Aviation safety investigations & reports

Piper Aircraft 600A, VH-IXG, 24 km NNE Port Keats, Northern Territory, 2 September 2000

Investigation number:
200003949
Status: Completed

History of the flight

The pilot had submitted a flight plan nominating a charter category, single pilot, Instrument Flight Rules flight, from Darwin to Port Keats and return. The Piper Aerostar 600A aircraft, with 6 Passengers on board, departed Darwin at 2014 Central Standard Time and arrived at Port Keats at 2106 hours after an uneventful flight. The passengers disembarked at Port Keats and the pilot prepared to return to Darwin alone. At 2119 hours the pilot reported taxying for runway 34 to Brisbane Flight Service. That was the last radio contact with the aircraft. Witnesses noted nothing unusual as the aircraft taxied and then took off from runway 34. As a departure report was not received, a distress phase was declared and subsequently a search was instigated.

The following morning a number of major structural components of the aircraft, including the outer left wing, were located at a position 24 km north-east of Port Keats aerodrome and close to the aircraft's flight planned track. The main portion of wreckage was found four days later, destroyed by ground impact. The impact crater was located a considerable distance from the previously located structural components and indicated that an inflight breakup had occurred. The accident was not survivable.

Wreckage examination

A portion of the left wing, part of the left aileron, the cargo door, a 1.3 metre section of the left horizontal stabiliser and the right landing gear door skin were found remote from the main impact area. The section of left wing had separated outboard of the engine nacelle. All fracture surfaces and tear lines on the wing section and the aileron were consistent with overload failure. No evidence of pre-existing deficiency such as fatigue fracture or corrosion was found.

The main body of the aircraft impacted the ground in a steep, nose down, approximately wings level attitude with substantial forward velocity on a generally southeasterly heading. Damage to the structure was extreme with very little fuselage intact and severe compression crush damage to the fuselage and wing structures. There was no evidence of fire in the aircraft or its components.

All control surfaces were found. Examination of the flight control continuity was not possible due to the extent of the aircraft damage. The flaps were found in the stowed position on both wings. All landing gear components were found outside the impact crater, indicating that the landing gear may have been extended at the time of impact. Recovery of the right main landing gear door skin remote from the main wreckage area was

consistent with the gear being extended in flight. The engines and propellers remained attached to the airframe and were found at a depth of 1.5 metres and exhibited indications of low power settings at impact. No pre-existing damage to the engines was evident. The engine-driven vacuum pumps were examined and there was no evidence of abnormal operation or failure of the pumps prior to impact.

Damage to the cockpit, flight and engine controls, instruments and switches was extensive. It was not possible to determine the selected position of controls and switches. Both attitude indicators were recovered and examination determined that they had both been operating at impact and indicated the same steep pitch attitude of 65-70 degrees nose down. That pitch attitude corresponded with observations at the accident site where the inclination between the crater and the damaged foliage was measured at approximately 60 degrees. Rotational scoring on the gyro mechanisms and similarities in indicated pitch attitudes suggested that the attitude indicators were most likely operating normally at impact.

The aircraft had a valid Maintenance Release and there was no maintenance outstanding at the time of the accident. The investigation found no evidence to suggest that the aircraft was not serviceable at the time of the accident.

Reconstruction of the flight

Calculations based on the aircraft's performance charts determined that if the flight had progressed normally to a point overhead the general location of the wreckage, the aircraft should have been close to its flight planned cruise altitude of 10,000 ft. Trajectory analysis of the wreckage distribution determined that the aircraft broke up between 2,700 and 4,000 ft.

The aircraft was equipped with a serviceable autopilot. However, a colleague who had flown with the pilot reported that the pilot's routine was to leave the autopilot disengaged until the aircraft was established in the cruise.

Pilot information

The pilot was aged 68 and the holder of a Commercial Pilot Licence endorsed for the Piper Aerostar 600A aircraft. The licence contained endorsement limitations that vision correction was required and the licence was not valid for operations requiring an Airline Transport Pilot Licence. The pilot held a valid Command Instrument Rating and had passed a renewal test on 25 July 2000. He had a total flying experience in excess of 15,000 hours of which 122 were in the Aerostar. Colleagues commented on his very professional and careful approach to flying, describing him as meticulous when it came to safety. His total flight time in the previous 30 days was 13.1 hours of which 3.5 hours were at night (including the accident flight). His most recent flight prior to the day of the accident was 2 days earlier in a Piper PA-31 aircraft. It had been 16 days since he had flown the Aerostar. The pilot held a Class 1 Medical Certificate valid until 13 October 2000. His last flight crew medical examination on 13 October 1999 revealed no deficiencies other than the continuing requirement to wear prescription lenses.

Examination of the pilot's medical history revealed that in 1990 the pilot's risk factors for ischaemic heart disease required that he undertake additional tests and monitoring. He was also placed on medication for a raised serum lipid (high Cholesterol). Specialist medical assessment found that while that condition was not considered to be critical, the combination of age, raised serum lipid and abnormal Stress Electrocardiogram increased the possibility of coronary ischaemia developing with time. No autopsy was able to be conducted.

Witnesses described the pilot as apparently healthy and in good spirits on the day of the accident. The pilot was semi-retired and he generally had a relaxed lifestyle. Enquiries revealed that his normal sleep pattern was approximately 10:00 pm to 6:00 am and that he slept well. In the 2

weeks prior to the accident most of his time was spent renovating the boat on which he resided. He showed no signs of fatigue, illness or injury. At the time of the accident he had been on duty for approximately 4 hours.

Meteorological information, terrain features and visual clues

An analysis of the meteorological conditions in the vicinity of the crash site at 2125 hours indicated that there was no significant weather. Light wind and clear skies were observed and there was no indication of turbulence. One of the passengers on the outward journey remarked that that it was a smooth flight. Moon data for that evening indicated a waxing crescent with approximately 20 percent of the moon's visible disc illuminated. At the time of the accident the moon was 13.2 degrees above the horizon at an azimuth of 265.3 degrees. The aircraft's flight planned track was 037 degrees and therefore flying away from the moon. Local witnesses reported the night as being very dark.

The area directly north of Port Keats aerodrome had few prominent features apart from a small settlement that was vacant at the time of the accident and was therefore probably unlit. During the climb to cruise the natural horizon would have been obscured or nonexistent. The view outside the cockpit in the prevailing conditions of good visibility (in the meteorological sense) would have been close to total darkness.

Manoeuvring limits

The operating limitations section in the Flight Manual for the aircraft specified a maximum manoeuvring speed of 162 kts Indicated Air Speed (IAS). At that speed, the aircraft's structure was designed to withstand full symmetrical deflection of the flight controls. That maximum safe manoeuvring speed decreased as the aeroplane gross weight was reduced. The manoeuvring speed at the estimated weight of the aircraft at the time of the accident was calculated to have been 148 kts IAS. Allowing for a design safety factor of 1.5, the ultimate load limit would have been exceeded at 181 kts IAS with a full, abrupt movement of the controls. The normal cruise speed of the Aerostar was approximately 170 knots IAS and 200 knots IAS was easily attainable in a cruise descent. Abrupt control movements at any given airspeed can cause peak loads significantly higher than those produced by steady inputs. A rapid and large application of aileron control input at high speed in a dive could produce torsional loading in a wing in excess of the design strength. That loading could result in wing structural failure consistent with the failure observed to the left wing.

Spiral instability

The Aerostar exhibits weak spiral stability. If, for example, the pilot becomes distracted while hand flying the aircraft on instruments, the aircraft may start to turn. The initial turning tendency is usually small and difficult to detect, especially if the pilot is not concentrating on instrument scanning. The nose of the aircraft will drop, a spiral descent commences and the speed will rapidly increase. Although the onset of a spiral dive is usually insidious, with physiological clues not strong enough to alert a distracted pilot, a well-developed spiral can rapidly develop. Airspeed can quickly increase to the point where there is much greater potential of exceeding the design G-loads. When denied strong visual cues, inadvertent entry to a spiral dive can happen even to highly experienced pilots. A pilot, confronted with a high-speed spiral, is trained to slow the buildup of airspeed, roll the aircraft to a wings-level attitude and then recover from the dive. The first step would therefore be to ensure the throttles are closed. Additional slowing, in aircraft like the Aerostar, can be achieved by lowering the landing gear and moving the propeller controls to a high RPM setting.

Human Physiology

Spatial disorientation is a situation in which a pilot fails to sense correctly the position, motion or attitude of the aircraft. It results from conflicting information from the pilot's senses, primarily those of vision and balance. Alternatively, where there are insufficient visual cues, the information from the sense of balance is all that is available to determine orientation. The sense of balance is extremely unreliable and, depending on the circumstances of the flight, may provide erroneous information to the pilot. If there is no visual means with which to crosscheck the information from the balance senses, the pilot may be unaware that it is in error. A pilot's perception of the aircraft's orientation in space may thus be incorrect, and the pilot will not be aware that this is so.

Fatigue can result in a number of potentially significant performance decrements including increased reaction time, lowered arousal, increased susceptibility to distraction, poor self monitoring, and reversion to previously well learned skills.

Structural failure

The wing separation from the aircraft was consistent with aerodynamic loads in excess of the aircraft structural limit during a high-speed or unusual attitude recovery manoeuvre. Those loads could have been imposed by either excessively high speed during the manoeuvre or a control input sufficiently abrupt to generate loads in excess of the wing load bearing capacity. In symmetrical flight conditions, both wings would have experienced identical flight loads and have failed in a symmetrical manner. Since only the left wing separated, it suggested that the wing load was not symmetrical or that the separation was triggered by sudden onset of aerodynamic load on the left wing only, such as would occur when aileron is applied to roll an aircraft.

Pilot distraction

Although the pilot was qualified to operate aircraft under Instrument Meteorological Conditions, his recent experience was limited and the night was dark. There would have been no visible horizon as the aircraft tracked over the sparsely populated countryside on a nearly moonless night. Under those conditions the pilot would have been required to monitor and control the attitude of the aircraft solely by reference to the flight instruments.

The possibility existed that during the climb, accomplished without the use of the autopilot, some unidentified fault or unexpected event diverted the pilot's attention from hand flying the aircraft. In those circumstances it would not have taken long for a spiral to develop and for the aircraft to rapidly increase airspeed and lose altitude. The low engine power at impact and the extended landing gear, support the theory that the pilot may have been attempting recovery from a spiral manoeuvre when the structural failure occurred.

Physiological factors

Although the pilot was well rested and of normal behaviour on the day, he had nevertheless been awake in excess of 15 hours at the time of the accident. Fatigue cannot be eliminated as a factor but there was insufficient evidence to draw any conclusions as to its significance. Given that an autopsy was not able to be conducted, the investigation was unable to exclude the possibility of pilot impairment or incapacitation.

1. Shortly after departure from Port Keats aerodrome, the pilot lost control of the aircraft for reasons unknown.
2. Aerodynamic loading of the left wing in excess of the ultimate load limit occurred, resulting in an inflight breakup of the airframe.

The investigation was unable to determine the circumstances that led to the loss of control and subsequent inflight break-up of the aircraft.

General details

Date:	02 September 2000	**Investigation status:**	Completed
Time:	2115 hours CST		
Location (show map):	24 km NNE Port Keats, Aero.		
State:	Northern Territory	**Occurrence type:**	In-flight break-up
Release date:	14 December 2001	**Occurrence category:**	Accident
Report status:	Final	**Highest injury level:**	Fatal

Aircraft details

Aircraft manufacturer	Piper Aircraft Corp
Aircraft model	PA-60
Aircraft registration	VH-IXG
Serial number	60-0567-7961185
Type of operation	Charter
Damage to aircraft	Destroyed
Departure point	Port Keats, NT
Departure time	2120 hours CST
Destination	Darwin, NT

Crew details

Role	Class of licence	Hours on type	Hours total
Pilot-in-Command	Commercial	122.0	15000

Injuries

	Crew	Passenger	Ground	Total
Fatal:	1	0	0	1
Total:	1	0	0	1

Last update 26 October 2017