

**Aviation Safety Investigation Report
199600939**

**Mooney Aircraft Corp
Mooney**

25 March 1996

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Occurrence Number: 199600939 **Occurrence Type:** Accident
Location: St George
State: QLD **Inv Category:** 3
Date: Monday 25 March 1996
Time: 1348 hours **Time Zone** EST
Highest Injury Level: Fatal
Injuries:

	Fatal	Serious	Minor	None	Total
Crew	1	0	0	0	1
Ground	0	0	0	0	0
Passenger	2	0	0	0	2
Total	3	0	0	0	3

Aircraft Manufacturer: Mooney Aircraft Corp
Aircraft Model: M20J
Aircraft Registration: VH-UYZ **Serial Number:** 24-0952
Type of Operation: Non-commercial Pleasure/Travel
Damage to Aircraft: Destroyed
Departure Point: Toowoomba QLD
Departure Time: 1225 EST
Destination: St George QLD

Crew Details:

Role	Class of Licence	Hours on	
		Type	Hours Total
Pilot-In-Command	Private	21.1	178

Approved for Release: Wednesday, April 9, 1997

FACTUAL INFORMATION

History of the flight

The aircraft had been hired by the pilot to travel to St George with his brother and an employee.

A flight plan submitted by the pilot showed that the flight was to be conducted at 8,500 ft and that the flight time was 66 minutes. The flight departed Toowoomba at 1225 EST and the pilot reported his departure at 1237 on Brisbane Flight Service frequency 121.2 MHz. There were no other known transmissions from the aircraft on this frequency. Witnesses reported seeing the aircraft approaching the aerodrome from the south-east at about 1330. The aircraft overflew the aerodrome at about 1,000 ft and made a left circuit.

A witness saw the aircraft at about 100 ft above ground level, making what appeared to be a normal approach to runway 11. This witness worked near the aerodrome and frequently observed aircraft landing. He saw nothing abnormal or unusual about the aircraft or its approach. Witnesses located near the other end of the aerodrome said they heard the aircraft land, but their view was obscured by trees. They thought it sounded like the aircraft may have touched down about halfway along the runway. The aircraft was then seen and heard climbing away from the runway at the eastern end of the aerodrome. The aircraft was then observed making a very steeply (estimated to be about 60 degrees) banked turn to the left. During this time, witnesses reported that the engine was running roughly and as the aircraft passed overhead, the witnesses could see that the landing gear was still down. The aircraft was low enough for printing approximately 10 cm high on the side of the aircraft to be readable.

The aircraft proceeded at low altitude in a westerly direction towards the township, and when over the builtup area, again made a very steep left turn, passing over the state primary school. Teachers in the school grounds saw the aircraft pass overhead in a south-westerly direction, and said it appeared to be travelling very low and fast before they lost sight of it behind trees. One witness recalled seeing the aircraft in a left wing down steep descent before her vision was obscured by trees. The elapsed time between the first sighting of the aircraft and the sound of impact was estimated to be about 4 seconds.

The aircraft impacted the ground on a north-westerly heading, 3 m from the side of an occupied house at Munro Street, which is located 800 m north-west of the runway threshold. An off-duty police officer residing across the street called emergency services when he heard the sound of the impact. The impact was not survivable.

Damage to aircraft

The aircraft impacted the ground at an indicated airspeed of 101 kts, as evidenced by a witness mark from the airspeed indicator pointer on the face of the instrument. The impact direction was vertical, with the aircraft attitude approximately 50 degrees nose-down and wings approximately level. The cabin was totally destroyed by impact, the engine was partially buried in the ground and the wings were destroyed. The tailplane, rear fuselage and fin were not significantly damaged. There was no fire.

Wreckage examination

Initial wreckage examination was carried out on site and the aircraft was then removed to a secure area for detailed examination. There was no evidence of any part of the aircraft having separated before impact. The gear was down and the flap actuator had extended approximately 4 degrees of flap. Some systems, including the stall warning system, could not be evaluated due to the extent of destruction to the cockpit area.

Engine

The propeller showed signs of radial abrasion on the face of the blades, indicating rotation at impact. Exhaust pipe examination indicated that it was at operating temperature and that the engine was running at impact. The engine was removed and stripped at a workshop facility. There were no defects found which might have prevented normal operation of the engine. The fuel control unit was examined by qualified personnel at an authorised fuel injection servo overhaul facility. The position of the mixture control at impact could not be determined. A bent throttle shaft with witness marks indicated that the throttle valve was almost closed at impact. Disassembly and flow testing of the fuel injection servo revealed no abnormalities. Engine control positions at impact could not be ascertained due to complete destruction of the cockpit area and movement during the impact sequence.

Fuel tanks

The aircraft was refuelled to full tanks (252 L) before departure from Toowoomba. There was adequate fuel to complete the flight without changing tanks. The fuel selector valve was selected to the left tank. Both integral wing tanks were ruptured. Witnesses arriving at the scene immediately following impact reported fuel leaking from the wing. The fuel had dissipated by the time investigators arrived, with insufficient remaining to allow a sample.

Flight controls

All control surfaces were accounted for and found to be correctly and securely attached. The control surfaces were mainly undamaged except for the right flap which was severed by tree impact. The examination established a continuity of control runs from the controls to the destroyed cabin area.

Magneto/starter switch

The magneto starter switch was found intact with the key still inserted. The switch was selected to the right magneto. The switch position may have been moved during the impact sequence.

Tachometer

The tachometer glass was broken and the casing damaged. On disassembly no pre-existing damage to the internal components was found. The tachometer needle movement was limited to between 2,600 RPM and 3,200 RPM due to impact deformation of the instrument face.

Airspeed indicator

The needle and dial of the airspeed indicator were intact and suffered little deformation. No pre-existing damage to the internal components was found. The airspeed indicator showed evidence of needle impact on the face of the instrument at 101 kts.

Vertical speed indicator

The outer case of the vertical speed indicator was shattered and the glass broken. No pre-existing damage to internal components was found. The needle indicated a descent of 1,700 ft/min (28.3 ft/sec). The needle was found trapped by debris, in this position. The reading is not considered to be representative of the actual rate of descent immediately before impact.

Crashworthiness

The extent and nature of the damage to the cabin area of the aircraft was such that the accident was not survivable. No abnormalities were found in the restraint harnesses.

Emergency locator transmitter (ELT)

The aircraft was equipped with an ELT that complied with TSO C91a. The ELT was found to be in the ARM position, but the antenna had broken from the aircraft. A serviceability test was conducted and the unit was found to be operating normally.

Pilot in command

The pilot in command was correctly licensed and endorsed to carry out the flight. His medical status was valid for private licence standard, with a restriction requiring vision correction. It is not known if the pilot was wearing glasses at the time of the accident. The pilot had 21.1 hours experience on type, of which 10 hours was dual instruction and, although he had 177 hours total flying, he was relatively inexperienced on constant speed / retractable gear aircraft. He was not known to be suffering from any ailments and appeared to be in good health on the day of the accident.

Meteorological information

The assessment of weather conditions at St George at the time of the accident was fine, an east-north-easterly wind of about 5 kts, scattered cumulus with a base of 4,000 ft, a temperature of 27 degrees C, and a dew point of 11 degrees C. The synoptic situation was a high pressure system in the South Tasman Sea, with a ridge along the Queensland and northern NSW coast. These combined to produce a light to moderate NE flow over the St George area. The weather assessment indicated that there would have been weak to moderate thermals to about 10,000 ft, producing light turbulence with occasional moderate patches.

Communications

At 1237 EST the pilot broadcast to Brisbane Flight Service that he had left Toowoomba at 1225 for St George, was abeam Moonie, and requested area QNH. The area QNH was passed to the pilot and no further transmissions were heard from the aircraft.

ANALYSIS

Witness observations

The flight to St George appears to have proceeded normally and the aircraft made a standard circuit entry for runway 11. The approach to runway 11 also appeared to be normal. Although the landing was not observed, witnesses heard the aircraft touch down about half-way along the runway. This probably resulted in the pilot's decision to go around. The next observations were of the aircraft performing a steep turn at a low height near the eastern end of the runway and the sound of the engine running roughly. The aircraft then flew over witnesses at a low height and the wheels could be seen still extended. The aircraft proceeded towards the township at a low height. Witnesses at the school saw the aircraft heading in a south-westerly direction and, seconds later, heard the sound of impact. The aircraft heading had changed through approximately 270 degrees during this interval, indicating that control may have been lost at about the time the aircraft was passing over the school ground. The witness observations lead to the conclusion that the aircraft stalled at a low height while the pilot was attempting to position the aircraft for a landing on runway 11. One witness, an experienced pilot and engine mechanic, confirmed that the engine sounded rough and erratic.

The possible causes were investigated, and, without discovery of any evidence of mechanical failure or malfunction, the only other possibility was that the mixture control was not in the full rich position when the pilot applied full power to go around. The actual position of the mixture control at impact could not be determined.

Aircraft landing characteristics

Aerodynamically, the Mooney is a relatively "clean" aircraft, and experienced pilots say that it has a tendency to float in "ground effect" if held off during the landing flare or if speed is excessive. However, the aircraft is not considered to be difficult to land. The reason why the aircraft landed so far along the runway on the first attempt is not known, but could be due to these characteristics.

Aircraft stalling characteristics

An aircraft is said to be stalled when the smooth airflow over the wing becomes turbulent and the lifting capability is reduced or lost completely on one or both wings. The condition is dependent on the relative angle of the wing to the airflow. Different aircraft types exhibit different stalling characteristics. The Mooney is similar to many light aircraft types and generally has what is known as a mild stalling behaviour. The pilot's operating handbook does not elaborate on stalling characteristics. In the section "Operating Limitations" the handbook states, "Operations shall be limited to normal flying manoeuvres, but may include straight and steady stalls, and turns in which the angle of bank does not exceed 60 degrees". The stalling characteristics described by experienced pilots indicate that the aircraft can be subject to sudden control loss if the controls are mishandled at low airspeed and high angle of attack (angle of relative airflow).

SIGNIFICANT FACTORS

1. The pilot probably misjudged his landing and subsequently executed a go-around.
2. During the go-around the engine was reported to be running roughly.
3. The pilot performed an unusually low circuit close to the runway, requiring a steep turn onto final approach, which may have led to the aircraft stalling.
4. The aircraft stalled at a height from which recovery was not possible.