AAIB Bulletin No: 1/94 **Ref: EW/C93/9/2** **Category: 1 3**

Aircraft Type and Registration:	Piper PA-28-161 Cherokee Warrior II, G-BNOD	
No & Type of Engines:	1 Lycoming O-320-D3G piston engine	
Year of Manufacture:	1987	
Date & Time (UTC):	15 September 1993 at 1418 hrs	
Location:	Near Sanquhar, Ayrshire	
Type of Flight:	Training (Approved CPL/IR Course)	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - Fatal	Passengers - N/A
Nature of Damage:	Aircraft destroyed	
Commander's Licence:	Student Pilot	
Commander's Age:	20 years	
Commander's Flying Experience:	90 hours (of which 43 were on type) Last 90 days - 63 hours Last 28 days - 38 hours	
Information Source:	AAIB Field Investigation	

The pilot

The pilot was a foreign student who was undertaking a CAA approved course at a flying college based at Prestwick. The course which was for the award of a Commercial Pilot's Licence and Instrument Rating, called for a total of 200 hours flying. At the time of the accident, the student had completed 90 hours of the syllabus flying. He was judged by his instructor to be of average ability as a student pilot while displaying a degree of overconfidence.

Flight preparation

On the morning of the accident, the student approached his flying instructor, and requested that he be authorised to fly a VFR navigation exercise that afternoon. This request was approved and the student was instructed to complete the detailed planning of a route from Prestwick to Kilmarnock to West Linton to Thornhill to Girvan and return to Prestwick (see Figure 1). The college did not use standard navigation routes and this particular route had been suggested by the student and approved by his instructor. The weather forecast for the planned route (see below) and reports from aircraft flying in

the area, indicated that it might not be possible for the student to maintain the minimum terrain separation specified by the college, 1,000 feet agl, once he was south of Biggar on the leg from West Linton to Thornhill. He was therefore briefed by his instructor, that in the event that he could not maintain the specified terrain separation, he was to abort the exercise in good time and return to Prestwick via Strathaven and Kilmarnock. The instructor then authorised the student to fly the planned route emphasising that he should remain clear of cloud.

Weather

At 1100 hrs, the duty instructor at the college made an entry in his log stating that the weather was unfit for solo navigation exercises in the Strathaven to Biggar area, but fit in the area of Sanquhar and the local flying area. The aeronautical weather forecast for Scotland, valid for the period of the flight, indicated that generally, the visibility would be 30 km with scattered cloud covering the tops of some hills. However, it also stated that the area of the planned route would occasionally be affected by rain showers with reduced visibility and a cloud base of 1,500 feet amsl which would have put the tops of the local hills in cloud. An aftercast for the accident area obtained from the Meteorological Office at Bracknell indicated that the forecast was substantially correct and that the weather during the period of the flight was reasonable with good visibility and broken cloud. However, the aftercast did indicate the presence of broken cloud covering hills above about 1,200 to 1,400 feet. An aircraft operating some 15 nm to the north of the crash site at the time of the accident was flying at 2,200 feet amsl in order to remain below cloud. Because the weather front that was producing the partly cloudy conditions was moving slowly south, it would have been reasonable to expect an improvement in the general weather with the passage of time. Actual weather reports from airfields within a radius of 50 nm from the accident site indicate that, at the time of the accident, visibility was good with scattered or broken cloud no lower than 2,000 feet amsl. The weather aftercast for the area at the time of the accident indicated that conditions of temperature and humidity presented a serious risk of carburettor icing.

History of the flight

The student took off from Prestwick at 1321 hrs (1421 hrs local time) in a Piper Warrior aircraft registration G-BNOD (OD) operated by the college. At the time that the student took responsibility for the aircraft, it was in an airworthy condition with no known defects and all required maintenance had been completed. The aircraft had sufficient fuel for a flight of at least four hours. After leaving the Prestwick zone, the student was receiving a Flight Information Service from ATC and at no time was radar assistance requested. The student had marked the New Galloway NDB on his chart and examination of the wreckage indicated that this beacon had been selected on the NDB receiver in the aircraft. A recording of the returns from 'OD' on the ATC radar together with information on the

airborne log kept by the student during the flight, and which was recovered from the aircraft wreckage, indicate that the flight progressed normally until 'OD' was some 5 nm to the west of West Linton. At this point 'OD' turned right onto a south westerly track rather than the southerly track required for Thornhill. There is no indication on either the recording of the student's radio transmissions or his log of the reason for this early turn but analysis of his log indicates that at this point he may have misread his watch by 5 minutes. The flight had been planned at 3,000 feet but radar information indicates that 'OD's' height varied between 1,800 and 4,000 feet amsl during this period. Shortly after the turn onto a south westerly track, 'OD' turned a further 60° to the right. Information from the student's log and from the recording of his radio transmissions, indicate that this was the start of a standard hazard avoidance manoeuvre which involves turning 60° off heading for a set time before turning 120° back towards track for the same time before resuming the original track. In the event, the student flew the first 60° leg for 5 minutes until, at a position 5 miles to the west of Lanark, he turned onto a heading that would cause him to fly parallel to his planned track for Thornhill. During this period of the flight, 'OD's' height was fairly steady at 2,400 feet amsl, but due to the height of the terrain below the aircraft, its height above the ground gradually reduced to about 500 feet. Having flown this parallel track for 6 minutes the student turned left onto a south easterly track which his log indicates was to regain his original track. This heading was maintained for 4 minutes while descending to 2,000 feet amsl which again put the aircraft within 500 feet of the ground. The headings referred to in this paragraph are those that appeared on the student's log. The actual headings flown were less precise (see Figure 1).

At 1410 hrs, in a position 5 miles to the south of Sanquhar, the student's log indicates that he turned onto his planned heading for Girvan followed by a further 60° turn to the right. On the radar recording, this manoeuvre appears as a continuous gentle turn to the right onto a northeasterly heading with a gradual increase in altitude to 2,300 feet amsl. The height of the ground in this area is about 1,800 feet. Having achieved a northeasterly heading, 'OD' flew a figure eight pattern during which the rate of climb increased to over 900 feet per minute, which equates to the aircraft climbing on full power, and the airspeed reduced from that equating to cruising flight to that which would be expected during a climb. During this manoeuvre, the increase in height was steady and the turns were of reasonable radius. Just before the completion of the figure eight manoeuvre, at 1418 hrs and 20 seconds, the student made a radio call stating that he was in cloud and climbing through 3,500 feet. The student was not qualified to fly in cloud but had been taught the basic technique to be adopted should he inadvertently enter cloud. This training assumed that cloud would be entered from level flight at cruising speed and the student had been taught to use his flight instruments to perform a gently banked turn through 180° to fly out of the cloud. Having entered cloud at high engine power, at a speed significantly below cruising speed and probably with his aircraft banked to the right, the student would have found himself in a situation which had not been covered in his training up to that time.

The student's radio call was heard by a college flying instructor, flying 15 nm to the north, who realised from the student's callsign that he was not qualified to fly in cloud. He therefore called ATC and informed the controller that the student's last transmission should be treated as a 'PAN' call. Several attempts were made to contact 'OD' on the frequency in use and alternative frequencies both directly by ATC and also using other aircraft as relay stations but nothing further was heard from the student.

Radar recordings timed at just after the pilot's last radio call indicate that, having made his radio call, the student continued to climb to 3,550 feet in a gentle right turn at which point the rate of turn increased and the aircraft began to descend rapidly. There was no further radio call and the last radar return from 'OD' at 1418 hrs and 39 seconds, was recorded with the aircraft in a right-hand turn passing through south east and descending rapidly through 2,650 feet amsl.

Search and Rescue

At 1425 hrs, the Civil Watch Manager at the Scottish ATCC informed the Distress and Diversion Cell that there was a potential problem with 'OD'. An aircraft from West Freugh was diverted to investigate a radar contact in the presumed position of 'OD' and attempts were made to contact the student on the International Distress Frequency. Meanwhile, a study of the recorded radar returns in the Thornhill area identified a contact that could have been 'OD' in a position 20 nm south east of Prestwick. At 1459 hrs, a Search and Rescue helicopter was scrambled from Prestwick. At 1538 hrs, a refined radar position was passed to the helicopter and at 1545 hrs the wreckage of 'OD' was located some 12 nm to the west of Thornhill at an elevation of 1,550 feet.

Post Mortem

A post mortem examination did not reveal any medical condition that could have either caused or contributed to the accident.

Examination of the wreckage

The accident site was on the south eastern slope of a hill that was planted with young conifer trees. Evidence from the wreckage indicated that just prior to the impact both wings and the left tailplane had separated from the fuselage. Examination of the wing spar failures showed that very large download forces had occurred prior to the actual separation of the wings in upload. The left tailplane had separated from the fuselage in downward bending. The right tailplane, which remained attached to the main fuselage had been severely distorted by a downward force. After the separation of the wings and the left tailplane the fuselage impacted the side of the hill in an upright attitude, nose pitched down approximately 25° and with high vertical and forward velocities.

Detailed examination of the wreckage did not reveal any defects or detachment/disconnection of any of the aircraft's control systems existing prior to the break-up of the aircraft. There was positive evidence that no fire had occurred and no evidence was seen of a bird strike or airborne collision. Both fuel tanks contained sufficient fuel of the correct specification to complete the planned flight. Damage to the aircraft's propeller indicated that at impact the engine was at a low power setting.

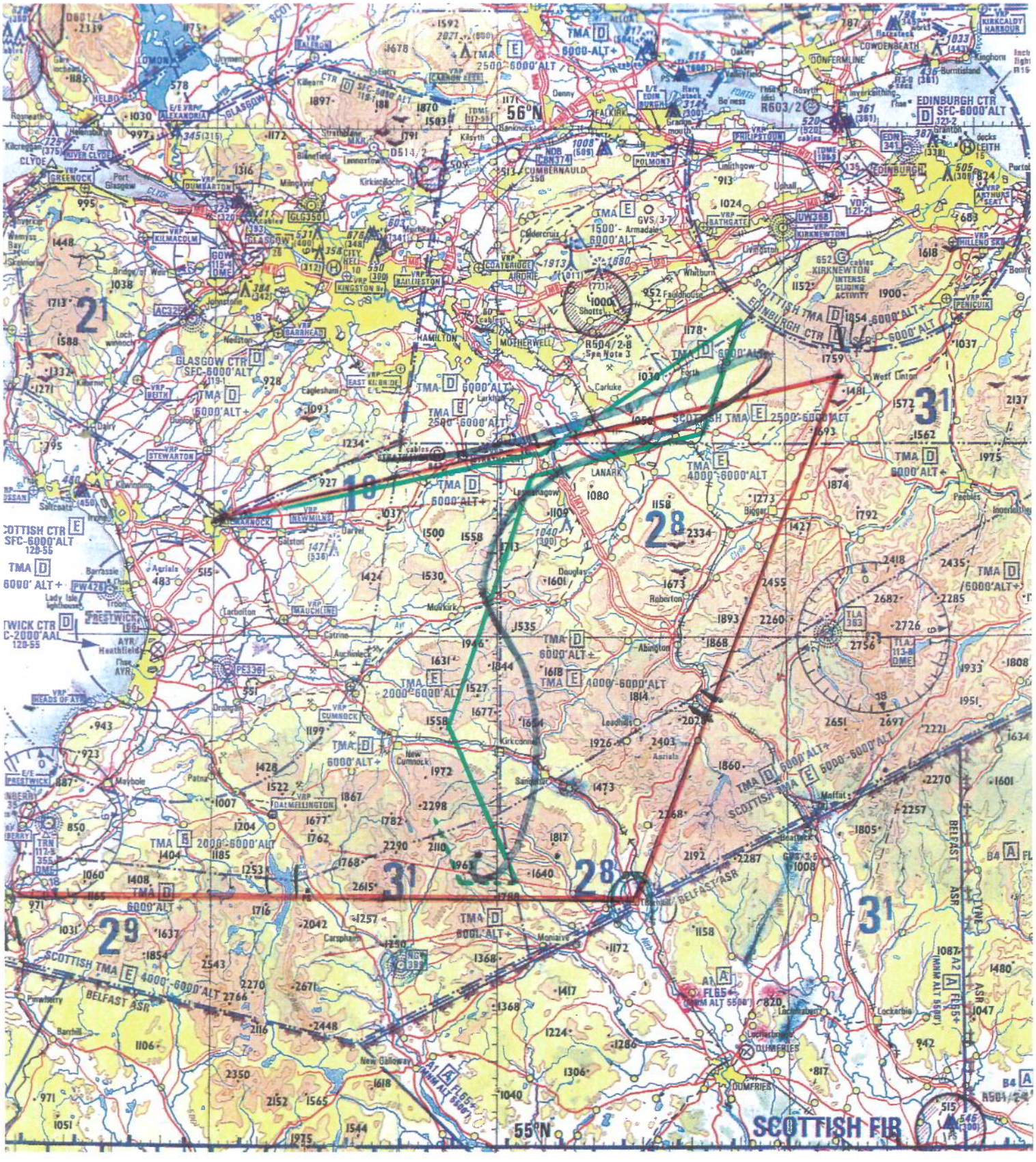
56°N
55°N
SCOTTISH FIR
EDINBURGH CTR SFC-6000'ALT
GLASGOW CTR SFC-6000'ALT
SCOTTISH TMA
BELFAST ASR
Planned track
Radar track
Track derived from pilot's log

Figure 1