the engine mount, part of the left wing tip and the cockpit.
- Part of the right instrument panel was found at mid-distance between point **b** and point **c**.

The wreckage was raised and examined on land by the BEA. Observations of the wreckage found that:

- The aeroplane was complete on impact with the surface of the water.
- The flight controls and the trim control cables were continuous.
- The right wing struck the surface of the water first with high energy.
- The engines were providing power.
- The landing gears were retracted.
- The fuselage broke up during the impact.
- The pilot's seat was torn from the cockpit floor during the impact and ejected forward.

It was not possible, given the damage, to determine the position of the flaps when the aircraft hit the surface of the water.

The position indicators of the rudder and pitch trims were found in the positions imposed by the return springs when the control cables are no longer taut. The position of the pitch trim at the time of the impact could not be determined.

No anomaly prior to the occurrence was observed.

2.5 Avionics computer

The aeroplane was equipped with a GA-EGPWS KGP 560 manufactured by Honeywell. This Terrain Avoidance and Warning System (TAWS) is dedicated to general aviation. It records in its internal memory the data relating to take-offs and landings, flight data and the history of failures, occurrences or warnings.

The flight path based on this data and supplemented by statements, was produced (see [Figure 2](#)).

The computer recordings show that shortly before the impact with the sea, the ground speed exceeded 180 kt (330 km/h).

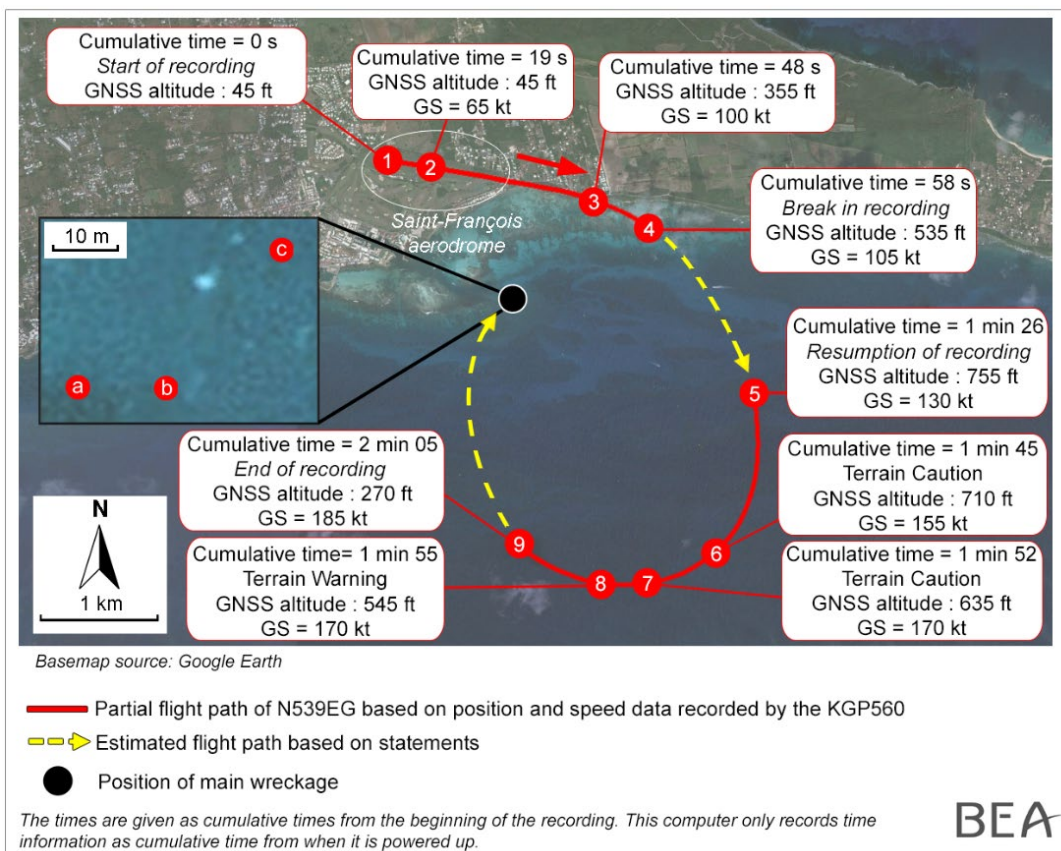


Figure 2: flight path of N539EG and distribution of debris (insert)

2.6 Aircraft information

N539EG was a twin-engine equipped with Lycoming IO-540-C4B5 piston engines, each providing 250 hp. Built in 1975, it had logged 5,587 flight hours at the date of the accident.

The plane had been operated by SOTRADOM based in Guadeloupe from August 2005. It was used to transport company personnel and was usually flown by an employee at Gadarkhan Ltd based in Dominica, the latter being economically tied to SOTRADOM. This employee also carried out the technical monitoring of the aeroplane (monitoring of time between overhauls, scheduling maintenance operations).

On the PA23, the manual rudder and pitch trim controls are composed of a handle and a central knob on the handle. These controls are located on the overhead panel of the cockpit (see [Figure 3](#)).

Moving the handle clockwise moves the pitch trim to a nose-up position and in the counter-clockwise direction, to a nose-down position. Moving the knob clockwise moves the rudder trim to the left and in the counter-clockwise direction, to the right.

The two trim position indicators are located on the overhead panel, aft of the handle.

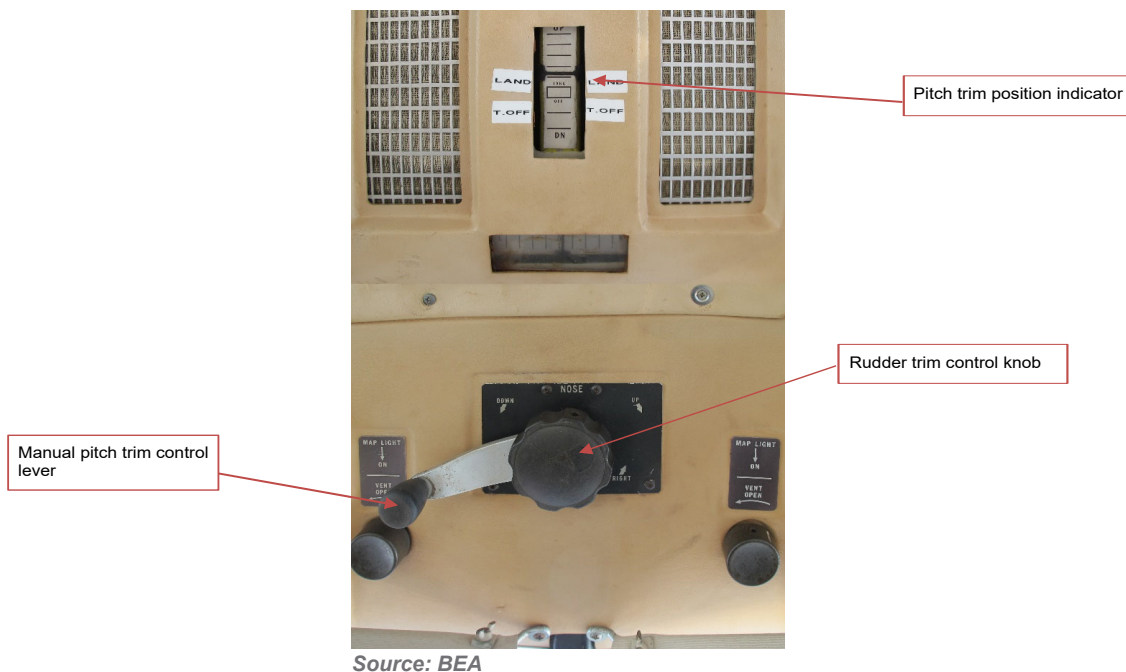


Figure 3: manual pitch and rudder trim controls and position indicator on cockpit overhead panel on a PA23

On light, piston-powered aeroplanes, the pitch trim control is generally placed in the centre of the cockpit, at the bottom of the instrument panel. Nevertheless, on certain models, it can be located on the cockpit overhead panel as is the case with the Piper PA23.

N539EG was also equipped with an electrical pitch trim control system connected to an autopilot. This system was composed of an ON/OFF button on the upper left side of the instrument panel, a circuit-breaker on the circuit breaker panel and a switch (UP/DOWN) on the pilot's control column to control the pitch trim. This system had been deactivated several months before the accident when a new avionics system was installed. This avionics system had induced malfunctions in the connection with the autopilot system. The pilot of the accident flight was not informed of the deactivation of this system.

The check-lists available in the aeroplane flight manual ask pilots to check the pitch trim position indicator on two occasions during the departure procedures: during the interior pre-flight inspection and before take-off.

2.7 Aeroplane maintenance information

Bretagne Aéro Services, based at Vannes (Morbihan) had been in charge of the aeroplane's maintenance. It had a second workshop situated at Saint-François in Guadeloupe. It was approved to maintain aircraft below 5.7 t registered in Europe (EASA Part M approval). The workshop manager held an A&P⁽²⁾ maintenance licence issued by the Federal Aviation Administration (FAA) and as a consequence, was approved to maintain aircraft registered in the United States of America such as N539EG. He was assisted by a mechanic who held an EASA Part 66 aircraft maintenance licence valid for aeroplanes registered in the European states.

The examination of the maintenance documents found that the calendar of maintenance operations carried out on N539EG complied with the regulatory requirements and manufacturer's recommendations.

⁽²⁾ Airframe and Powerplant.

⁽³⁾ Document FAA AC43.13-1 indicates that the cables must be visually inspected using a cloth in order to detect the presence of broken strands. A complete inspection of these areas generally requires bringing the cable to both stops which was the case for the pitch trim control cable.

The aeroplane had arrived at the workshop on 1 February 2016 for a scheduled maintenance operation (100-hour inspection) and additional work requested by the owner. This work had been spread over the three weeks that the aeroplane was present in the workshop.

In the scope of the maintenance operation carried out, the pitch trim control cables had to be checked. This requires fully deflecting the pitch trim with one person turning the lever on the overhead panel and another checking the condition of the control cables as they move⁽³⁾. This operation was carried out with the help of an assistant. The mechanic has no memory of then repositioning the pitch trim control in the "Take-off" position. He specified that the manufacturer's maintenance manual did not explicitly request that the control be returned to the "Take-off" position, but that it was a best practice.

2.8 Pilot information

The 65-year-old pilot held a valid professional pilot licence issued by the FAA in 2014 along with multi-engine (land) and instrument ratings. He had carried out an instrument proficiency check on a Piper PA32 (single engine piston) on 4 April 2015 with an FAA-approved inspector. He held the necessary licences and ratings to fly the Piper PA23. The FAA do not require a specific proficiency check on a multi-engine aeroplane.

His medical fitness was checked on 12 December 2015 in an FAA-approved centre.

In addition, he held a professional pilot licence issued by the DGAC with single-engine (land) and night ratings.

The pilot indicated that at the time of the accident, he had logged a total of 7,104 flight hours of which 2,351 hours on multi-engine aeroplanes and 2,026 hours on multi-engine piston aeroplanes, including several hundred hours on the PA23. He had performed 99 flight hours in the previous 6 months, including 30 hours on a multi-engine aeroplane, all on the Beech 90.

Up until September 2011, he had been a regular pilot on N539EG for the company which owned the aeroplane.

Subsequently, he had only occasionally flown PA23s. He last flew this aeroplane on 14 June 2014. It was the sole flight carried out in a PA23 in 2014.

2.9 Statements

■ N539EG pilot

The pilot indicated that in the morning he had carried out a return flight between Pointe-à-Pitre and Antigua on a PA32 type and then ferried the PA32 to Saint-François at the beginning of the afternoon so that it could undergo maintenance.

He explained that he was then contacted by an employee at Gardakhan Ltd who was responsible for monitoring the aeroplane and who was initially going to carry out the ferry flight. Due to an impediment, this employee asked the pilot to bring N539EG back to Pointe-à-Pitre as the aeroplane was to be flown to Dominica at the end of the afternoon.

After the pilot's arrival at the Saint-François workshop, the mechanic positioned N539EG in a departure position on the apron. The pilot indicated that there was no time to lose as N539EG was blocking the apron and taxiway leading to the runway.

The pilot specified that as he had not flown a PA23 for a long time, he had first put the flight manual close to hand.

⁽⁴⁾The PA23 flight manual indicates flaps retracted, a rotation speed of 64 kt and maximum power for take-off.

The mechanic informed the pilot of the maintenance actions carried out on N539EG. The pilot started up the engines, tested the controls and carried out a ground run with the mechanic on board. He specified that the mechanic then exited the aeroplane while the engines were at idle. The pilot then prepared the PA23 for take-off. He put the flaps in the first detent⁽⁴⁾ and then visually checked all the aeroplane's controls and that the door was correctly closed. This check did not concern the overhead panel as he was not used to including it in his visual scan. He indicated that he did not use the paper check-list or the aeroplane flight manual.

The pilot explained that he applied power on brakes and that the take-off run had been normal. During the rotation, at 65 kt, he felt that the controls were stiffer than normal. He added that after retracting the flaps, the controls became even stiffer and the aeroplane had a tendency to nose down.

The pilot has no memory from the impact to when he found himself on the surface of the water, still fastened in his seat. He explained that he then released his seatbelt and clung to his seat which was floating. Boat pilots present in the area for another event approached and rescued him. He specified that he did not know how to swim and that the buoyancy of the cushion of his seat helped him stay at the surface the time required for him to be rescued.

The pilot added that it is possible that he took off with the pitch trim in a non-compliant position. He thought that on that day, a certain time pressure due to the need to ferry N539EG in the allotted time and the fact that it was blocking the apron, may have incited him not to get out the paper check-list and to only carry out the before take-off checks visually.

He indicated that the PA32 that he had ferried to Saint-François on the same day had a pitch trim control at the bottom of the instrument panel, between the two seats.

He specified that he had not been told that the autopilot and electrical pitch trim control had been disconnected and were thus inoperative.

■ Mechanic who carried out maintenance operation at Saint-François

The mechanic indicated that he summarized for the pilot, the maintenance actions which had been carried out and was present for the external pre-flight inspection and the engine tests which were necessary due to the operations which had been carried out on the engines.

He was in the aeroplane for the start-up and checks carried out by the pilot. He explained that the aeroplane start-up checks were carried out without a guide or check-list.

He added that he removed the flight manual from the pilot's bag at the latter's request and placed it on the front right seat. He then exited the aeroplane while the engines were running. The pilot took off around three minutes later. He specified that the pilot took less time than was usual for him and that he considered him as being of a rather calm and deliberate nature.

The mechanic who carried out the maintenance of N539EG had not participated in the installation of the new avionics nor in the deactivation of the autopilot. As no specific operation had been programmed on this equipment, he indicated that he could not remember if an "INOP" label had been affixed to the ON/OFF button and if the circuit breaker had been pulled and safetied with a lock-out.

■ Employee at Gadarkhan Ltd who flies and is responsible for monitoring the aeroplane

The employee indicated that he had asked the pilot to fly N539EG back from Saint-François. As the pilot had regularly flown N539EG in the past, he did not review the aeroplane with him and did not remind him of the PA23's technical specificity, namely the position of the pitch trim on the overhead panel, and that the autopilot and electrical switch of the pitch trim on the pilot's control column, were inoperative

2.10 Post-maintenance safety occurrences linked to flight control problems

2.10.1 Occurrences registered by the BEA

A search in the BEA database found five other occurrences involving the flight controls of aeroplanes below 5.7 t, just after a maintenance operation:

■ Reversal of pitch trim effects⁽⁵⁾

The pilot was carrying out a checkout flight following a maintenance operation on the aeroplane in which the pitch trim control cables had been installed the wrong way round. After taking off, the pilot made a maximum nose-up deflection on the pitch trim which resulted in the trim moving in the opposite direction, to maximum nose down. The pilot reduced speed by reducing the engine power and managed to carry out a runway circuit at very low height before landing with the elevator control close to full back.

■ Absence of post-maintenance checks and pre-flight checks⁽⁶⁾

The pilot lost control of the aeroplane during the take-off run and collided with an obstacle. The aeroplane's manufacturer had carried out modifications to the flap control mechanism and incorrectly re-assembled the parts which led to the positioning of the two aileron rods being reversed. The absence of pilot checks for the direction of movement of the ailerons after these maintenance operations and during the pre-flight checks along with haste in carrying out the pre take-off checks may have contributed to this accident.

■ Take-off with elevator control cables reversed⁽⁷⁾

During a checkout flight following a maintenance operation, the pilot took off with the elevator control cables reversed. The aeroplane veered off the runway and then turned over onto its back.

■ Take-off with aileron control cables incorrectly assembled⁽⁸⁾

During a checkout flight following a maintenance operation, the pilot lost roll control during the take-off rotation. The left wing touched the runway and the aeroplane veered off it. The aileron control cables had been incorrectly assembled during the maintenance operation.

■ Blocking of pitch trim after take-off⁽⁹⁾

After taking off for a cargo flight, the pilot realised that the pitch trim was blocked in the nose-up position. He returned and landed at the departure airport. On inspecting the aeroplane following the incident, a bag of screws was found in the trim compartment. The workshop manager indicated that this bag of screws might have blocked the pitch trim control.

⁽⁵⁾ [Serious incident to the Cessna T500 registered F-GJDG operated by Air Normandie on 6 April 1999 at Le Havre](#)

⁽⁶⁾ [Accident to the Murphy Rebel registered F-WNOA on 9 March 2005 at Tarbes](#)

⁽⁷⁾ [Accident to the Luscombe 8 registered N2131B on 27 July 2007 at Dijon – Darois](#)

⁽⁸⁾ [Accident to the Cessna U206 registered F-HIDZ on 2 June 2020 at Gap-Tallard](#)

⁽⁹⁾ [Incident to the Cessna 404 registered F-GXAS operated by Airawak on 7 May 2021 at Fort-de-France](#)

⁽¹⁰⁾ [Safety Alert
No SA-041](#)

2.10.2 Safety alert issued by the American safety investigation authority (NTSB)

Following several accidents and deaths in the United States of America in connection with reversed or incorrectly rigged flight controls during maintenance operations, the NTSB issued a Safety Alert in March 2015 entitled: *"Pilots: Perform advanced preflight after maintenance"*⁽¹⁰⁾.

This alert bulletin specifies that four events of this type occurred over a two-year period sharing two types of issue:

- *"The maintenance personnel who serviced or checked the systems did not recognize that the control or trim surfaces were moving in the wrong direction.*
- *Pilots who flew the airplanes did not detect the control anomalies during their preflight checks."*

This bulletin also indicates that the FAA has produced a pamphlet to provide guidance to help pilots develop the knowledge and techniques required to reduce the risk of undetected maintenance problems. This guide recommends notably to:

- *"Conduct a complete review of maintenance-related records and data.*
- *Develop an "additional items check-list" to be used in conjunction with the aircraft's preflight check-list."*

3 - LESSONS LEARNED AND CONCLUSION

Scenario

The pilot was contacted to ferry the Piper PA23 registered N539EG that same day from Saint-François airport to its base at Pointe-à-Pitre after maintenance operations. The plane was to be used shortly after its arrival for a planned own-account flight for the company which operated it.

The mechanic summarized for the pilot, the maintenance operations that had been performed, carried out the start-up actions and engine tests with the pilot and then exited the aeroplane while the engines were running.

The pilot, concerned about ferrying the aeroplane to its base on time and swiftly vacating the aerodrome taxiway, quickly started the take-off without taking the time to check the pitch trim position indicator on the overhead panel, or get out the check-list from the flight manual which was placed on the passenger seat. The pitch trim was probably in a nose-down position on taking off.

After retracting the flaps, the pilot tried to use the electrical pitch trim control on the control column and then the manual control at the bottom of the instrument panel but was unable to find it. The pilot had not been informed before leaving that the electrical pitch trim control was inoperative.

Although the pilot was initially able to exceed the nose-down moment due to the position of the pitch trim during the take-off, the loads on the control column to maintain a positive pitch quickly increased due to the increase in speed. The pilot had to keep both hands on the control column to counter the loads and was thus unable to reduce the engine power.

With the increase in speed, the loads on the controls became greater and greater, the pilot was unable to prevent the aeroplane from descending and then colliding with the surface of the water at a speed of around 180 kt.

The break-up of the aeroplane's cockpit and the forward ejection of the pilot's seat on impacting the sea at high speed averted, by chance, more serious or even fatal injuries to the pilot.

Contributing factors

The following factors may have contributed to the take-off with an inappropriate pitch trim setting, and then the loss of control:

- The inadequate checks carried out by the pilot before take-off which did not include the trim position indicators on the overhead panel.
- Not using the flight manual check-list.
- The pilot's small amount of recent experience on this type of plane in which the pitch trim control is situated on the overhead panel.
- The pitch trim probably not being repositioned to neutral after the trim cables had been checked during a scheduled maintenance operation, resulting in the trim being in a "nose-down" position.
- The pilot not being informed that the electrical pitch trim control on the control column was inoperative.
- The time pressure felt by the pilot to vacate the sole taxiway of the airport and to return the plane, expected at Pointe-à-Pitre-Le Raizet, in time for the planned flight. This pressure may have been reinforced by the fact that the mechanic handed over the plane to him with the engines running and close to the holding point of the runway in use.

Safety lessons

The pitch trim setting is of major importance for take-off safety. Carrying out the check-lists recommended by the manufacturer using the paper copy enables the pilot, among other things, to detect an inappropriate configuration before take-off.

Particular attention must be paid to these checks when an aeroplane has just come out of maintenance because of, notably, the possibility of omissions, incorrectly positioned cables or even reversed flight controls.