

**Aviation Safety Investigation Report  
199200757**

**SOCATA - Groupe Aerospatiale  
Trinidad**

**23 July 1992**

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**Occurrence Number:** 199200757                      **Occurrence Type:** Accident  
**Location:** Ceduna  
**State:** SA    **Inv Category:** 3  
**Date:** Thursday 23 July 1992  
**Time:** 1915 hours                              **Time Zone** CST  
**Highest Injury Level:** Fatal  
**Injuries:**

	Fatal	Serious	Minor	None	Total
Crew	2	0	0	0	2
Ground	0	0	0	0	0
Passenger	0	0	0	0	0
<b>Total</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>

**Aircraft Manufacturer:** SOCATA - Groupe Aerospatiale  
**Aircraft Model:** TB-20  
**Aircraft Registration:** VH-LQB                      **Serial Number:** 1072  
**Type of Operation:** Instructional Other Training  
**Damage to Aircraft:** Destroyed  
**Departure Point:** Ceduna SA  
**Departure Time:**  
**Destination:** Parafield SA

**Crew Details:**

		<b>Hours on</b>	
<b>Role</b>	<b>Class of Licence</b>	<b>Type</b>	<b>Hours Total</b>
Pilot-In-Command	Private	61.0	189
Other Pilot	Private	65.0	192

**Approved for Release:** Wednesday, August 7, 1996

## FACTUAL INFORMATION

### History of the Flight

At 0700 CST on 23 July 1992, two foreign national pilots, who were undergoing airline transport pilot licence training acquired the keys and documentation for TB20 aircraft VH-LQB in preparation for a daytime instrument flight rules (IFR) navigational exercise.

The aircraft departed at about 0930. After carrying out practice instrument approaches at several aerodromes along the route, they arrived over Ceduna at 1330 where an NDB approach was made before landing. While positioning the aircraft for refuelling a scraping sound was heard from the front of the engine. After the aircraft was refuelled and the engine restarted, the same noise was heard. An examination revealed that the starter motor was remaining engaged. The pilots contacted the operator and requested assistance. The operator despatched a maintenance engineer who replaced the starter motor.

The aircraft commenced taxiing at 1854. The pilot established radio contact with Adelaide Flight Service Unit (FSU) advising that he was taxiing for Parafield, IFR, and would be using runway 11.

A Cessna Conquest, VH-ANJ, commenced taxiing at 1859, with its pilot being unable to see VH-LQB take-off. He reported taxiing to Adelaide FSU and advised that his departure would be from runway 29. Approaching the threshold of runway 11 he noticed the navigation lights of VH-LQB as the aircraft climbed, and estimated the aircraft to have been at 100 to 200 ft above ground level. He then commenced to back track along the runway for a departure to the west.

Witnesses, located to the north of the Flinders Highway, noticed the lights of an aircraft departing from Ceduna Airport, tracking in an easterly direction. Although several kilometres away from the aircrafts track, they believed it was lower than normal, having watched many aircraft depart, including three or four that day. The aircraft lights then descended towards the ground and an orange flame appeared, followed by the sound of an explosion.

VH-ANJ informed Adelaide FSU that they had observed VH-LQB depart, and then saw a fireball appear in that direction. Adelaide FSU were unable to contact VH-LQB. VH-ANJ was requested to locate the fire when airborne and direct emergency services to it. The fire was located approximately 5 km from the airport, 3 km to the right of runway 11 centre line. It was subsequently identified as the wreckage of VH-LQB.

### Injuries to persons

Both pilots of VH-LQB were fatally injured.

### Damage to aircraft

The aircraft was destroyed by impact forces and post-impact fire.

#### Other damage

There was no other damage.

#### Personnel information

The pilot-in-command held a current Private Pilot Licence with a Class 1 medical certificate, and a Command Instrument Rating for single-engine aeroplanes. He was qualified to fly the TB20 aircraft and had accumulated 61 hours on the aircraft type. His total flying experience was 189 hours, which included 26 hours of instrument flight time, 26 hours of simulated instrument flight time, and 11 hours of night flying experience. He last flew at night on 17 June 1992.

The other pilot held a current Private Pilot Licence with a Class 1 medical certificate, and a Command Instrument Rating for single-engine aircraft. He was qualified to fly the TB 20 aircraft and had accumulated 65 hours on the aircraft type. His total flying experience was 192 hours which included 38 hours of instrument flight time, and 15 hours of night flying experience. He last flew at night on 14 July 1992.

#### Aircraft weight and balance

The weight and centre of gravity were within limits at the time of the accident.

#### Meteorological information

The Ceduna weather was fine with 1 octa of strato-cumulus cloud at 3500 ft. The wind was from 170 to 180 degrees at less than 5 kts. It was reported to be a very dark night with no discernible horizon. Moon rise was not until approximately 0100.

#### Wreckage and impact information

Ground impact marks indicated that the aircraft had been on a heading of 150 degrees in a shallow dive, with a bank angle of 15 degrees to the right, at an estimated speed of approximately 140 kt when it impacted the ground in an area of open pasture. The right wing separated from the fuselage. The aircraft continued in the southerly direction, breaking up as it went, with the cabin consumed by fire. Propeller contact with the ground caused a torsional failure of the crankshaft at the propeller attachment flange. The propeller travelled in a direction of 210 degrees for 65 m, leaving a trail of slash marks in the ground as it continued to rotate. The engine, left wing and other components separated during the impact sequence. The engine bounced away on a curved track to the right for a distance of 110 m in a direction of 240 degrees from the main wreckage trail. The remains of the fuselage, consisting of the fire gutted cabin and tailplane, came to rest 166 m from the initial point of impact.

Fire damage was confined to the cabin area, which was totally consumed, except for the two instrument panels and co-pilot's seat, which were thrown clear.

No evidence was found to suggest a pre-existing defect in the aircraft structure or control systems prior to the accident. The propeller damage, condition of the engine and its components, and specialist analysis of exhaust pipe temperatures at impact, indicated that the engine was delivering power at impact. The temperature of the exhaust pipes was determined to be approximately 500 to 600 degrees Celsius at the time of impact. The vacuum pump frangible coupling, made from a ductile polymeric material, had failed under torsional load. Laboratory examination determined that there was no rotational damage to the failed coupling faces which indicated that the engine ceased operating immediately following the coupling failure.

#### Medical and pathological information

There was no evidence that either pilot had any medical or psychological condition which might have contributed to the accident.

#### Fire

A fierce fire, fuelled by aviation gasoline from the ruptured fuel tanks, engulfed the aircraft's cabin, reducing to ash the area between the engine firewall and the tailplane. The remainder of the wreckage suffered little or no fire damage.

#### Tests and research

##### Flight profile

A similar aircraft was used to attempt to replicate the accident flight profile from various altitudes. Six flights were conducted. The first flight followed the Ceduna to Adelaide track on climb to a point abeam the accident site. Normal climb power settings and speeds were used. The next four flights used a 10 to 15 degree angle of bank to the right, with the aircraft being held in a dive so as to arrive at the accident site without changing the climb power or trim settings during the descent. The final flight was conducted with power off and the controls left unattended from the top of climb.

The investigation was not able to establish the actual flight profile of the aircraft. However, from the flights it was considered possible that the aircraft may have descended from approximately 500 ft at an indicated airspeed of 140 kts.

The effects of somatogravic illusion were considered. Acceleration after takeoff, into a dark horizonless sky accentuates the illusion giving the impression of a steep nose-up attitude. This illusion may cause a pilot to assume that the aircraft attitude is too nose high, and to respond by lowering the aircraft nose. However, studies have shown that this illusion is only likely to have an effect during the takeoff rotation and initial climb phase of flight.

### Attitude indicator

Tests were later conducted with a similar type of aircraft to establish the time for the attitude indicator to topple following a vacuum source failure.

This was simulated by ground running the engine at 2000 RPM for 5 minutes to ensure the gyro was fully erect, then shutting it down. This test, with a vacuum indication of 4.8 inches of mercury was conducted several times resulting in an indication of a bank to the left.

### Gyro instruments

Detailed inspection of the gyro instruments failed to reveal any defects which may have prevented their normal operation.

### Additional information

Following replacement of the starter motor the battery was found to be flat requiring the use of an external power source for starting. It was after last light by the time the repairs had been completed, and the pilot who had flown the aircraft to Ceduna carried out the engine run following the starter motor replacement. He then remained in the left pilot seat during the preparations for departure, as it was considered easier to leave the engine running than jump start it again, so by default he became the pilot-in-command for the return flight.

While talking to the pilots prior to departure the instructor who accompanied the engineer to Ceduna did not consider giving them a night operations briefing, but was satisfied that they were capable of conducting the flight.

### Flight and duty times

On the day of the accident the pilots had planned to complete the exercise during daylight hours. They had commenced duty at 0700, prepared and submitted their flight plan, checked the aircraft, then departed at approximately 0930. One pilot being in command for the Adelaide to Ceduna sector, the other for the return sector to Adelaide. The flight to Ceduna took approximately 4 hours.

### Training

Prior to commencement of night flying training, this operator ensured that all student pilots received classroom instruction in night flying techniques. In the syllabus of training the operator also covered the subjects of somatogravic and other illusions which can effect pilots under limited visual conditions.

The initial night flying training was carried out at Parafield, and students were subsequently taken to country airports, away from the lights of built-up areas, so they could experience dark night operations.

## ANALYSIS

Following an apparent normal take-off the aircraft then descended back into the ground in what appeared to be controlled flight.

It is unlikely that the aircraft was lower than 500 ft above ground level when it commenced the descent. At this height the effects of acceleration and therefore somatogravic illusion would not be experienced by the pilot.

After becoming airborne the pilot may have become involved in recording the departure time, making a departure call on the CTAF, and changing to the Adelaide FSU frequency to advise them of the departure and next estimate, while failing to give sufficient attention to flying the aircraft.

At departure the pilots had been on duty for 12 hours, and it is possible that fatigue may have contributed to the accident.

The reason for the accident could not be established.