

No: 6/92

Ref: EW/C92/2/2

Category: 1c

Aircraft Type and Registration: Piper PA-28R-200 Cherokee Arrow II, G-IPJC

No & Type of Engines: 1 Lycoming IO-360-C1C piston engine

Year of Manufacture: 1974

Date & Time (UTC): 13 February 1992 at 1831 hrs

Location: Skiddaw, Near Keswick, Cumbria

Type of Flight: Private

Persons on Board: Crew - 1 Passengers - None

Injuries: Crew - Fatal Passengers - N/A

Nature of Damage: Aircraft destroyed

Commander's Licence: Private Pilot's Licence with IMC rating

Commander's Age: 36 years

Commander's Flying Experience: 139 hrs (of which 27 hrs were on type)

Information Source: AAIB Field Investigation

History of the Flight

The pilot involved in this accident obtained his PPL Group A in 1990. During 1991, as a result of an intermittent medical condition, his Class 3 Medical Certificate was reissued with a standard safety pilot condition, meaning that the privileges of the licence could only be exercised in an aircraft fitted with dual controls, and whilst carrying a qualified safety pilot. In order to remove this condition, after a course of treatment, regular medical monitoring was carried out over a six month period. During this time the pilot initially refrained from flying, but then took the opportunity to undertake training courses, including dual flight training, for the IMC and Night Ratings. The IMC Rating was completed, and issued by the CAA in January 1992. During February 1992, the CAA Medical Branch reissued the Class 3 Medical Certificate, having removed the safety pilot condition. The pilot was thus able to fly solo, and completed the solo flying requirement for the Night Rating. The paperwork to support this application was then forwarded to the CAA Licensing Department.

In the meantime, the pilot planned a flight from Stapleford Tawney aerodrome to Glasgow Airport, intending to route via the Brookmans Park, Gamston and Dean Cross VOR facilities, thence direct to Glasgow. The purpose of the flight, in addition to exercising the solo privileges of the licence after a

significant period, was to transport several boxes of advertising materials to Glasgow, in support of his sales promotion project. Around 1300 hrs on the 13th February, from his office in central London, the pilot obtained the Airmet forecast for the Scottish region, along with the TAF and METAR for Stansted and Glasgow Airports. The pilot then travelled to Stapleford aerodrome to continue his flight planning. The aircraft, which was operated by a local flying club, was due to arrive at Stapleford by 1500 hrs from its previous flight, but was later than planned. Meanwhile, the pilot had some discussion about the proposed flight with his flying instructor, who had conducted most of the training for his IMC and Night Ratings. As a result of these discussions, the flight routing was amended slightly, departing from Stapleford, via Brookmans Park VOR, to Barkway VOR, then direct to Gamston VOR and overhead Leeds Bradford Airport, then direct to Dean Cross VOR, in order to avoid the controlled airspace surrounding Luton and Manchester Airports. Certain aspects of the weather situation were discussed, including selection of Flight Levels, and the possibilities of airframe icing and mountain wave activity in the vicinity of high ground. Also discussed was the fact that the flight, the duration of which was quoted by the pilot to be "under three hours", would continue into the hours of darkness.

The pilot had planned the route using standard half million scale aeronautical topographical charts, although those recovered after the accident were not the current editions, and did not show the recently introduced Maximum Elevation Figures (terrain and obstacle data for each half degree of latitude and longitude). Track and distance information was recorded on a proprietary brand of A5 size Radio Navigation Flight Log, to be used in conjunction with the pilot's kneeboard. Also recorded were details of the radio facility 3 letter identification codes, their morse equivalents, and the Flight Levels at which the pilot intended to fly on each sector, along with the distance of each turning point from en route DME facilities. On this particular flight log, there was no provision for the recording of Minimum Safe Altitude for each leg of the flight. No evidence has been recovered of any calculation of Minimum Safe Altitudes, nor of any calculations to take account of wind effect on track or groundspeed. However, the pilot's navigation computer was recovered, and revealed that the wind vector set up corresponded to that of the 2000 feet wind from the Southern Airmet forecast, which was available at the aerodrome prior to departure. At the bottom of the flight log were written several communications frequencies, and a note "G-IPJC - IFR Flight, request LARS". No ATC flight plan was filed.

The aircraft arrived at 1530 hrs. To facilitate a quick turnround, the flying instructor gave assistance with loading the aircraft, and noted that most of the boxes were loaded on the rear seats. A small number of light packages were put in the luggage area, aft of the rear seats. Subsequent checking of an identical batch of packages found their total weight to be 219 kg. The aircraft was refuelled to full tanks (40 gall imp). The pilot was advised to depart from Runway 22 in order to have the benefit of a

longer Takeoff Run Available. The aircraft was subsequently observed to be airborne in approximately half of the available distance. Based on these loading figures, it is estimated that at the time of the accident, the aircraft was loaded to approximately 26 kg below its maximum permissible weight, and was within the permitted centre of gravity limits.

The first radar return from the aircraft occurred at 1617 hrs turning left after takeoff from Stapleford, and continued towards the Brookmans Park VOR. At 1625 hrs, the aircraft contacted Luton Approach Radar and reported level at 2400 feet QNH (1008 mb). It was radar identified as being inside Stansted's controlled airspace, which has a base of 1500 feet in that area. Radio contact with Stansted Approach Radar was established at 1627 hrs, and the aircraft was given a radar information service. After passing Brookmans Park VOR the aircraft received some navigational assistance to reach Barkway VOR, crossing this beacon at 1637 hrs. The aircraft then set course for Gamston VOR, and climbed to FL45 (4500 feet on 1013 mb), reporting VMC at that level at 1642 hrs. The flight progressed along the planned track in contact with Wyton and Cottesmore Radars for Lower Airspace Radar Service (LARS). Handover to Waddington Radar followed, and at 1709 hrs the pilot requested descent to get below cloud, finally reporting level at 3400 feet (Barnsley Regional QNH, 1001 mb) two minutes later. The pilot enquired whether the controller had any information about the level of the cloud tops, but was told that none was currently available. He then descended to 2500 feet, reporting level at 1717 hrs. Sunset was at approximately 1715 hrs.

The aircraft was handed over to Finningley Radar and, shortly after passing Gamston VOR, the pilot requested a climb to FL65. Finningley Radar approved this initially, but as the aircraft passed FL40 in the climb, it was requested to stop at FL55, which was the base of airway B1 in the vicinity of Upton reporting point. Meanwhile, the Finningley controller negotiated a procedural crossing clearance with Manchester Centre for the B1 airway, which was approved at FL60. This clearance was passed to, and accepted by, the pilot and the aircraft crossed airway B1 uneventfully at FL60. On entering the airway, 'JC' was handed over to Leeds Bradford Approach control for radar service. On approaching the Leeds Bradford Airport overhead, at 1744 hrs, the controller suggested that if the pilot wished to climb to FL65, then a radar service would be available from Pennine Radar. The pilot agreed to this and, shortly after passing overhead the airport, requested information on the upper winds. These were passed as being 290°/30 kt at 5000 feet, and a stronger 300°/40 kt at 2000 feet. Some nine minutes later, the pilot requested the latest weather report for Glasgow. The 1720 hrs weather was passed as 260°/18 gusting 30 kt, visibility over 10 km, recent showers, one okta Cumulus cloud base 1800 feet, temperature +4 °C, QNH 1000 mb. The pilot's reply to this suggested that he was relieved that conditions were going to improve.

Handover to Pennine Radar occurred at 1759 hrs, and at 1805 hrs the pilot requested descent to FL45, reporting at that level seven minutes later. The aircraft was passed to Scottish Control (East) at 1821 hrs, when approximately 27 nm south east of the Dean Cross VOR. Although a radar squawk (code 5074) was allocated and set by 'JC, formal identification did not occur immediately. At 1824 hrs, the pilot requested descent to FL35, "to get out of some rough weather", and enquired as to whether that level would be clear of any obstacle/safety altitude. The controller requested the aircraft's present position, to which the pilot replied that he was tracking on the Dean Cross VOR but that his DME was not giving any indication of distance, so he was unsure of position at that moment. 'JC was requested to squawk ident, and was positively identified on the 133° Radial from Dean Cross, at a range of 16 nm. The pilot repeated his request for descent "to get below this weather", and "descent below Flight Level 40". At 1826 hrs, the controller replied that he was not able to give terrain information in that area, as he was not equipped to do that. The pilot replied that he understood. Subsequent replay of the radar recording showed that the aircraft commenced a descent shortly after this exchange. A diagram showing the SSR Transponder Mode C altitude encoding data received at the Great Dun Fell Radar from 'JC, and the correlation with radio transmissions, is included at Fig.1.

The East Scottish Sector controller at the time of the accident was a trainee, being supervised by a senior controller, and a procedural controller was also present on the position, which was described as moderately busy. Over the ensuing four minutes, a topographical chart was obtained at the position, and at 1830 hrs the controller passed G-IPJC's position as being on the 130° Radial from Dean Cross, at a range of 9.5 nm, and that it was believed there was high ground in the area up to 3054 feet. The pilot acknowledged this with the aircraft call sign, the transmission of which was interrupted before the end of the last word. The controller then suggested that 'JC climb to remain in radar contact and to keep it above the high ground. No response was heard at the Scottish Centre to this message. However, the pilot of another aircraft on the same frequency, at high altitude, attempted to relay the suggested climb message to 'JC, but received no response. The controller noted that the radar return from 'JC had disappeared, approximately 8 nm south east of the Dean Cross VOR. Several subsequent relay attempts were made to contact 'JC, with no response. The Rescue Coordination Centre at Pitreavie was then informed, and a search commenced for the aircraft.

Initially, Search & Rescue Helicopters were deployed, and the local area Mountain Rescue Teams commenced a ground search for wreckage in several likely areas. An RAF Mountain Rescue Team was deployed from RAF Leeming, arriving in Keswick at approximately 2120 hrs, and commenced searching shortly afterwards. The first items of wreckage were found near the summit of Skiddaw at approximately 0145 hrs, followed by the main wreckage site nearby.

Examination of the wreckage

The aircraft had struck rising ground and had come to rest some 30 feet below the summit ridge on the eastern flank of Skiddaw, with the disposition of the wreckage indicating that the impact attitude had been nominally straight and level, on a track of approximately 328° magnetic. The hillside sloped upwards towards the west, such that the first part of the aircraft to contact the ground had been the left wing tip. This had had the effect of yawing the aircraft to the left, bringing the nose into heavy contact with the ground. The aircraft slid diagonally up the hillside for a total distance of about 40 yards; marks in the snow indicated that it then slid sideways down the slope for about five yards before finally coming to a halt. The ground was covered with scree and larger rocks, with the result that the forward part of the cabin floor was almost torn out. The left hand cockpit sidewall was similarly damaged and the left wing had been torn off, remaining attached to the fuselage only by the aileron control cables.

It was established that the flaps and landing gear were in their retracted positions, and that the aircraft had been structurally intact prior to impact. Although the location of the wreckage precluded a detailed examination of the flying controls, it was concluded that any failure would have caused an impact other than in the previously noted straight and level attitude.

No fuel was found in the tank in the left wing, although the fuel lines had been severed in the impact. The tank in the intact right wing was approximately 75% full of fuel. The fuel selector, located on the left hand cockpit sidewall, appeared to be positioned to the left tank, although the degree of disruption in this area prevented positive confirmation of this. The instrument panel had sustained considerable damage in the impact with the result that many of the readings were meaningless. It was established however that the main altimeter subscale was set to 1013 mb, the second altimeter subscale was set to 1005 mb, and that the engine tachometer needle had stuck at an indication of 2200 rpm. Comms 1 was the "active" radio, as selected by the station box, and was found to be tuned to 124.5 MHz, the East Scottish Sector frequency. Navs 1 and 2 were selected to VOR frequencies 115.2 (Dean Cross) and 115.4 MHz (Glasgow) respectively. The DME was also selected to 115.4 MHz (Glasgow), and the transponder code was 5074 (as allocated by Scottish Centre). Of the switch positions, it was noted that the pitot heat, fuel pump, master switch and anti collision beacon had all been selected ON. It was also noted that the engine alternate air supply had been selected. The throttle and propeller rpm levers were found close to their fully forward positions, which although credible, were not necessarily indicative of their pre-impact positions due to the likelihood of movement of control cables and linkages during the impact.

The pilot's harness was of the lap and diagonal type, and it was found that the lap restraint had failed close to the floor attachment on the right hand side. This had allowed the pilot to be released from the harness during the impact sequence and be thrown forwards and to the right against the instrument panel.

The propeller, which had become detached during the impact, had suffered considerable damage to the blades, with considerable chordwise scoring. This indicated that the engine had been developing significant power at impact. In an attempt to refine this further, the propeller, which was of the constant speed, variable pitch type, was taken to AAIB's facility at Farnborough for a strip examination. Witness marks made by the pitch change lugs of each blade on the preload plates of the opposing blade, suggested that the blades had been approximately 6° away from the fine pitch stop at the time of the impact. Information from the propeller manufacturer indicated that for a typical airspeed, the as-found blade angle was consistent with the engine developing cruise power (as opposed to climb power) at the time of impact. The only untoward feature noted during the strip examination was a sediment in the quantity of oil that remained in the hub. Analysis indicated that the main constituent of the sediment was lead bromide and was likely to have originated from fuel additives. It was not considered that this would have impeded the operation of the propeller.

Documentation relating to the aircraft indicated that it had been maintained in accordance with the LAMS schedule.

Weather considerations and Altimetry

An aftercast for the Keswick area indicated that, at the time of the accident, a moist and fresh to strong unstable westerly airflow covered the Lake District. The visibility was generally 30 km, but falling to 3500 metres in occasional showers of rain or hail, with isolated heavier showers. Hill fog patches were also forecast. Scattered to broken Cumulus/Stratocumulus cloud, base 1800 feet, tops around 4500 feet, with scattered Stratocumulus base 6000 feet, tops 7000 feet, and isolated large Cumulus or Cumulonimbus clouds, base 1500 feet, tops 10000 feet were forecast. The freezing level was expected to be around 3000 feet. Winds were forecast to be 270°/20 kt at the surface, and 280°/30-35 kt up to 5000 feet, with high relative humidity. Mean Sea Level pressure (QNH) was 1004 mb. With the strong surface wind and mountainous terrain, moderate or severe low level turbulence was forecast.

The Airmet forecasts contained warnings of moderate icing and turbulence in cloud. The situation was confirmed by the pilot of a commercial aircraft which was climbing out of Leeds Bradford Airport on a route taking it just to the east of the accident site. He reported approximately 6/8 cover of thick

cumulus cloud, base around 1000 feet, tops around FL90, appearing to be thickest towards the West coast and the Lake District, and took action to avoid areas of weather returns that were showing on his aircraft's weather radar.

G-IPJC was not equipped with weather radar, nor approved for flight in icing conditions, having no ice protection equipment other than a pitot heater and an alternate engine induction air system. The static vent on this type of aircraft is integral with the pitot head, and therefore would have been heated by the pitot heater. The pilot, although having some 27 hours experience on this aircraft up to the time of the accident, had not previously operated it at night. The aircraft was fitted with instrument panel lights, and a red map light. Contour shading of high ground on topographical charts becomes less marked when viewed under red light. A torch was subsequently recovered from the pilot's brief case. A second altimeter was fitted in this aircraft, located on the far right hand side of the instrument panel, but no evidence has been obtained that the pilot had ever used it on previous flights.

At the time of the initial call to Scottish Control requesting descent out of FL45 to get out of rough weather, the aircraft was some 5 nm directly downwind of the Helvellyn peak (3116 feet AMSL) which, in the strong wind conditions prevailing, would be expected to generate moderate to severe turbulence and cloud formation. The pilot reported a lack of DME indication at this stage. Intervening terrain between the aircraft and the ground station would prevent "line of sight" reception of DME signals. Inspection of the DME controller in the wreckage showed it to be tuned to 115.4 MHz, the Glasgow frequency, whereas the Dean Cross frequency was 115.2 MHz.

The local QNH at the time of the accident was 1004 mb. Therefore, when set to 1013 mb, the aircraft's altimeter would have been over-reading its true altitude by 243 feet (1 mb is equivalent to approximately 27 feet altitude). Radar data indicated that the aircraft descended to FL35 (1013 mb), which is equivalent to 3257 feet AMSL (QNH). The summit of Skiddaw is 3055 feet AMSL. However, the final north-westerly track of the aircraft brought it close to the summit of Skiddaw on the downwind side. Given the strong winds, moderate to severe downdraughts and turbulence would be expected in the lee of such terrain.

The final contact with 'JC, from the Great Dun Fell Radar recording, occurred at 1830 hrs and 40 seconds, the final radar position being approximately 250 metres from the accident site. Radar returns received at SSR sites such as this are from transponder equipped aircraft only, therefore no returns from high ground or weather are recorded.

The Flying Club's IMC Rating flight training record for this pilot was not available, having been destroyed prior to the investigation. CAP53 states that such records are to be kept for a period of two years following completion of the training.

Safety Recommendations

As a result of this accident, the following safety recommendations have been made to the CAA:

92-29 The CAA conduct an urgent review of altimeter setting procedures, with a view to raising the transition altitude outside controlled airspace to provide adequate clearance above the highest terrain within the UK.

92-30 The CAA publish a recommended standard for navigation logs, as currently published for commercial operators in CAP360/450.

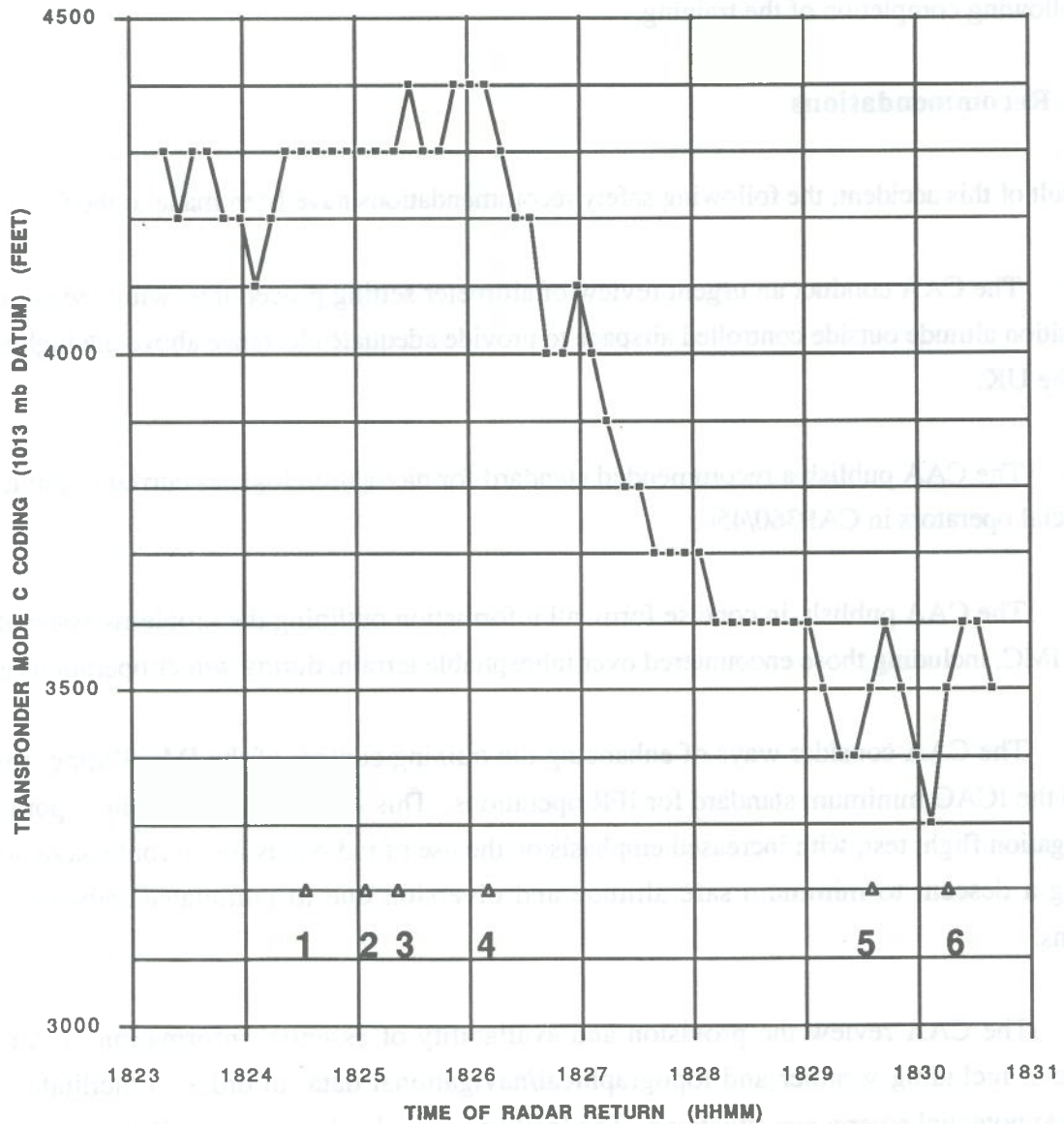
92-31 The CAA publish, in concise form, all information outlining the problems associated with flight in IMC, including those encountered over inhospitable terrain, during winter operations etc.

92-32 The CAA consider ways of enhancing the training content of the IMC Rating, to bring it closer to the ICAO minimum standard for IFR operations. This should include the incorporation of a full navigation flight test, with increased emphasis on the use of radio aids for en route navigation, and including a descent to minimum safe altitude and diversion due to (simulated) adverse weather conditions.

92-33 The CAA review the provision and availability of essential information to Air Traffic Controllers, including weather and topographical/navigational data, in order to facilitate a timely response to potential emergency situations. The facilities available by use of the Distress & Diversion Cell in these situations should also be emphasised to both pilots and controllers.

92-34 The CAA re-emphasise to pilots of general aviation aircraft that the allocation of a transponder code does not, in itself, mean that a radar service is being provided, unless specifically notified as being so.

G-IPJC 13.02.92 GREAT DUN FELL RADAR DATA



- 1 G-IPJC REQUESTS DESCENT TO GET OUT OF ROUGH WEATHER
- 2 NO DME INDICATIONS FROM DEAN CROSS - UNSURE OF POSITION
- 3 RADAR IDENTIFIED DCS 133°/16 nm
JC REQUESTS DESCENT BELOW FL40 TO GET BELOW WEATHER
- 4 ATC REPLY - NO IDEA OF TERRAIN IN THAT AREA - NOT EQUIPPED TO DO THAT
- 5 ATC - POSITION DCS 130/9.5 - HIGH GROUND IN THE VICINITY UP TO 3054 FEET
"TO KEEP YOU WITHIN RADAR COVERAGE AND ALSO ABOVE THE HIGH GROUND,
SUGGEST YOU START A CLIMB AGAIN"
- 6 OTHER AIRCRAFT RELAYS SUGGESTED CLIMB CALL

FIGURE 1. G-IPJC MODE C DATA AND RADIO TRANSMISSION CORRELATION