No: 1/84 Ref: EW/C852

Aircraft type and registration:	Cessna F150M G-BFRP (light single-engined fixed wing aircraft)
Year of manufacture:	1978
Date and time (GMT):	25 October 1983 at 1936 hrs
Location:	Edale, Derbyshire
Type of flight:	Private (training)
Persons on board:	Crew — 2 Passengers — Nil
Injuries:	Crew — 2 (minor) Passengers — N/A
Nature of damage:	Aircraft destroyed on ground impact
Commander's Licence:	Private Pilot's Licence
Commander's Age:	39 years
Commander's total flying experience:	2500 hours (of which over 1000 were on type)

The aircraft was returning to Manchester at night, towards the end of a training flight. It was based at Manchester and the instructor on board was familiar with the area in which he was flying. There was a stable westerly to north-westerly airflow over the area, with patches of St/Sc between 1500 and 3000 ft.

At 1916 hrs, when some 15 nm SE of Manchester, the pilot was cleared to enter controlled airspace Special VFR on a heading of 360° (M), not above 3000 ft. He was subsequently offered radar vectors to an ILS on runway 24, which he accepted. At 1922 hrs, in reply to a request from the Manchester approach controller, he confirmed his heading as 360° (M). At 1926 hrs he was asked to take up a left-hand orbit to increase his separation from other traffic. During this orbit the controller checked the identification of the aircraft on his radar. He then advised the pilot that he seemed to be tracking 030° (M) when steering 360° (M), and passed to him a new heading of 320° (M).

The radar plot of the aircraft shows that for the 10 minutes prior to 1926 hrs the aircraft had, in fact, flown a track of 036° (M) at an average groundspeed of 7 knots, indicating a wind at 3000 ft of approximately 290°/45 knots. This track had carried the aircraft east of Buxton, to a position 5 nm south-south-east of Kinder Scout, the highest point of the Derbyshire Peak District, with an elevation of 2088 ft. The left hand orbit had carried the aircraft a further 2 miles to the east, and the new heading put the aircraft on a track which would take it to the lee side of Kinder Scout.

Between 1928 hrs, when the aircraft steadied on 320° (M), and 1933 hrs, the aircraft tracked 350° (M) at an average speed of 46 knots, again indicating a wind of approximately 290°/45 knots. At 1933 hrs the controller passed a new heading of 300° (M), adding that this heading should bring the aircraft onto the centreline at about 7 or 8 miles from touchdown and that its present range was 14 miles. At this time the aircraft was still at 3000 ft, approximately one mile north-east of the village of Edale, tracking into wind and directly towards ground rising steeply from 1000 to 2000 ft.

After some 90 seconds on the heading of 300° (M), the controller passed a further heading change of 280° (M), which the pilot acknowledged. 30 seconds later, the pilot reported that he was in a severe downdraught and was unable to maintain height; thereupon the controller instructed him to resume his own navigation to keep clear of high ground. A further 30 seconds elapsed before the pilot advised the controller that he was 'going down at 1000 fpm' and declared an emergency.

The pilot's own report after the accident stated that on the lee side of the hills he encountered a strong downdraught in smooth air and that, despite the use of full power and best rate of climb speed, he was unable to maintain height. On being carried down through 1840 ft, the air became extremely turbulent and the rate of descent increased to 1000 fpm. He was aware of the loom of hills ahead and was able to reduce airspeed to 50 to 55 knots before the aircraft struck a steep upslope at 1650 ft amsl, 1 mile north of Edale. The aircraft turned over on impact but both occupants suffered no more than severe bruising.

Air Traffic Control

The pilot was aware that he was flying on a Special VFR clearance and that he was not to fly above 3000 ft. For his part, the controller was satisfied that the pilot had sight of the ground because the latter had reported seeing the lights of Buxton at about 1923 hrs and, shortly afterwards, had reported that he was aware that the aircraft's track was affected by strong winds. The UK AIP (RAC 1-7, para 5.3) states that when operating on a Special VFR clearance the pilot must comply with ATC instructions and remain at all times in flight conditions which will enable him to determine his flight path and to keep clear of obstructions. Guidance for approach radar controllers given in CAP 390 states that for VFR and Special VFR flights terrain clearance remains the responsibility of the pilot, that radar vectors should not normally be given to either VFR or Special VFR flights and that, if such aircraft have to be vectored, it should be with the pilot's agreement. One implication of these rules is that, whilst on a Special VFR flight, if a pilot accepts radar vectors he nevertheless still remains responsible for his own terrain clearance.

The CAA are investigating the ATC aspects of this accident.

Meteorological Aspects

The nearest Meteorological Office Upper Air Reporting Station to the site of the accident is at Aughton, near Liverpool. Ascents from Aughton on 25 October showed a marked temperature inversion between 3000 and 5000 ft and, at 1800 hrs, measured the following winds:—

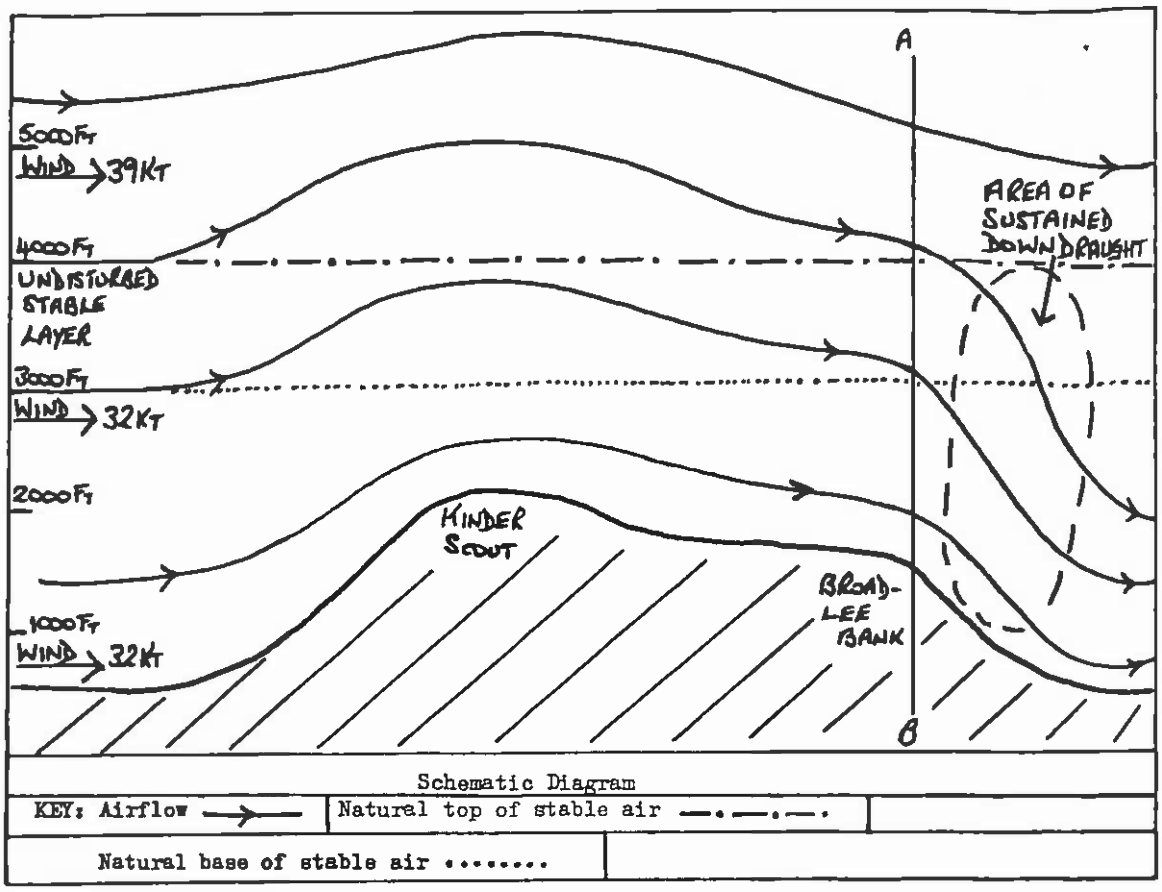
Height (m/ft)	Wind Velocity (°T/knots)
0/0	260/11
300/ 984	275/31
900/ 2953	265/32
1500/ 4921	295/39
2100/ 6890	295/34
3900/12795	290/18

A report from the Meteorological Office on conditions that day stated that the normal requirement for the production of mountain/lee waves, of a consistent increase of wind speed with height, did not exist. However, if the atmosphere below 5000 ft alone was considered, conditions existed which were ideal for mountain/lee waves to form. An inversion existed not far above the high ground, the wind direction was consistently at right angles, or nearly so, to the high ground and the wind showed some tendency to increase with height on the 1200 hrs and 1800 hrs ascents. The influence of the stable air above the inversion would tend to squeeze the air in the lower levels through a narrower band between the top of the high ground and the inversion, thus resulting in an increase in wind speed. The stable air itself would be forced upwards and, as it sank back over the leeside of the hills at line A B in the diagram, its vertical momentum would carry it below its natural level before stable conditions were restored. With these conditions in the lower atmosphere, there was a strong likelihood of severe downdraughts near the lee of the high ground. The attached diagram, illustrating these conditions, is reproduced by the permission of the Meteorological Office.

It is of particular interest that, although the radar recording of the aircraft's track showed the 3000 ft wind to be approximately 290°/45 knots, the surface wind at Manchester Airport, only 14 miles to the north-west (but on the up-wind side of the Pennines), was of the order of 280°/5 knots at the time.

The behaviour of airflow over and in the vicinity of mountains and the consequent hazards to aircraft were described in AIC 13/1975. It has been recommended to the CAA that this AIC should be reviewed and reissued.

CONDITIONS OVER KINDER SCOUT, 25 OCTOBER 1983



Schematic Diagram

KEY: Airflow → | Natural top of stable air —·—·—· | Natural base of stable air ·····