

AAIB Bulletin No: 3/94

Ref: EW/C93/8/2

Category: 1.2

Aircraft Type and Registration: Piper PA-31 Navajo, G-SEAS

No & Type of Engines: 2 Lycoming TIO-540-A2C piston engines

Year of Manufacture: 1979

Date & Time (UTC): 15 August 1993 at 0705 hrs

Location: Pewley Down, near Guildford, Surrey

Type of Flight: Public Transport (positioning)

Persons on Board: Crew - 1 Passengers - None

Injuries: Crew - Fatal Passengers - N/A

Nature of Damage: Aircraft destroyed

Commander's Licence: Commercial Pilot's Licence with Instrument Rating

Commander's Age: 33 years

Commander's Flying Experience: 1,493 hours (of which 440 were multi-engined and 15 were on type)
Last 90 days - 162 hours
Last 28 days - 50 hours

Information Source: AAIB Field Investigation

The pilot was rostered to fly from his home base at Stapleford to Southampton on a positioning flight. He was due to pick up passengers at Southampton and fly to Cambridge where more passengers were to be collected; from Cambridge he would fly to Berlin. For the return journey he would fly back to Cambridge, unload some passengers and be relieved by another pilot. The day prior to the accident the pilot had a 2 hour flight, and then spent 4 hours planning the Berlin flight with the assistance of his Chief Pilot. Following the planning the two pilots made a comprehensive check of G-SEAS and refuelled to full tanks.

On the 15 August the pilot arrived at the airfield at 0605 hrs and opened the flight offices. Shortly afterwards an assistant arrived and saw the pilot of G-SEAS doing some pre-flight paperwork. The assistant then opened the clubhouse and had a short conversation with the pilot who had come in to prepare coffee for his prospective passengers; the pilot appeared to be in normal spirits. Subsequently, the assistant saw the pilot doing external checks on G-SEAS, heard the aircraft being taxied away at approximately 0635 hrs, and then heard it take off at approximately 0645 hrs. The assistant stated that, at the time, the weather at Stapleford was warm with light haze and that he could not see any cloud.

Reconstruction of the accident flight was achieved using air to ground radio recordings from London and Farnborough ATC, and secondary radar recordings from Heathrow, Pease Pottage and Debden. The radio recordings indicate that the pilot of G-SEAS, using callsign STL 819, checked in with Thames Radar at 0649 hrs but received no reply and so contacted Heathrow Radar; this call was acknowledged but he was asked to recall on another frequency. Heathrow Approach frequency was fairly busy but by 0653 hrs G-SEAS had been identified, and been cleared direct to Ockham not above 2,000 feet on QNH 1011 mb; this clearance was acknowledged by the pilot. The next radio contact was at 0658 hrs when Heathrow called STL 819 to inform him that there was another aircraft, Ascot 7963 holding over Ockham at 1,500 feet amsl. When Heathrow informed the holding aircraft of the approach of STL 819, the Ascot pilot stated that he was climbing to 2,400 feet amsl. Shortly afterwards, the captain of Ascot 7963 saw an aircraft passing below him in a normal attitude tracking towards Ockham. (Subsequently he estimated the weather in the area at the time as 3 okta to 7 okta stratus between 1,000 feet and 2,000 feet amsl; below the cloud the visibility was between 3 km and 5 km and the wind was approximately 15 kt from the north west.) At 0701 hrs STL 819 passed Ockham and then at 0703 hrs reported that he would like to contact Farnborough ATC. He was informed that Farnborough might not be open but he was given clearance to leave the Heathrow frequency. At 0704 hrs STL 819 called on Farnborough frequency but had no reply as the airfield was not yet open; this was the last radio call recorded from STL 819.

The radar recordings confirmed the track of STL 819 to Ockham and from there the aircraft made a gentle left turn onto a track of approximately 185°T; all three radars confirmed the aircraft speed as approximately 160 kt and at a level altitude of 1,500 feet amsl until a few seconds before 0705 hrs. At that point the aircraft started a high rate of descent with increasing speed but maintaining a fairly constant southerly track. Radar contact was lost 2.6 seconds after 0705 hrs. The last radar contact was within 250 metres of the crash site and at that point the aircraft was at 1,000 feet amsl; the crash site is approximately 400 feet amsl. Various eye witnesses reported hearing the aircraft passing low overhead and some also saw the aircraft. One witness, who holds a Private Pilot's Licence and a twin rating, saw the aircraft coming out of a cloudbase, estimated at about 800 feet, in a steep dive. He stated that both engines were operating and that no attempt was made to pull the aircraft from the dive. Several witnesses heard the impact and three saw G-SEAS hit the ground. One witness, who had a clear view of Pewley Down, stated that the aircraft flew straight into the ground and that there was no noticeable change in engine noise or change in aircraft attitude. A few witnesses commented that the aircraft engines did not sound normal but the majority stated that there was nothing unusual apparent.

An aftercast obtained from The Meteorological Office at Bracknell indicated the following weather conditions at the time of the accident: 5,000 metres visibility, no mist, fog or rain, scattered stratus base 1,200 feet amsl and broken stratocumulus base 5,000 feet amsl. This accords with the estimate from the Ascot captain.

Engineering investigation

The aircraft had crashed into a field of pasture and a paddock just to the north of the crest of the Pewley Down. The direction of travel at impact had been 191°M which accords closely with the aircraft's final track seen on radar. Wreckage was spread over a distance of 160 feet from the impact with a few individual items being thrown somewhat further. The aircraft had been fragmented by the impact and there had been an intense fire which had melted or consumed much of the aluminium structure. The aircraft had hit the ground at high speed and in a steep dive. Measurements obtained from the ground damage suggested a dive angle of 30° to 35° and evidence later obtained from the aircraft's airspeed indicating system indicated that, at impact, the aircraft's speed had been substantially in excess of its certificated maximum speed of 236 kt. The initial impact had left an impression on the ground which corresponded with the frontal aspect of the aircraft. There was an imprint of the leading edge of the wing complete from one wingtip to the other and the engines had come to rest, embedded in the ground, just forward of their impact positions. The impact evidence showed that the aircraft had been upright, banked slightly to the right and yawed significantly to the left when it hit the ground. The impact evidence, either from the ground marks or the airframe wreckage, showed no indication of the aircraft being pitched up relative to its flightpath, *ie.* no evidence of any attempted recovery from the dive.

Over the 36 hour period following the crash an area of withered grass became visible beyond the area which had been directly affected by the fire. This showed the area of the ground which had been splashed with fuel from the aircraft's tanks and demonstrated that there had been a large amount of fuel in the tanks in both wings.

The wreckage was recovered to the AAIB at Farnborough where it was examined in detail. The aircraft and its internal components had been crushed, fragmented and burned and the recovered material included a large amount of ash.

The aircraft had been complete at impact in terms of its essential structure and flying surfaces. Flaps and landing gear had been retracted. Evidence was found that the main cabin door and the forward baggage door were in place and latched. No evidence was found of a large bird impact on the aircraft's wing leading edges or tail. Fragments of the pilot's windscreen were collected, examined for blood smears and viewed under ultraviolet light which will cause any particles or smears of bone to fluoresce. No evidence was found of a bird impact but the amount of material which was collected probably amounted to less than half of the windscreen. Evidence was found that the locking pins for the pilot's seat had been engaged in the seat rails at impact.

Not all the control system components recovered from the wreckage could be individually identified but all the failures seen in such components were in overload and were thus consistent with being a result of the crash. No failure or defect in the controls could be identified as being pre-existing. Both the pilot's and co-pilot's control columns with their connected mechanisms were found fragmented. The control columns had been trapped by impact damage near the fully forward position. They had

moved beyond the fully forward position by about 1 inch under impact loads but no evidence was found for their being in any other position during impact. The belcrank to which the elevator cables had been attached was found wrapped by some of the adjacent structure; when its position was related to the structure it too was found to be in the 'controls fully forward' position with no evidence of it having been in any other position during impact. Evidence was also found on the elevators that they had been depressed at impact. In the roll sense the yokes were found to have been approximately central. No evidence was found for rudder or rudder bar position.

The aircraft's tailcone remained intact with the empennage and control surfaces attached but all had suffered severe fore-and-aft crushing. The final elements of the elevator control system, a control rod, elevator horn and downspring were all present though crushed and damaged. The elevator horn had detached from the elevator through overload failure of its attachment bracket but otherwise all the attachments of these components were still made.

In the aircraft's documents there were recorded cases of problems with the electrical trim when used in conjunction with the autopilot. These problems had not been resolved and a placard had been placed beside the electrical trim ON/OFF switch stating that it was not to be used if the autopilot was engaged. During the investigation a report was received that one pilot had experienced a marked pitch-down with autopilot only engaged which had resulted in a height loss of 150 feet. An examination of the damaged components from the electrical trim and autopilot systems, however, found evidence that suggested that neither the autopilot nor the electrical trim had been engaged at the time of impact. There was also evidence that, at impact, the trim tab was in an intermediate position and not an extreme position and this would indicate that there had not been a trim runaway.

The propellers had both sustained rotational damage at impact. This damage was almost identical between the two propellers and it would appear, therefore, that at impact there had not been a problem of asymmetric power. No direct evidence was identified of power being transmitted by either engine and this indicated that, at most the engines were at a low power setting. The engines and their ancillaries were dismantled and no pre-existing failure or defect was identified in either of the power units.

Pathology

The pathology examination and medical records of the pilot produced no evidence of any medical condition which could have caused incapacitation prior to the crash. Additionally, there were no indications that the pilot was in other than good health and spirits prior to the flight. Finally, there was no evidence of any emergency calls and, throughout the flight the pilot's radio calls were normal. An Inquest on the death of the pilot returned an open verdict.