

Aviation safety investigations & reports

Aero Commander 500-S, VH-YJT

Investigation number:

199804432

Status: Completed



History of the flight

A Shrike Commander departed Horn Island on a charter flight to Saibai and Boigu Islands in accordance with the visual flight rules (VFR). The flight to Saibai took 32 minutes, and a further 13 minutes to Boigu Island. The aircraft then departed Boigu to return to Horn Island with an expected flight time of 35 minutes.

The pilot reported that he had maintained 5,500 ft until commencing descent at 35 NM from Horn Island. He tracked to join final approach to runway 14 by 5 NM, reducing power at 1,500 ft. At 5 NM from the runway, the pilot extended the landing gear and approach flap and commenced a long final approach.

When the aircraft was approximately 3 NM from the runway both engines commenced to surge, with the aircraft initially yawing to the right. The pilot commenced engine failure procedures and retracted the flaps. He tried a number of times to determine which engine was losing power by retarding the throttle for each engine, before deciding that the right engine was failing. The pilot shut down that engine and feathered the propeller. A short time later, when the aircraft was approximately 200 ft above the water, the left engine also lost power. The pilot established the aircraft in a glide, advised the passengers to prepare for a ditching, and transmitted a MAYDAY report on the flight service frequency before the aircraft contacted the sea. The aircraft quickly filled with water and settled on the seabed. All five occupants were able to escape and make their way ashore.

Wreckage and impact information

The aircraft ditched approximately 400 m short of the threshold of runway 14, and settled in 2.5 m of water. It was subsequently recovered for examination. Although the aircraft had been damaged during the ditching, it remained essentially intact. The fuselage was distorted in front of and behind the cabin area as a result of impact forces. The underside of the fuselage had also been pushed upwards, and both windscreens were broken. The fuel tanks were intact, and the fuel tank vents were not obstructed.

Personnel information

The pilot in command had gained a commercial pilot licence in 1994, and worked as a flight instructor until April 1998. He had been based at Horn Island since April and was subsequently appointed as the company chief pilot on 11 September 1998. Two days prior to his appointment he had been endorsed on the Aero Commander. At the time of the occurrence, the pilot had accumulated a total flying experience of 2,045 hours, including 566 hours on multi-engine aircraft, and 79 hours on Shrike Commander aircraft.

Aircraft information

The aircraft had undergone scheduled maintenance in Cairns on 28 August 1998, and had since flown 100.8 hours. The next scheduled maintenance was due in 19.2 hours. The horizontal situation indicator was unserviceable and had been placarded as such, with the defect being recorded in the maintenance release; however, that did not preclude the conduct of VFR flight.

No defects that could have contributed to the accident were found in the airframe or flight control systems. An examination of the engines and their associated systems did not reveal any defects that could have led to the loss of power. The right engine fuel control unit was found to be serviceable but worn. Bench tests indicated that it provided a fuel flow 10% greater than normal (approximately 6 L/h).

The right propeller had been feathered before the ditching; however, the propeller blades had not moved to the fully feathered position. Examination of the propeller dome revealed that oil sludge had prevented the propeller piston from driving the blades to the fully feathered position.

It was determined that the aircraft had been operated within its normal weight-and-balance range throughout the accident flight

The fuel system of the Shrike Commander consisted of five interconnected tanks, with one fuel quantity indicator receiving an electrical signal from a float-type sensor mounted in the fuselage tank. The flight manual specified that a fuel quantity indicator was a mandatory instrument for operation of the aircraft.

A single fuel filler point was situated on the upper surface of the right wing, inboard of the engine, and connected to the right forward wing tank. It was not possible to assess the fuel quantity by "dipping" the fuel tank through the fuel filler point. After the aircraft had been recovered from the sea the fuel system was drained and found to contain approximately 0.75 L of aviation fuel and approximately 100 L of seawater. The fuel quantity indication system was examined. A wire that connected to the wiper arm in the fuel transmitter unit was found to be broken under its insulation, causing an intermittent open circuit, which resulted in a fluctuating fuel quantity indication. When the wire was repaired the fuel indication system operated normally. The wire to the wiper arm in the fuel quantity transmitter had been repaired on 7 August 1998 by resoldering the wire onto the wiper arm. The maintenance manual for the Shrike Commander provided instructions for removal and replacement of the transmitter unit; however, there were no instructions for disassembly and repair of any components within the unit. No other defect was found in the fuel quantity indication system.

A piece of adhesive paper was found covering the fuel quantity indicator. The pilot reported that he had covered the indicator before the flight because he noticed that its indications had been intermittent on a flight the previous day, and believed that the fluctuating indications might have alarmed the passengers.

Fuel planning and consumption

Company operations in the Torres Strait involved transporting passengers and freight on flights between the islands. Pilots would frequently undertake two or three flights each day, with up to five sectors per flight. The Shrike Commander was normally flown with less than full fuel tanks in order to permit greater payloads.

An examination of the aircraft fuel records since the fuel tanks were last filled on 13 October 1998 revealed that the average fuel consumption rate was 143 L/h, with an average sector time of 22 minutes. The company operations manual specified the procedure to be used for fuel planning. That procedure stipulated that the fuel consumption rate for the Aero Commander was to be calculated at a rate of 110 L/h, with an additional allowance of 20 L for each takeoff. The fuel log found in the aircraft revealed that, in practice, pilots had used a consumption rate of 120 L/h without any additional allowance for takeoff's.

A fuel log was maintained for each flight; however, during the investigation significant inconsistencies in the recording of fuel quantities were repeatedly found between consecutive fuel log records. The fuel log indicated that before the aircraft was partially refuelled prior to the accident flight, the fuel tanks appeared to have 170 L of fuel remaining. Investigation revealed that the actual quantity was substantially less.

Survival aspects

During the impact sequence, the passenger in the rear left seat was thrown over the centre seats into the front right seat, which was unoccupied at the time. The passenger in the centre right seat received a back injury. Both windscreens were shattered by the impact. The pilot pushed out the remaining pieces of perspex on the left windshield with his hands, cutting his finger in the process, and the passenger who had been thrown into the front right seat was able to kick out the remaining perspex pieces of the right windshield. The pilot and the three passengers in the front of the cabin exited the aircraft through the open windshields. The passenger in the rear right seat escaped through the emergency exit window. The cabin rapidly filled with water. All the occupants then swam ashore, assisting the injured passenger.

All the aircraft seating and seat-belt assemblies were found to be securely attached to the airframe. Surface corrosion was present on seat-belt end fittings, which was consistent with salt-water immersion, and all except one operated normally. The left rear passenger lap-belt end fittings were stiff to operate, and difficult to close properly. The end fittings could be easily placed together incorrectly, allowing improper locking of the assembly.

The aircraft was not equipped with life jackets, nor was that a requirement for the intended operation.

Organisational and management information

The company had expanded rapidly over a short period. At the time of the accident, it was operating 13 aircraft of various types. The company structure consisted of a managing director who was based in Melbourne, an operations manager who controlled sales and the allocation of tasks to aircraft, a chief pilot who managed the aircrew and assigned their duties, and a total of seven pilots. The chief pilot had worked for the company for six weeks, and was his first appointment as a chief pilot. During the course of the investigation, it became apparent that he had had minimal experience or guidance in the management of operational personnel. There was evidence that the new chief pilot had experienced difficulty in establishing practices that ensured compliance with safety requirements.

The pilot had been approved as a chief pilot in accordance with the procedures contained in the Civil Aviation Safety Authority (CASA) Air Operator Certification Manual. The guidelines in appendix 16 stated that it was preferable to have a chief pilot who could "manage the system" rather than one with the best manipulative skill. A candidate for the position of chief pilot was required to demonstrate to a CASA Flying Operations Inspector (FOI) an ability to operate within the regulatory framework. The checklist for the approval process contained a list of regulatory knowledge required of a chief pilot, however, no guidance was provided to an FOI in assessing the overall capability of an applicant to manage the objectives of the operator, within the boundaries imposed by aviation safety legislation.

No formal system of responsibility for maintenance control existed within the organisation. Unscheduled maintenance was recorded on a whiteboard in the operations room, but responsibility to ensure that the whiteboard was kept up to date was not a delegated duty of any of the company personnel.

Pilots verbally reported defects to the chief pilot, who would then approach the relevant maintenance organisation to arrange for rectification. The company used four different suppliers of third-party maintenance, depending on the aircraft. The remoteness of the location meant delays would frequently occur while spare parts were sourced.

Evidence indicated that the engines had stopped because of fuel exhaustion.

In order to maximise payloads the aircraft was normally operated with the minimum fuel sufficient for safe flight. Consequently, the fuel tanks would have rarely been filled to capacity. As filling the fuel tanks to capacity provided one of the only opportunities to accurately determine a datum for the assessment of fuel quantity, any subsequent inaccuracies in the system of assessing fuel quantity would have compounded over extended periods. As most of the pilot's previous flying experience had not involved working in situations where it was necessary to carefully balance the requirements of payload against fuel, it is possible that he did not recognise the critical need to carefully monitor such aspects of the operation.

There were two systems available to a pilot to monitor fuel quantity - a fuel quantity indicator and a fuel log. The fuel quantities as determined by each system should have been in agreement. During the accident flight, however, the pilot had covered the fuel gauge due to intermittent and unreliable fuel indications, which made one system unusable. In addition, the fuel-log system was not being applied with rigour and did not provide an accurate indication of the actual fuel quantity. This had masked any opportunity to reveal differences in estimated and actual consumption rates, when compared with the fuel gauge. As a result, at the time of the occurrence the aircraft had substantially less fuel on board than the pilot believed to be the case.

CASA had recently assessed the pilot as competent to act as chief pilot. Although he met all the regulatory requirements to fulfil that role, he had little experience in managing flight operations to ensure regulatory compliance. The process of approval for the position of chief pilot did not appear to adequately assess his capabilities to control and maintain a consistent, safe system of flight operations. The process adequately addressed the candidate's knowledge of the regulatory requirements, but was insufficient to adequately assess managerial ability. Although the organisation was approved to conduct fare-paying passenger flights, the management structure and expertise of the chief pilot did not provide for effective oversight of the operational aspects of those activities. The rear left seat passenger was thrown forward into the front right seat by impact forces because the seat-belt restraint was probably not secure at the time of impact, due to the unusual amount of force required to secure it correctly. This may have given the impression that the harness was locked when in fact it was not securely fastened.

FINDINGS

1. The pilot was correctly licensed and qualified to operate the flight as a VFR charter operation.
 2. The aircraft was dispatched with an unusable fuel quantity indicator.
 3. The right engine fuel control unit was worn and allowed additional fuel through the system, increasing fuel consumption by approximately 6 L/hr.
 4. Inappropriate fuel consumption rates were used for flight planning.
 5. The aircraft fuel log contained inaccuracies that resulted in a substantial underestimation of the total fuel used.
 6. At the time of the occurrence, there was no useable fuel in the aircraft fuel system.
 7. Although the pilot met the Civil Aviation Safety Authority criteria to fulfil his role as chief pilot, he did not have the expertise to effectively ensure the safety of company flight operations.
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1. The pilot had little experience flying in operationally limiting situations and did not appear to recognise the critical need to carefully monitor fuel quantity during those situations.
 2. There was no reliable system available to the pilot to assess the fuel quantity in the aircraft during the accident flight.

As a result of the investigation into the circumstances leading to the accident of a Cessna 185E floatplane at Calabash Bay, NSW (Occurrence 199802830), the Bureau issued Recommendation R19980277 on 6 January 1999. During the course of that investigation a number of organisational and management deficiencies were identified concerning the conduct of charter flight operations. One of those deficiencies concerned the adequacy of assessing chief pilot applicants in their ability to manage the conduct of safe flight operations. A similar safety deficiency was identified during the course of this investigation (Occurrence 199804432).

Part (ii) of safety recommendation R19980277 stated:

"The Bureau of Air Safety Investigation recommends that the Civil Aviation Safety Authority:

(ii) develop a process to assess the ability of a chief pilot applicant to administer and manage regulatory and safety compliance."

The response from CASA indicated that it intended to amend the Air Operator Certification Manual to more adequately address system safety management issues. The Bureau will continue to monitor the progress of that amendment.

General details

Date:	21 October 1998	Investigation status:	Completed
Time:	0940 hours EST		
Location (show map):	Horn Island, Aero.		
State:	Queensland	Occurrence type:	Ditching

Release date:	19 May 2000	Occurrence category:	Accident
Report status:	Final	Highest injury level:	Minor

Aircraft details

Aircraft manufacturer	Aero Commander
Aircraft model	500
Aircraft registration	VH-YJT
Serial number	3089
Type of operation	Charter
Damage to aircraft	Substantial
Departure point	Boigu Island, QLD
Departure time	0900 hours EST
Destination	Horn Island, QLD

Crew details

Role	Class of licence	Hours on type	Hours total
Pilot-in-Command	Commercial	79.0	2045

Injuries

	Crew	Passenger	Ground	Total
Minor:	1	4	0	5
Total:	1	4	0	5

Last update 13 May 2014