

ACCIDENT

Aircraft Type and Registration:	Reims Cessna F152, G-BJKY	
No & Type of Engines:	1 Lycoming O-235-L2C piston engine	
Year of Manufacture:	1981	
Date & Time (UTC):	21 March 2011 at 2000 hrs	
Location:	Ingleborough, North Yorkshire	
Type of Flight:	Training	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - 2 (Serious)	Passengers - N/A
Nature of Damage:	Aircraft destroyed	
Commander's Licence:	Commercial Pilot's Licence	
Commander's Age:	55 years	
Commander's Flying Experience:	1,615 hours (of which 400 were on type) Last 90 days - 22 hours Last 28 days - 7 hours	
Information Source:	Aircraft Accident Report Form submitted by the instructor and further telephone inquiries by the AAIB	

Synopsis

During a dual night cross-country navigation training flight the aircraft deviated from its planned track and flew into rising ground. The crew were seriously injured but survived the accident. Using a mobile phone, they were able to contact the emergency services and were rescued after an extensive search.

Background

The flight was part of the training towards a night qualification for a PPL holder with about 60 hrs flying experience. The route included pre-planned legs from Blackpool to Clitheroe followed by a practice 'diversion' to a nominated point. The instructor briefed the student

that he would provide him with the waypoint to divert to during the flight.

History of the flight

The aircraft departed Blackpool Airport in good visibility. The instructor reported that the first three planned legs of the exercise (see Figure 1) were completed satisfactorily and, during the leg to Clitheroe, he told the student that after Clitheroe he would like him to divert to Kirkby Lonsdale, a town which was often used by the flying school as a turning point during PPL VFR navigation training. The student plotted the diversion leg on his chart, calculated the wind-corrected heading and time for

the diversion leg and successfully identified Clitheroe. He then turned the aircraft onto the heading for Kirkby Lonsdale and climbed to the calculated safe altitude. The instructor could not recall the heading that the student had selected or the exact altitude flown but believed the latter was either 2,800 or 3,000 ft amsl.

The instructor reported that, initially, the student had some difficulty maintaining the intended heading but subsequently managed to regain it. He also stated that they could see nothing, describing the leg from Clitheroe as a “black hole”. He could not ascertain whether this was because they were in cloud. To back up their visual and dead-reckoning navigation, the instructor used the aircraft’s single navigation receiver to obtain bearings from the Wallasey (WAL) and Pole Hill (POL) VORs, to the south-west and south-east of the aircraft respectively. From these bearings, which were not plotted on the chart, he concluded that the aircraft was slightly to the right (east) of track. He reported that there was still nothing visible outside the aircraft. The instructor then saw some lights to the right of the aircraft and concluded that this was Ingleton, a small town which he had expected to see to the right of the planned diversion track. He confirmed this with a “rapid reading” of the VOR bearings.

From this point on, the instructor had limited recollection of the flight and the student could remember nothing. The instructor thought that he then asked the student to alter course on to a heading of about 300°M, towards lower ground, and commence a gentle descent to 2,000 ft amsl “to gain more ground visibility”. He believed that this altitude would enable them to maintain at least 1,000 ft clearance above the highest obstacle within 5 nm.

The instructor and student’s next recollections were of regaining consciousness after the aircraft had crashed on high ground. They had both sustained serious injuries

and remained with the aircraft which, although destroyed, did not catch fire.

Search and rescue

The instructor and student used a mobile phone to contact Blackpool ATC who then alerted the Distress and Diversion Cell (D&D) at NATS Swanwick. An extensive air and ground search was initiated, initially using the Lancashire Police Air Support Unit (ASU). The ASU was directed to the last known position of the aircraft which, based on radar data, was about 8 nm south of the crash site. The ASU was able to search the lower ground between Settle and Kirkby Lonsdale but considered it too hazardous to search the higher ground due to the weather and light conditions. The ASU crew were also aware that a Night Vision Goggle (NVG) equipped RAF Sea King SAR helicopter was en route and elected to leave the search of the high ground to them.

Meanwhile, the police used mobile phone location techniques in an attempt to pinpoint the position of the injured crew. However, in the rural location, the accuracy of these techniques did not significantly refine the search area.

Once in the search area, the Sea King crew phoned the injured crew and, over a period of about thirty minutes, the instructor directed them to his location, based on whether the helicopter was getting louder or quieter. At about 2330 hrs the instructor could see the lights of the Sea King. However, attempts to effect a rescue were thwarted by poor visibility and low cloud. Having located the crew to within a radius of about 300 m, the Sea King returned to its base.

At about 0010 hrs the Clapham Cave Rescue Team and the Kendal Mountain Rescue Team, using search dogs, located the wreckage and crew. When found, the crew

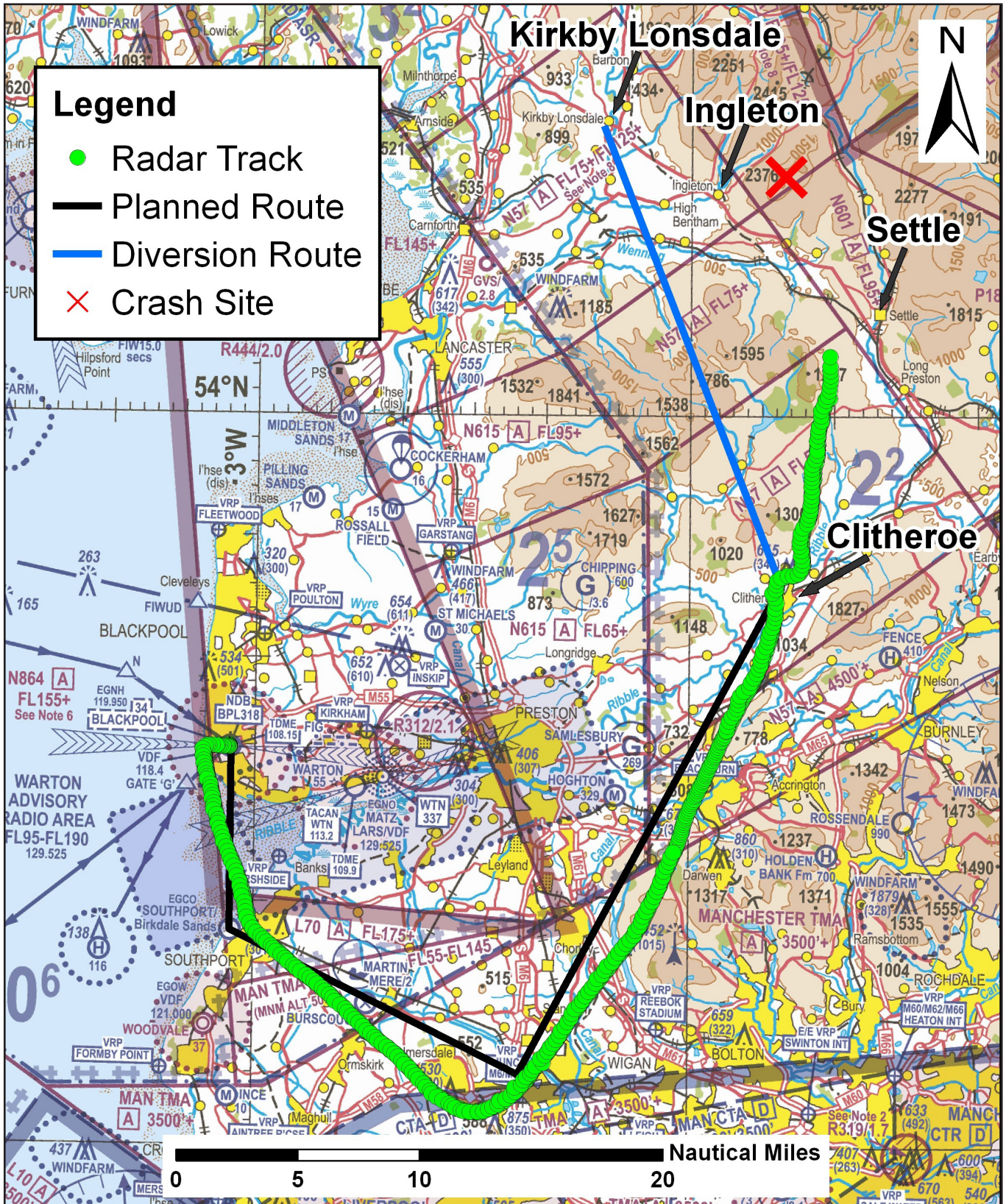


Figure 1

Reconstructed chart showing planned and actual aircraft track

were beginning to suffer from exposure, in addition to the serious injuries they had sustained in the accident. The crew were both wearing denim jeans and a shirt. In addition, the instructor had on a “relatively thick” jacket. They were carried, on stretchers, to the nearest vehicle access point and were admitted to hospital at 0530 hrs.

Meteorology

The UK Low Level Forecast (Metform 215), relevant to the time of the accident, forecast isolated areas of scattered or broken cloud with a base at 1,500 ft amsl. It also forecast a possibility of isolated hill fog.

In an aftercast, the Met Office calculated that the wind at 2,000 ft amsl would have been from 250° at 15 to 20 kt. This compared to the ‘planning’ wind of 220°/12 kt used by the instructor and his student.

On the evening of the accident, moonrise was at 2148 hrs and the moon was 97% full.

Radar data

The aircraft was equipped with a transponder but did not have an altitude reporting capability. A portion of the flight was recorded by three separate radars and was transposed on to a 1:500,000 chart (see Figure 1). The track information stopped about 4 nm south-west of the town of Settle, probably due to the aircraft being below radar coverage in the hilly terrain. This position was approximately 8 nm south of the accident site.

Accident site and wreckage

The accident site was located in an area of remote terrain at an elevation of approximately 1,970 ft, within 0.5 nm of the summit of Ingleborough (elevation 2,376 ft) (see Figure 2). It was 6 nm east of the direct track from Clitheroe to Kirkby Lonsdale, in an area noted for its lack of cultural lighting, 8 nm from Kirkby Lonsdale.

The accident site was 3.7 nm to the south of Whernside, elevation 2,414 ft, the highest point within 25 nm.

The aircraft’s insurers reported that, when they arrived at the site, the dome light, navigation lights and beacon switches were on. The landing light switches were off. The VOR Omni Bearing Selector (OBS) was set to 330° but it was not possible to determine the frequencies selected on the NAV and COM radios.

Flight planning

The night qualification for the PPL requires a minimum of one hour of dual night cross-country navigation flying. The instructor had briefed the student to plan a route from Blackpool Airport to Southport, then to the M6/M58 motorway intersection Visual Reporting Point (VRP) before routing to Clitheroe. The student calculated that the flying time for these three legs would be 28 minutes, in total, with the leg to Clitheroe being 13 minutes. Thereafter, the student was briefed that he would be instructed to conduct a diversion to a nominated point, to be specified when they were on the third leg to Clitheroe. The instructor was familiar with the route, having used it before, and had chosen it and the diversion, Kirkby Lonsdale, in part, to demonstrate the difficulties of night visual navigation in an area with few visible ground features.

Following the accident, a chart showing the planned route (replicated in Figure 1) and a wind reference of “220/12”, but no other markings, was recovered from the aircraft. Also recovered was a knee board with the pilot’s log for the flight legs to Clitheroe. The chart included a line joining Clitheroe and Kirkby Lonsdale.

The flight was being conducted under IFR, in VMC, at night. The route was planned, initially, at an altitude below 3,000 ft amsl, to remain clear of the Manchester



Figure 2

Accident site looking south

Terminal Manoeuvring Area (TMA). When the aircraft was north of the TMA, it was intended that it would be at an altitude that was 1,000 ft above the highest obstacle within 5 nm of the aircraft's track.

The distance from Clitheroe to Kirkby Lonsdale is 21 nm, on a track of 343°M. Settle is 12.5 nm to the north-north-east of Clitheroe and Ingleton is 17 nm to the north-north-west.

Approximately halfway along the direct track from Clitheroe to Kirkby Lonsdale, an aircraft would pass within 0.5 nm of White Hill, elevation 1784 ft. At Kirkby Lonsdale an aircraft would be 4 nm to the west of Gragareth, high ground which rises to an elevation of 2,057 ft amsl.

Procedures

Civil Aviation Publication (CAP) 393, *Air Navigation: The Order and the Regulations, Section 2, The Rules Of The Air Regulations 2007* state that an aircraft flying at night shall:

'(a) be flown in accordance with the Instrument Flight Rules [IFR] outside a control zone.'

IFR require that:

'An aircraft shall not fly at a height of less than 1,000 feet above the highest obstacle within a distance of 5 nautical miles of the aircraft unless: ... (d) the aircraft flies at an altitude not exceeding

3,000 feet above mean sea level and remains clear of cloud and with the surface in sight and in a flight visibility of at least 800 metres.'

They also require that:

'an aircraft in level flight above 3,000 feet above mean sea level or above the appropriate transition altitude, whichever is the higher, shall be flown at a level appropriate to its magnetic track.'

Levels (Flight Levels (FL)) appropriate to magnetic track above 3,000 ft (and below 19,500 ft) are referred to as quadrants. On a north-westerly track, the appropriate quadrants are 'even thousands of feet + 500 feet [on an altimeter pressure setting of 1013.2 hPa]'.

CAA Safety Sense Leaflet 3, *Winter Flying*, advises pilots to:

'Dress sensibly (you should spend some time outside whilst pre-flighting the aircraft), and have additional warm clothing available in case of heater failure or a forced landing.'

Safety Sense Leaflet 5, *VFR Navigation*, contains guidance which would have been applicable to this flight. On the subject of navigation aids, it states:

*'Radio aids and GPS are to assist visual navigation, **NOT** substitute for it.'*

CAA Safety Sense Leaflet 1e, *Good Airmanship*, gives the following advice under the heading *Lost*:

*'if any **2** of the items below apply to you, you should call for assistance quickly, **'HELP ME'**:'*

H High ground/obstructions – are you near any?

E Entering controlled airspace – are you close?

L Limited experience, low time or student pilot (let them know).

P Position uncertain, get a 'Training Fix' in good time; don't leave it too late.

M MET conditions; is the weather deteriorating?

E Endurance – fuel remaining; is it getting short?

It advises pilots to:

'Transmit first on your working frequency. If you have lost contact on that frequency or they cannot help you, then change to 121.5 MHz and use Training Fix, PAN or MAYDAY, whichever is appropriate (see CAP 413 'Radiotelephony Manual'). If you have a transponder, you may wish to select the emergency code, which is 7700. It will instantly alert a radar controller.'

Discussion

The evidence highlighted the aircraft's departure from its intended track and descent below a safe level, resulting in Controlled Flight into Terrain (CFIT).

The aircraft's track from Clitheroe to Kirkby Lonsdale should have been 343°M. However, the radar data indicated that it initially tracked east before turning left on to a track of approximately 009°M, maintaining this track for at least 9 nm. It is not clear why the aircraft did not follow the correct track (it was over 25° to the east of the intended track) and the crews' recollection of this part of the flight was incomplete. The light conditions were poor and there were few visible features, if any, that the crew could use to confirm their position and any track error.

In a candid report, the instructor later concluded that he made a “classic HF [human factors] mistake”, making the information available to him fit his assumption of their position. He deduced that the town they had identified as Ingleton was in fact Settle, which has terrain rising to the north-west. This is supported by the radar data.

The time to fly from Clitheroe to abeam Ingleton, en route to Kirkby Lonsdale, would have been approximately 35% longer than the time it should have taken to fly to abeam Settle. However, the aircraft’s initial track from Clitheroe, to the east, may have increased the time it took to reach Settle, adding to the confusion.

The gentle descent “to gain more ground visibility”, the forecast cloud conditions and the visibility experienced by the search and rescue helicopters suggest that remaining clear of cloud, with the surface in sight and in a flight visibility of at least 800 metres was difficult to achieve. Hence, remaining 1,000 ft above the highest obstacle within a distance of 5 nm of the aircraft would seem to have been appropriate.

Within 5 nm of Kirkby Lonsdale, 1,000 feet above the highest obstacle would have been 3,100 ft amsl, to the nearest 100 ft. IFR would require the aircraft to have been at a quadrantal, which in this case was FL045 (4,500 ft on an altitude setting of 1013.2 HPa). At that level, the aircraft would have been well above the highest obstacles within 5 nm of the aircraft’s track, both intended and actual. Whether the meteorological conditions at that level would have precluded the successful completion of the exercise is not known, but possible.

It appears that three of the items in the CAA Safety Sense Leaflet 1e list, under the heading *Lost*, were probably

present when the aircraft was near Settle. Namely, high ground/obstructions, position uncertain (although the instructor believed that he knew where they were, he had little information on which to base his position) and deteriorating weather. In those circumstances, a request for assistance on the ATC frequency in use, or 121.5 MHz, could have confirmed their location, identifying the inaccuracy in the crew’s navigation and enabling them to decide on the best level to fly.

The instructor surmised that the aircraft probably struck the gentle upslope of the surface at a groundspeed of approximately 90 kt. Having survived the accident, albeit with serious injuries, the crew were both beginning to suffer from the effects of exposure when they were eventually rescued. CAA Safety Sense Leaflet number 3, *Winter Flying*, provides advice on the clothing to consider taking on a flight. It was fortuitous that the crew had a mobile phone with them and were able to call for help from their remote accident site.

Conclusion

It was not possible to determine the navigation error that resulted in the aircraft being approximately 25° to the right of their intended track. The instructor acknowledged that he incorrectly identified the aircraft’s position, citing the human factors error in which a person makes the information available to them fit their assumption. This led to the instructor initiating a descent which he believed would be over lower ground and therefore safe.

The description of the meteorological conditions, both forecast and actual, indicate that, under IFR, it would have been appropriate for the aircraft to be at FL045 on the diversion leg to Kirkby Lonsdale. At this level, it would have been clear of any obstacles within 5nm of its intended or actual tracks. A call to ATC on the

frequency in use, or 121.5 MHz, could have confirmed the aircraft's position when it was near Settle. Based on that, the crew would have been able to refine their intentions.

The aircraft struck the surface at an estimated ground speed of 90 kt. The crew were both seriously injured but the outcome could have been worse.