

ACCIDENT

Aircraft Type and Registration:	Piper PA-32R-300 Cherokee Lance, G-BSYC	
No & Type of Engines:	1 Lycoming IO-540-K1G5D piston engine	
Year of Manufacture:	1977	
Date & Time (UTC):	5 April 2008 at 0948hrs	
Location:	Cairn Gorm, Cairngorms, Scotland	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - 1 (Fatal)	Passengers - N/A
Nature of Damage:	Aircraft destroyed	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	45 years	
Commander's Flying Experience:	Approximately 440 hours (of which at least 126 were on type) Last 90 days - not known Last 28 days - not known	
Information Source:	AAIB Field Investigation	

Synopsis

The pilot had planned to fly the aircraft from the United Kingdom (UK) to the United States of America (USA) and was en route from Carlisle to Wick. He was flying VFR and was in receipt of a Flight Information Service from ATC. Heading north-north-east over the northern part of the Cairngorms, he descended the aircraft from an altitude of 8,300 ft amsl to 4,000 ft amsl, whereupon he encountered severe weather and icing conditions. The pilot elected to divert and, while flying south-south-east in cloud, the aircraft struck 150 ft below the summit of Cairn Gorm, which rises to 4085 ft amsl. The pilot suffered fatal injuries. No fault was found with the aircraft.

History of the flight

The pilot had planned to fly from the UK to Orlando, Florida, USA. He began the journey at Gamston Airfield, Nottinghamshire on Friday 4 April 2009, departing from there at 1025 hrs. He then flew to Wolverhampton Halfpenny Green Airport, arriving there at 1111 hrs and uplifted 177 litres of fuel. At 1123 hrs he departed for Carlisle. At some point that morning he telephoned a handling agent at Wick Airport, advising him of his intended journey to the USA and requesting the hire of a liferaft. The implication was that the aircraft would be arriving at Wick the same day.

As the aircraft approached Carlisle, the pilot advised Scottish Information that he was over the sea, unsure of

his position and 'experiencing cloud in the vicinity'. He was advised to contact the Distress and Diversion Cell at London Centre on 121.5 MHz, which, despite some reported problems with his radio, he did successfully.

Scottish Information contacted Carlisle ATC and informed them that the aircraft was inbound and had been experiencing difficulties. At 1359 hrs, Carlisle ATC advised Scottish Information that they were in contact with the aircraft. While G-BSYC was in the circuit at Carlisle, the pilot, again, seemed to be having problems with his radio. The aircraft landed at 1404 hrs and, having shut it down, the pilot spoke to one of the local flying instructors. The instructor gained the impression that the pilot had miss-selected the audio panel controls and this had caused the communication difficulties.

The pilot decided to spend the night at Carlisle and informed the handling agent at Wick. They discussed the weather forecast for the flight to Wick the following day but the pilot gave no ETA. While at Carlisle Airport he purchased a 1:500,000 scale aeronautical chart for Scotland, a ruler and some pens. He was also provided with some meteorological information for the following day's flight.

At 0812 hrs the next day, Saturday 5 April, the aircraft departed Carlisle Airport. It had not been refuelled. At 0908 hrs the pilot contacted Scottish Information, reporting that he was north of RAF Leuchars at an altitude of 4,000 ft, on a pressure setting of 1011 mb and on a direct track to Wick. He confirmed that this would take him to the west of the Aberdeen Control Area and his ETA at Wick was 1125 hrs. He was given a Flight Information Service (FIS). At 0920 hrs the pilot requested a climb to an altitude of 6,000 ft because he was experiencing turbulence. He was advised that there was no known traffic to affect his climb to that

altitude and was asked if he was flying IFR or VFR. The pilot confirmed that he was flying VFR.

At 0930 hrs, in response to a request from Scottish Information, the pilot estimated that he was 42 nm west of Aberdeen at an altitude of 8,300 ft. He also requested the weather information for Inverness Airport and was given details of the conditions at 0920 hrs, which were: surface wind 350°/12kt, visibility 25 km, nil weather, few clouds at 1,200 ft agl, scattered clouds at 4,200 ft agl, temperature plus 5°C and a QNH pressure setting of 1021 mb. At 0933 hrs he was transferred to Inverness Approach.

The pilot advised the Inverness Approach controller that he was en route from Carlisle to Wick, 44 nm west of Aberdeen at 8,300 ft and requested clearance to descend to an altitude of 4,000 ft. The controller asked the pilot to 'squawk' 6174 on his transponder and to confirm that he was VFR. The pilot acknowledged the 'squawk' and confirmed that he was operating VFR. He was asked to notify Inverness ATC when he reached 4,000 ft and was informed that the Inverness QNH pressure setting was 1021 mb. The pilot confirmed the pressure setting and Inverness ATC advised him that he was identified 10 nm south of Lochindorb, which is 4.5 nm north-east of Aviemore, and that he was receiving a Flight Information Service. The pilot acknowledged this. The time was 0935 hrs.

Between 0936 hrs and 0940 hrs Inverness ATC called the pilot four times but there was no reply. The aircraft, which was visible on secondary surveillance radar (SSR) only, was observed turning away from Inverness. It was 20 nm to the south-south-east of Inverness in the vicinity of Aviemore and Grantown-on-Spey, indicating that it was at a pressure altitude of 3,600 ft. This equated to 3,840 ft amsl. At 0940 hrs and 0941 hrs Inverness ATC

received carrier wave transmissions only, but not speech. On the second occasion, they called the unknown station, advising it that it was unreadable. At 0943 hrs, Inverness ATC carried out a radio check with the pilot. There was no reply, so they asked him to ‘squawk ident’¹.

At 0944 hrs the pilot called Inverness ATC. The Approach controller advised the pilot that he had been trying to call him without success. The pilot reported that he seemed to have a problem with his ‘comms one’. In a broken transmission, he advised Inverness ATC that he was diverting to Aberdeen. He had encountered some severe weather, mentioned some icing and asked for details on Aberdeen or that he be given a vector. He was asked if he would rather go to Inverness, which was only 20 nm away; he was 40 nm to the west of Aberdeen. The pilot acknowledged the transmission and asked if it was ‘ok’ to divert to Inverness. ATC advised that Aberdeen was probably busier than Inverness and that Inverness would probably prefer to accept him. Inverness was on a bearing of 320°(M) from him.

Inverness ATC informed the pilot, whose transmissions were becoming broken, that they were very quickly going to lose radio contact and gave him the Aberdeen Approach and the Distress and Diversion Cell frequencies, telling him that they would be advised. The pilot responded that he was not ‘reading’ Inverness ATC and the crew of a commercial aircraft, that was inbound to Inverness, offered to relay the transmissions between the pilot and Inverness ATC. The commercial crew established communications with the pilot and advised him that Inverness ATC were losing radio contact with him as he travelled towards ‘the hills’ and gave him the same frequencies to call as previously advised by Inverness.

Footnote

¹ This is a selection on the aircraft’s transponder control panel which gives a particular indication on ATC’s radar screen

They also gave the pilot details of the recent weather conditions at Aberdeen. Following that transmission, the commercial crew sought confirmation from the pilot that he had copied the information. There was no reply. It was 0948 hrs. The commercial crew advised Inverness ATC that they had probably lost communications with the pilot but agreed to continue trying to make contact with him.

At about 0950 hrs, an employee of the ‘sportscotland Avalanche Information Service’ (SAIS) was standing outside the top station of the funicular railway that serves the Cairngorm ski resort. She was approximately 800 m north of the summit of Cairn Gorm, facing south, observing the weather and the conditions underfoot. She recalled it being very cold and snowing, with visibility of about 50 m and a moderate northerly wind. She heard an aircraft approaching from behind her and immediately looked up to see the grey shape of a small aircraft passing overhead. She couldn’t distinguish any colouring or details but estimated that it was at a height of approximately 100 ft agl. The aircraft, which was travelling south-south-east, quickly vanished from sight and the engine noise, which sounded steady, faded rapidly. At about the same time, a member of staff who was working as a lift operator in the same vicinity heard a light aircraft flying in a north-south direction. He did not see the aircraft but thought that it was at a low height. The engine noise, which was muffled by the wind and cloud, sounded normal. He estimated that the visibility was about 40 m and the temperature was approximately -4°C. The wind was northerly, gusting to about 35 kt. After the aircraft had passed overhead he did not hear it again.

The Aeronautical Rescue Coordination Centre (ARCC) at RAF Kinloss was informed that the aircraft was missing at 1003 hrs. A Search and Rescue (SAR)

operation was initiated and a SAR helicopter took off from RAF Lossiemouth. This was joined by another SAR helicopter from the Royal Naval Air Station at Prestwick. A number of Mountain Rescue Teams (MRTs) were also deployed to the aircraft's last radar position. The search was hampered by the snow and poor weather; however, the following day, at 1040 hrs, the aircraft wreckage and the body of the pilot were discovered near the summit of Cairn Gorm by a MRT.

A post mortem concluded that the pilot had died as a result of multiple injuries, including a particularly severe head injury, sustained during large deceleration forces when the aircraft struck the ground. There was no evidence of any medical condition that could have contributed to the accident.

Meteorology

Following the accident, an aftercast for the area was obtained from the Met Office. This indicated that, at the time of the accident, Scotland was covered by an Arctic Maritime airmass. The weather in the vicinity of the accident site included variable cloud cover with scattered showers of snow. Hill fog would have covered the hills and mountains of the Cairngorm, almost certainly above 1,800 ft amsl, and at times lower.

The cloud cover was calculated to have been few or scattered, locally broken, cumulus or cumulonimbus with a base at between 1,400 ft and 2,800 ft amsl. Further scattered and broken stratocumulus/altocumulus layers were estimated to have been between 2,000 ft and 6,000 ft amsl, with other isolated layers of scattered and broken stratocumulus/altocumulus clouds between 6,000 ft and 13,000 ft amsl. In general, cloud would have been covering the hills and mountains of the Cairngorms.

The wind at 4,000 ft amsl was estimated to be 010°/35 to 40 kt. The direction and strength varied little between 1,500 ft and 5,000 ft amsl. Visibility outside cloud and precipitation was estimated to be 40 km, reducing to between 300 m and 3,000 m in moderate or heavy showers of snow, and less than 200 m in hill fog.

The freezing level was between 1,500 ft and 2,200 ft amsl.

These conditions were reflected in the forecasts for the period covering the pilot's intended flight from Carlisle to Wick. For the north and east of Scotland, including the Grampians, the forecasts also warned of moderate icing and turbulence in cloud, and severe icing and turbulence in cumulonimbus clouds.

An automatic observation at the meteorological station on the summit of Cairn Gorm, taken at 0945 hrs on 5 April 2009, recorded a temperature of -5.4°C and a wind speed of 350°/37kt, with a maximum gust of 51 kt in the previous hour. Another automatic station at nearby Aviemore, which recorded more parameters, reported that the local barometric pressure, corrected to mean sea level, was 1020.8 mb.

Radar

Recorded primary and secondary surveillance radar data on the aircraft was obtained from a number of civilian and military radar heads. The data showed that at 08:13:00 hrs the aircraft was approximately one and a half nautical miles north-east of Carlisle airport, tracking in a northerly direction, past Dundee, towards the Cairngorms. Figure 1 shows the final part of this track in the Cairngorms from 09:27:00 hrs until contact was lost at 09:45:21 hrs.

The initial part of the track in Figure 1, from the Allenshill radar head, shows the aircraft's route as it

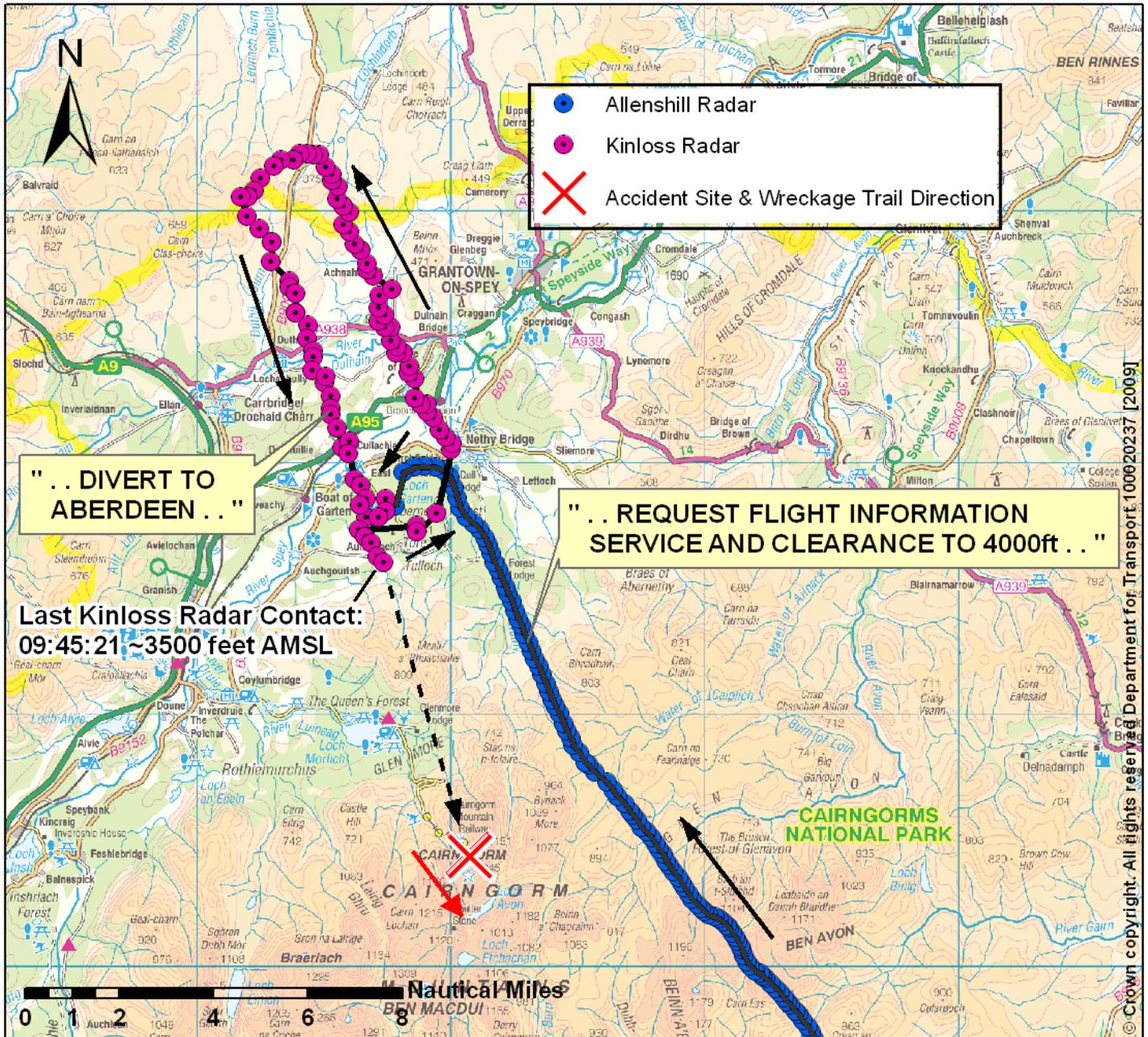


Figure 1

G-BSYC radar track near Cairn Gorm and location of accident site

climbed from an altitude of 6,700 ft² to 9,000 ft (see Figure 2). Two and a half minutes after reaching 9,000 ft, the pilot requested clearance to descend to 4,000 ft, beginning the descent one minute later. As the aircraft passed through 7,000 ft, it started a turn to

the left through almost 180° during which it descended a further 2,000 ft. Allenshill radar lost contact in the process, but at 09:36:30 hrs the aircraft's progress was picked up by the radar at RAF Kinloss³.

Footnote

² The Mode C altitudes have been corrected for the reported Inverness QNH of 1021 mb.

Footnote

³ The aircraft track from the Kinloss radar had to be manually digitized from the controllers screen when it was played back later, to generate the track presented in Figure 1.

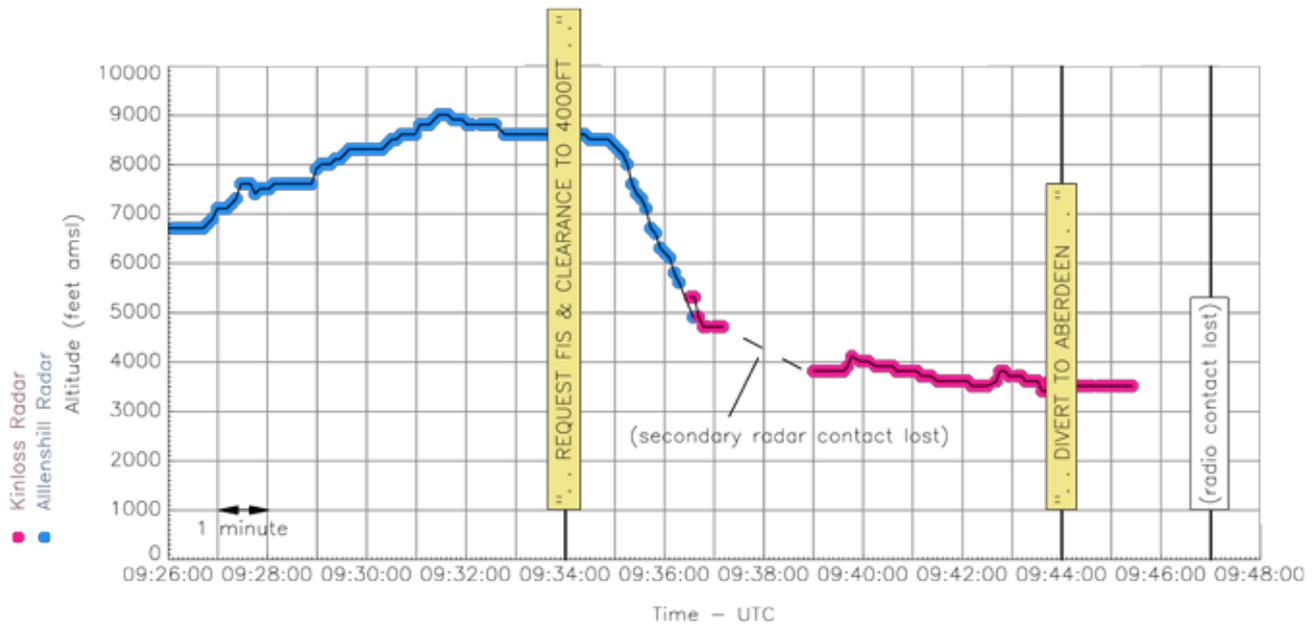


Figure 2

G-BSYC Mode C altitude (corrected to Inverness QNH of 1021 mb)

The Kinloss radar track shows that the aircraft continued the left turn through a full 360° as it levelled just below 4,000 ft, before continuing to track in a north-north-westerly direction for a further eight nautical miles. The aircraft then turned left through 90° and, after another two nautical miles, to the left again on a track back towards Cairn Gorm (elevation 4,085 ft amsl), 15 nm ahead. After five nautical miles (09:44:00 hrs), the pilot reported severe weather, some icing and his intention to divert to Aberdeen.

Kinloss lost contact with the aircraft at 09:45:21 hrs, by which time the aircraft had descended to an altitude of 3,500 ft, with Cairn Gorm seven nautical miles ahead. Playback of the Inverness radar recording showed that contact was lost at around the same time and position. The average ground speed over the last eight nautical miles of the track was approximately 168 kt.

Accident site

The poor weather conditions that affected the region on the day of the accident persisted for the next few days, with sub-zero temperatures and continuous snowfall resulting in most of the wreckage being buried in snow. In addition, visibility was down to a few metres for much of the duration of AAIB's on-site activity.

The main wreckage, consisting of the fuselage and nose section, had come to rest at an elevation of 3,936 ft amsl, approximately 200 m to the north east and 150 ft below the summit of Cairn Gorm. This is a dome-shaped feature with a rocky surface which, at the time of the accident, is likely to have been covered with patchy snow. A GPS plot of the debris, made by the police on the day the aircraft was found, indicated that the wreckage trail was some 200 m in length and that the impact track was 162°(M). This was confirmed by the AAIB in a subsequent plot, albeit with fewer debris items visible due to the accumulation of snow on the mountainside.

The initial wreckage items were found to be parts of the right wing, with the substantially intact left wing being found approximately halfway along the wreckage trail. The main cabin entry door, on the right hand side of the aircraft, was found a few metres short of the main wreckage. The fuselage, minus the nose, windscreen and instrument panel, had come to rest upright, facing back along the impact track, while the engine and propeller assembly, together with the associated cowlings, were lying just beyond the tail.

Some of the cabin contents had spilled out in the area of the main wreckage. Documentation included pages from an aircraft Maintenance Manual and material relating to business concerns. There was also an aeronautical chart of Scotland. It seemed probable that many of the loose documents would have been blown away in the immediate aftermath of the accident.

The horizontal stabilisers had sustained damage consistent with being scraped over the rocky surface, although it was clear from the absence of damage to the cabin roof that the fuselage had remained upright throughout the impact sequence. The top of the fin and rudder had sustained some impact damage, either from a rock thrown up during the ground slide, or from the engine as it became detached prior to the fuselage coming to rest.

The direction of the impact track indicated that the aircraft had flown into rising ground on the northern flank of Cairn Gorm. This had brought the propeller and nose underside into violent contact with the ground, resulting in serious disruption to the forward fuselage including the removal of much of the floor in the forward cabin area. The degree of damage was consistent with the aircraft having struck the ground at a typical cruising speed and attitude. The fact that the fuselage had come

to rest facing back along the track suggested that the wing contact with the ground had resulted in a horizontal cartwheel manoeuvre. When all the wing structural parts eventually became available for inspection, it was found that both wings had been damaged to a similar degree; it was thus not possible to conclude in which direction the aircraft had rotated.

The left wing, which, as noted earlier, was almost complete, had come to rest inverted. The left main wheel was in its retracted position and the flaps were also retracted. There was a strong smell of fuel and the snow in the immediate area was stained with the characteristic blue colour of Avgas.

The accident site was close to the Aviemore ski area, with the main wreckage lying approximately 500 m south of the top station of the funicular railway. Access was thus relatively straightforward and one of the tracked vehicles used for piste preparation was used to recover the main wreckage to the base of the mountain. The remainder of the wreckage was gathered over the following weeks as the snow and ice thawed; all of it was ultimately delivered to AAIB's facility at Farnborough for a more detailed examination.

Examination of the aircraft

The propeller blades had all been bent during the impact, with the tips having been heavily scored as a result of contact with the rocks on the ground. In addition, the blade pitch change mechanism in the hub was broken. The nature of the damage indicated that the engine had been developing power at impact although it was not possible to quantify this.

Examination of the engine showed it to be in good condition, consistent with a recent overhaul. There were no significant combustion deposits on the pistons

or cylinder heads, and the spark plugs were normal in appearance. The oil filter was found to be clean.

The engine driven fuel pump was stripped and found to be in good condition, with the rubber gasket intact. Some of the fuel lines had remained primed with fuel. The vacuum pump, which powered the gyroscope within the artificial horizon, and which was mounted on the accessory gearbox, was examined and found to be functional.

The disruption that had occurred to the forward cabin area had resulted in the complete detachment of the instrument panel. The instruments were all registering their normal, power off indications, thus little useful information could be gained from them. However, it was noted that the altimeter subscale was set at 1021 mb, which was the regional QNH setting at the time of the accident.

Elsewhere in the cabin it was noted that the flap operating lever was in its lowest detent, which corresponded to the flaps retracted position. The pilots harness consisted of a lap belt and shoulder restraint. The webbing showed evidence of distress where it passed through the lap buckle; however, the shoulder strap was in pristine condition, suggesting that it was not fastened at the time of the accident. Examination of the flying control system revealed no evidence of a pre-impact failure or disconnect.

The lack of documentation prevented the compilation of a detailed history of the aircraft. However, it had achieved comparatively few flight hours since being repaired following an accident, with the same pilot, at Wolverhampton airfield in June 2005 (see AAIB Bulletin 10/2005). The engine overhaul formed part of this repair.

The pilot

The pilot qualified for his Joint Aviation Authorities (JAA) Private Pilot's Licence in August 2003, valid until August 2008. At the same time, he was issued with a Single Engine Piston (Land) (SEP(land)) rating which was valid for two years. In February 2004 he was issued with a night qualification (aeroplanes). This was valid for life and enabled him to act as pilot in command of an aeroplane at night. In September 2006 he was issued with a Federal Aviation Administration (FAA) PPL. This was *'issued on [the] basis of and valid only when accompanied by United Kingdom pilot license [sic] ... All limitations and restrictions on the United Kingdom license apply.'*

The pilot did not hold a qualification to fly in visibility of less than 3 km or out of sight of the surface; however, he had completed a course to qualify for an Instrument Meteorological Conditions (IMC) rating in 2004. This included 20 hours of instructional flying with sole reference to instruments. The pilot then successfully completed the flight test for the rating in April of that year but his application for its issue was not received by the Civil Aviation Authority until April 2005, by which time the validity of the test had expired. Subsequently, he was known to have flown in cloud on occasion. During a flight from Perth to Wolverhampton in 2006 the aircraft he was flying entered cloud, encountered icing conditions and the pilot diverted to Edinburgh Airport.

Records show that by June 2005 the pilot had accrued a total of 340 hours, of which 126 hours were on the Piper PA-32R-300. Following the accident, his logbook was recovered from the aircraft but was in poor condition. There was evidence that in September 2006 he flew a Piper PA-28 Warrior II from Florida, USA to the UK.

There were also entries for instrument flying training in a Cessna 172 at Winter Haven's Gilbert Airport, Florida, USA, in January and February 2007. His last flight was recorded as being in the UK in a Piper PA 28 on 21 April 2007. Due to the state of the log book it was not possible to verify the date of his most recent SEP (Land) revalidation.

The pilot held a JAA Class 2 medical certificate which was valid until June 2008.

Procedures

The accident flight was being flown VFR outside controlled airspace, in accordance with the Rules of the Air Regulations 2007. For an aircraft flying in that airspace, between Flight Level (FL) 100 and 3,000 ft amsl, at an indicated airspeed of 140 kt or less, the Rules state that it:

'shall remain at least 1,500 metres horizontally and 1,000 feet vertically away from cloud and in a flight visibility of at least 5 km.'

The pilot held a Private Pilot's Licence. The Air Navigation Order 2005 states:

'He shall not... unless his licence includes an instrument rating (aeroplane) or an instrument meteorological conditions rating (aeroplanes), fly as pilot in command of such an aeroplane on a flight outside controlled airspace when the flight visibility is less than 3 km... or out of sight of the surface.'

The pilot was in receipt of a Flight Information Service (FIS) from ATC. The Manual of Air Traffic Services (MATS) Part 1 stated that:

'a FIS is a non-radar service supplied, either separately or in conjunction with other services, for the purposes of supplying information useful for the safe and efficient conduct of flights. Under a FIS the following conditions apply: a) Provision of the service includes information about weather, changes of serviceability of facilities, conditions at aerodromes and any other information pertinent to safety....'

Also,

'the controller may attempt to identify the flight for monitoring and co-ordination purposes only. Such identification does not imply that a radar service is being provided or that the controller will continuously monitor the flight.'

Under a FIS the pilot was responsible for his own navigation, collision avoidance and terrain clearance.

The aircraft was not cleared for flight in icing conditions.

Discussion

Evidence from the accident site indicated that the aircraft was in a nominally level attitude and at a typical cruising speed when it struck rising ground. Subsequent examination of the wreckage indicated that the engine was delivering power and that the aircraft was intact and serviceable prior to impact.

The pilot did not hold an IMC rating; however, in 2004 he had successfully completed the syllabus and passed the flight test and examination for the rating. Due to the delay in his application reaching the CAA, the validity of the flight test had expired. There was also evidence of some more recent instrument flying instruction in 2007

in the USA. The last entry in his logbook was for an SEP (Land) flight in April 2007. Owing to the state of the logbook, it was not possible to verify the date of his most recent SEP (Land) revalidation.

The pilot was flying VFR, under a FIS from ATC. This implied that, at an altitude of 4,000 ft amsl, he was clear of cloud, in visibility of at least 5 km and responsible for his own navigation and terrain avoidance. When he commenced the descent from 8,300 ft amsl to 4,000 ft amsl, the aircraft was about 6 nm north of Cairn Gorm. During the descent the aircraft appears to have circled to the left before continuing on its original track in the direction of Inverness Airport. Why it orbited is unclear. When it was within 15 nm of Inverness Airport, and the highest ground (elevation of 2162 ft amsl) was 5 nm to the west of its track, the aircraft turned left through 180° and flew back towards higher terrain. The pilot did not respond to radio calls from early in the descent until he was established on the south-south-easterly track, approximately 10 nm from Cairn Gorm.

The Met Office aftercast and the pilot's report of severe weather and icing suggest that, by then, he was flying in very challenging conditions. This seems to have prompted his decision to divert to Aberdeen, twice the

distance to Inverness and with higher ground en route. The difficulty of the situation was compounded by radio problems. Having advised ATC that he was flying VFR, it is not clear when the pilot first encountered cloud. He was not qualified to fly in such conditions but had some experience of doing so. However, the previous day, in cloudy conditions he had become unsure of his position and this may have influenced his request for a vector to Aberdeen. In addition, requesting the weather conditions at Aberdeen would have increased his workload even further.

The aircraft was not cleared for flight in icing conditions and it seems to have climbed only about 400 feet during the last seven track miles before it struck Cairn Gorm, approximately 150 feet below the summit. This suggests that the pilot may have been attempting to climb above the high ground. Witness reports of the conditions at the time also suggest that the pilot would not have seen the terrain ahead of him in sufficient time to avoid the impact, which proved fatal. The severity of the pilot's injuries, in particular to his head, may not have been as great had he been wearing his shoulder restraint, in addition to his lap strap. However, although considered unlikely, it was not possible to determine whether the accident would have been survivable had he done so.