

**Aviation Safety Investigation Report
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**Partenavia Costruzioni Aeronautiche
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1. FACTUAL INFORMATION

1.1 History of the flight

The aircraft was the second to take off in a stream of six on a night flight from the Tangalooma Resort strip to Coolangatta aerodrome. Shortly after takeoff it struck the ground, nosed over and was consumed by a fuel-fed fire.

The take-off run appeared normal but the initial climb was shallow according to the witnesses, some of whom were pilots waiting their turn to take off. At about 150 ft above ground level the aircraft entered a descent which continued until ground impact, 164 m beyond the departure end of the strip. The nose gear collapsed at impact but the aircraft remained upright and skidded along the ground on its main gear and front fuselage. It traversed a low sand dune, fell 10 ft to the beach and overturned. The aircraft came to rest 112 m beyond the first ground contact. All four passengers were able to evacuate the aircraft which had started to burn. The pilot was rescued by her passengers.

1.2 Weather and visibility

The weather was fine with some cumulus cloud over Moreton Bay to the west of the strip. It was a dark night with only stars visible. The wind was almost calm but slightly favoured a takeoff towards the north. The northern take-off path extended over north-eastern Moreton Bay. Except for a possible light from a fishing trawler or house at Cowan Cowan township, there was no surface illumination and no discernible horizon. A takeoff to the south on the other hand was available with a distinct horizon reference due to an illuminated Tangalooma Resort some 5 km south and the very bright lights of the Brisbane Port facilities at Fisherman Islands some 40 degrees to the right of runway heading.

1.3 Personnel information

1.3.1 Pilot in command

The pilot was a Grade 2 instructor, employed by the flying school where she learnt to fly. She had a current command multi-engine instrument rating and was endorsed to fly the aircraft type. The pilot was required to wear spectacles when flying and she did on this occasion.

On 14 September 1995 the pilot was checked on the route by the chief pilot. The route check included a night takeoff at Tangalooma strip. Her most recent flights in the aircraft were on 15 October and 2 November 1996. Both flights were return flights between Coolangatta and Tangalooma, with a night takeoff from the Tangalooma strip. The night takeoff on 2 November was conducted towards the south.

1.3.2 Previous 72-hours history

The weather on the two days before the accident precluded any flying duties. During this period the pilot worked at the flying school office and brought her book-keeping duties up to date. On the two nights prior to the accident she had retired to bed at 2030 hours and 2130 hours local time respectively. Prior to then she had been off duty for 9 days. On the day of the accident, the pilot commenced duties at 1400 hours, planning the afternoon flight to Tangalooma and the night return. Between her arrival at Tangalooma and the night takeoff, she rested and had dinner at the resort.

1.3.3 Information from the pilot

The pilot was hospitalised with serious leg injuries. She had also suffered a blow to the head. She was interviewed in hospital and said that she could not remember the takeoff and subsequent flight into terrain. The pilot said that the aircraft carried a printed checklist on a single sheet of paper which her employer required company pilots to use in normal aircraft operations. However, for reasons not established, the pilot did not use the checklist after landing at the island strip or during the subsequent night departure.

1.4 Passenger action

The four passengers were foreign nationals and were seated in rows 2 and 3. They were not injured in the crash and were able to crawl out through the open cabin doorway. A fuel-fed fire had started almost immediately and the aircraft was well alight by the time they cleared the aircraft. They soon realised that the pilot was still in the cockpit. Some of the passengers crawled back inside and pulled the semi-conscious pilot clear of the aircraft. Other people arrived on the scene soon afterwards and moved the passengers and pilot further away from the burning aircraft.

1.5 Wreckage examination

The aircraft had come to rest upside down on a beach. The front of the cockpit was crushed during the nose-over. The cabin was completely destroyed by a post-impact fire which also damaged the right engine.

Examination of the wreckage found that the flaps were retracted and that the elevator trim was set about halfway between the takeoff setting and the fully forward position. Both engines were removed for specialist bulk strip examination. This examination did not discover any defect which could have prevented the engines from developing rated power. This evidence supports witness information that the engines' note did not change during the entire flight sequence. Due to the high wing configuration, neither propeller contacted the ground until the aircraft nosed over. Examination showed significant torque twisting and bending to both propellers indicating that the engines were still developing significant power when the aircraft nosed over.

1.6 Aircraft flight characteristics and flight test

1.6.1 Flap retraction

Discussions with pilots experienced on the aircraft type indicated that during initial climb, the take-off flap must be retracted in stages, trimming the elevator at the same time. Their opinion was that if the flap was retracted in one movement instead of stages, the nose-down trim change would be significant. This would result in a lower nose attitude unless the pilot held back pressure on the control column.

1.6.2 Flight test

At the Bureau's request a flight in a Partenavia was undertaken by a Grade 1 instructor with the view to establishing elevator control forces under specific conditions. The aircraft was flown on a final approach with full flap selected. The elevator was trimmed so that there was no residual force on the elevator control. This resulted in a trim indication halfway between neutral and a fully nose-down position. A takeoff was conducted with the elevator trim and flap in the previous position. The pilot reported that a medium-to-heavy rearward elevator force was required to rotate the aircraft and establish a positive rate of climb. At a safe height the flaps were retracted. This procedure was accomplished twice with the following result:

1. If the indicated airspeed and rate of climb were maintained the elevator force increased to the point of being very heavy.
2. If the elevator force was not increased, the aircraft settled into a 400 ft per minute rate of descent.

The pilot conducting this test commented that unless a pilot was prepared, the high elevator force required to maintain a positive rate of climb was excessive and well outside the normal experience range of an average pilot.

1.7 Dark night take-off research

Bureau research has shown that dark night takeoffs can present a number of special problems for pilots, particularly when departing from aerodromes in areas with little or no ground lighting. Specifically, the somatogravic illusion has been suggested as being a contributing factor in the majority of these accidents. A somatogravic or false climb illusion occurs when a pilot who is deprived of outside visual cues attempts to maintain a desired pitch attitude without reference to instruments whilst the aircraft is accelerating. Under such conditions, pilots can experience a sensation of excessive pitch-up. The sensation is thought to exist primarily at takeoff, go-around and during visual flight into cloud. At take-off, pilots who attempt to correct for this sensation by relaxing the backward pressure on the elevator control, may fly the aircraft into the ground.

2. ANALYSIS

2.1 The checklist

The pilot said that she did not use the checklist following the daylight landing at the Tangalooma strip, nor did she use it prior to the night takeoff. The pilot could not give an explanation for this omission. A checklist written on loose paper can be difficult to handle during busy periods of operation such as circuit work or in low-light conditions, specifically at night. This could explain the lack of use in this case. If a checklist is not used, the pilot must commit all checks to memory.

2.2 Elevator trim

The elevator trim was found in a position consistent with the trimmed position for a full-flap landing. It is highly likely that the pilot missed the trim item off her memorised checklist both following the daylight landing and during pre-takeoff checks at night.

2.3 Evidence from the test flight

The test flight pilot reported that the elevator force induced by an incorrectly set elevator trim would overpower a pilot who was not prepared for this predicament. The shallow takeoff witnessed by others was probably the result of the pilot encountering such an unexpected down-elevator force. The pilot probably retracted the take-off flap in one movement rather than in a staged retraction since she would have needed both hands on the control column. Such an action could only have exacerbated the downward force on the elevator.

2.4 Dark night takeoff

In addition, the pilot was faced with a dark night takeoff. Unless the pilot's attention was focussed almost solely on the correct climb attitude, it was likely that the nose attitude would be lowered inadvertently. Because of the unexpected elevator force, she was probably distracted from her proper instrument scan. Under these circumstances, an illusion of a false climb would have resulted in her not maintaining the high load needed on the control column. This would have resulted in the aircraft descending back onto the ground. That this came as a totally unexpected event is borne out by the lack of any action in correcting the aircraft attitude, reducing descent, or reducing power.

The collective decision by the pilots to conduct take-off operations towards the north was unwise, considering that a useful visual horizon was available for takeoffs towards the south.

3. CONCLUSIONS

3.1 Findings

1. The pilot was fully qualified to undertake the flight.
2. The night was dark and the area beyond the departure end of the runway was devoid of any useful lighting.
3. A southerly takeoff direction was available, with a visible horizon.
4. The pilot did not make use of the written checklist carried in the aircraft.
5. The elevator trim was set halfway between neutral and fully forward.
6. The flaps were fully retracted at impact.
7. The aircraft impacted wings-level and in a shallow descent.

8. Full power was maintained throughout the takeoff and accident sequence.

3.2 Significant factors

1. The takeoff direction was dark and had no visible horizon
2. The elevator trim was not set for takeoff.
3. The elevator load on takeoff was high.
4. The pilot did not monitor the aircraft attitude after lift-off.
5. The flap was retracted in one movement, increasing the elevator load.
6. The pilot may have been affected by somatogravic illusion to the extent that she thought the climb attitude was adequate.