ACCIDENT

Aircraft Type and Registration:	Reims Cessna F152, G-BFEK
No & Type of Engines:	1 Lycoming O-235-L2C piston engine
Year of Manufacture:	1977 (Serial no: 1442)
Date & Time (UTC):	2 February 2016 at 1320 hrs
Location:	Gloucestershire Airport
Type of Flight:	Training
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Right wing tip, propeller and engine
Commander's Licence:	Student pilot
Commander's Age:	53 years
Commander's Flying Experience:	27 hours (of which 26 were on type) Last 90 days - 14 hours Last 28 days - 5 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

Synopsis

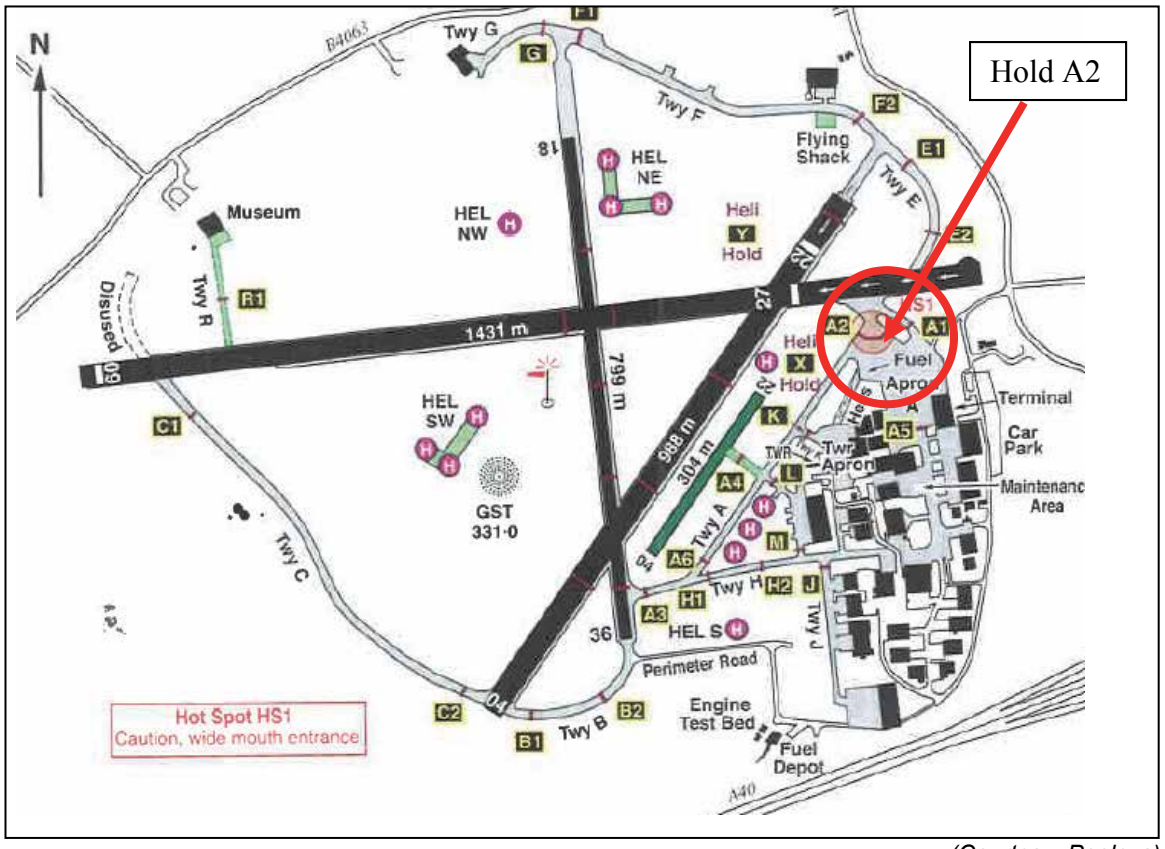
The student pilot of G-BFEK had been instructed to halt his aircraft at a holding point for Runway 27 at Gloucestershire Airport. After waiting for about two minutes, the aircraft suddenly tipped to the right, coming to rest on its right wing tip, right main wheel and propeller. An EC145 helicopter had completed a rotors-running refuel and, after obtaining ATC clearance, was hover taxiing behind the Cessna. Another helicopter, an R44, was on the ground at the nearby Avgas pumps, with rotors running. The EC145 pilot was aware of both the Cessna and R44 and followed a path that gave maximum clearance to both. It was estimated that he passed between two and three rotor diameters from the Cessna. It was concluded that the downwash from the EC145, perhaps exacerbated by the wind speed and direction, caused G-BFEK to tip over.

Circumstances

The pilot of G-BFEK, a Cessna F152, had recently conducted his first solo flight and subsequently had one session of consolidation solo circuits (dual to solo). On the day of the accident the pilot completed three dual circuits, which the instructor assessed were well executed in the slightly turbulent conditions. The wind was steady and at the time of the last landing was 270°/13 kt, which the instructor considered was suitable for solo flight. Accordingly he briefed the student to carry out up to three solo circuits.

After conducting power checks the pilot taxied the aircraft to the holding point at A2 (see Figure 1), to await clearance to enter Runway 27. He positioned the aircraft such that he

had vision of any aircraft on final approach. He further stated that he held the flying controls in a position commensurate with the wind direction.



(Courtesy: Pooleys)

Figure 1

Airfield layout, showing location of incident

The pilot was informed of a delay to his takeoff clearance due to a Cessna Citation in the circuit. After approximately 2 minutes and without any warning, the aircraft started to tip, pivoting on its nose and right main wheels, causing the propeller and right wing tip to strike the ground. The pilot looked to his left and saw a yellow helicopter in a low hover immediately upwind of his holding point.

G-BFEK came to rest on the right wheel, wingtip and propeller spinner, following which the pilot transmitted a PAN call informing the tower of his situation. He then shut down the fuel and electrics and, because of the attitude of the aircraft, vacated via the passenger door. Figure 2 shows the aircraft after it had come to rest.

The pilot was in no doubt that his aircraft had been blown over by wake turbulence from a helicopter that had passed behind him. He estimated that the distance between his aircraft and the helicopter was around 20 m.

(Photo: Gloucestershire Airport Ltd)

Figure 2

View of aircraft after the incident

The investigation

The airfield operator conducted an investigation into the event, gathering information from the flying school and the helicopter operator. The ATC R/T recordings were also examined. The helicopter was a Eurocopter EC145, which has a main rotor diameter of 11 m and had just conducted a rotors-running refuel from a bowser, on the large 'H' sign at the refuelling point on the apron. This can be seen in the satellite image at Figure 3. This is located approximately 30 m southeast of the corner of the gasoline fuel pumps installation, which occupies a square area with sides of around 15 m; this can also be seen in Figure 3.

Around the time of the incident a Robinson R44 helicopter was parked on the southwestern corner of the square, after refuelling, and had just started its engine. At 13:18:49 the Tower controller cleared the EC145 to air taxi to its hangar on the southern side of the airfield via Taxiway A. The R44 had also requested clearance to lift from the pumps for departure to the south. The controller observed the EC145 pass to the west of the fuel pumps and turn south and, at 13:19:48 instructed the R44 to follow it. At 13:20:05 the Cessna Citation pilot reported he was going around Runway 27 and additionally reported "AIRCRAFT ON ITS NOSE AT THE HOLDING POINT". At around this time the Approach controller had observed G-BFEK in its predicament and alerted the Tower controller; a ground incident was then declared.

The R44 was on a training detail and at the time the EC145 was requesting taxi clearance, the instructor was focussed on her student's actions. Her aircraft was facing west and, although she was unable to see the EC145, she was aware that it was somewhere behind her. She observed the helicopter pass to the right of her aircraft, north of the fuel pumps, with the main rotor blade tips possibly over the concrete square. She later commented

that she was relieved that her own main rotors were up at operating rpm, as the downwash from the EC145 may have caused problems. She was unaware of the incident involving G-BFEK until she heard a radio message from the Tower referring to it.

The EC145 pilot was aware of both G-BFEK and the R44 and maximised his separation from them by taxiing close to the north side of the pumps. He observed no adverse effects on either aircraft and received no information from ATC on the event. He commented that there was a strong westerly wind at the time with gusts of around 25-30 kt.

The approximate track of the EC145 is shown in Figure 3; this was based on an Internet-based Flight Tracking application. Whilst the accuracy cannot be guaranteed it accorded with the reports from all three pilots involved. From this it was concluded that the EC145 had, whilst hover taxiing, passed between two and three rotor diameters from G-BFEK. The Civil Aviation Authority (CAA) Safety Sense Leaflet 15, version C, notes that:

> *'Helicopters with rotors turning create a blast of air outwards in all directions, the strongest effect being downwind. This effect is not so significant when the helicopter with rotors turning is on the ground. It is most severe during hovering and hover taxiing, when the rotors are generating enough lift to support the full weight of the helicopter, and this creates the greatest downwash, out to a distance of approximately three times the rotor diameter.'*

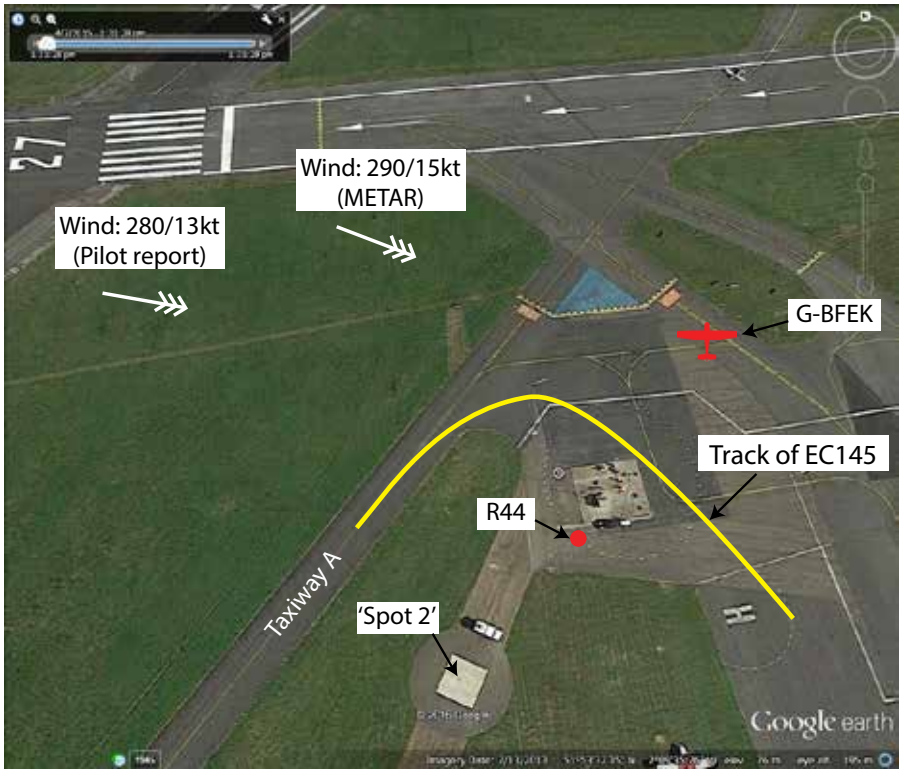


Figure 3

Satellite image showing approximate track of EC145 and positions of Cessna 152, G-BFEK, and the Robinson R44

The airfield operator's report also commented that the position of G-BFEK was typical of many aircraft when, having been given clearance to proceed to A2, they actually stop well short of the holding point.

Weather

The pilot of G-BFEK stated that the wind was 280°/13 kt at the time he reported ready for takeoff, and this is shown in Figure 3. However the METAR for the airfield at 1320 (the time of the accident) gave the wind as 290° at 15 kt (also shown in Figure 3),gusting 25 kt, with a strong wind warning in force. The METARS additionally showed that during the period 1020 to 1420 the wind veered from 240 to 300°.

Safety actions

The incident occurred in a congested part of the airfield that had already been identified as a 'Hot Spot', and is marked as such in Figure 1. The apron and taxiways are used by rotary and fixed wing traffic and, in addition to the two helicopter refuelling points that featured in this event, there are other frequently used helicopter landing sites nearby, including 'Spot 2', shown in Figure 3, and 'Spot 5', which is located just off to the right edge of the image in Figure 3, approximately 55 m from G-BFEK's holding point.

The airfield operator has implemented a number of changes, including not conducting rotors-running refuelling operations on the large 'H'. Restrictions on the use of Spots 2 and 5 include the stipulation that Spot 5 can only be utilised if there are no fixed wing aircraft holding at A2. There is likely to be a reduction in rotors-running refuelling operations as a result of these measures. Finally, fixed-wing operators will be encouraged to 'move up' at holding points in order to generate increased separation from nearby rotary traffic.

Discussion

The Cessna 152 was tipped over, most probably as a result of the main rotor downwash generated by the EC145 helicopter hover taxiing behind it at a distance of between two and three rotor diameters. The effects of the downwash may have been exacerbated by the wind speed and direction. The METAR indicated that the wind strength had increased during the elapsed time between the pilot's previous landing and the incident, with the direction having veered by around 10°. The gusts increased in strength during this period, although, with reference to Figure 3, the change in the average wind direction would have tended to direct the helicopter downwash to the rear of G-BFEK.

The EC145 helicopter pilot was aware of both G-BFEK and the R44 at the fuel pumps and, after being given clearance to taxi, manoeuvred his own aircraft such that he remained approximately equidistant from the other two. However, G-BEFK was holding short of the stop line at A2 and it could be argued that there was scope for 'moving up' a few metres closer, which would have given increased separation from the EC145. Whether this would have affected the outcome is debatable and would tend to counter the advice given by flying schools to their student pilots, in that attempting to halt on the stop line runs the risk of overshooting it, thus potentially exposing the aircraft to the greater risk of a runway incursion.

If such relatively small distances do have an effect on the incidence of occurrences such as this, it serves to illustrate the problems of mixing rotary and fixed wing operations in a confined area.

The measures adopted by the airfield operator include reducing congestion by restricting or stopping rotors-running refuelling operations from some of the currently used sites. This may have the effect of dispersing such operations to other sites on the airfield and perhaps reducing the overall number. Potential issues here include the reluctance of helicopter operators to significantly increase the number of turbine cycles that would result from shutting down for refuelling, and that RFFS facilities should be within a reasonable distance of sites where rotors-running refuelling is conducted.