ACCIDENT

Aircraft Type and Registration:	SB-5E glider, G-DEJH	
No & Type of Engines:	None	
Year of Manufacture:	1970 (Serial no: 5041A)	
Date & Time (UTC):	7 August 2019 at 1303 hrs	
Location:	Summit of Cross Fell, Pennines, Cumbria	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - 1 (Serious)	Passengers - N/A
Nature of Damage:	Destroyed	
Commander's Licence:	BGA Glider Certificate with Bronze endorsement	
Commander's Age:	15 years	
Commander's Flying Experience:	69 hours (of which 2 hours were on type) Last 90 days - 21 hours Last 28 days - 9 hours	
Information Source:	AAIB Field Investigation	

Synopsis

The 15 year old pilot, who was part of a private group visiting a gliding club near Penrith, was flying low behind the ridge at Cross Fell in the Pennines when the tail section of the glider began to oscillate rapidly before breaking away from the glider. The glider pitched nose down and was heavily disrupted when it struck the surface. The pilot was seriously injured. The cause of the failure was flutter, which was driven by the ruddervators and likely occurred when the glider was flying between the Rough Air speed limit and V_{NE}.

A number of safety actions have been taken to improve the supervision of young glider pilots, maintenance of training records and the introduction of a national syllabus for hill soaring (ridge flying).

History of the flight

The 15 year old pilot was part of a private group, who were all members of the same gliding club, visiting a gliding club located near Skelling in Cumbria. They arrived on Friday 2 August 2019, five days before the day of the accident, and during the intervening period undertook a number of check flights and were briefed on flying in the local area and along the ridges[1].

Footnote

[1] Ridge flying, which can also be referred to as hill-soaring, will be used throughout this report except where the term hill-soaring is specifically used in the documentation referred too.

On Wednesday morning (7 August 2019), the Chief Flying Instructor (CFI) briefed the pilot on the relevant NOTAMs and weather. He explained how the wind speed and direction would affect the conditions on the ridge, which would be different to what the pilot experienced on previous days. The CFI marked a copy of an Ordnance Survey Map (Figure 1) highlighting the area on the south-westerly ridges that were likely to give the best lift (solid green), and the areas the pilot should avoid (dotted green).

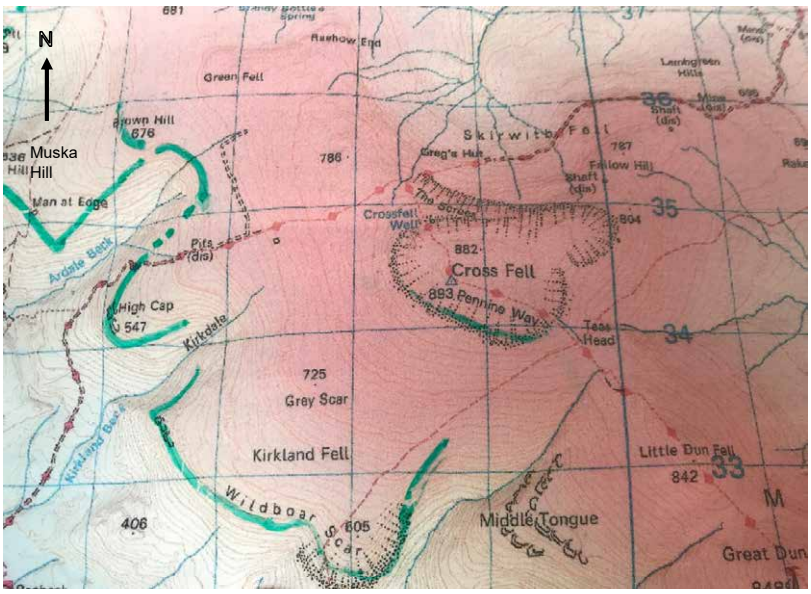


Figure 1

Ordnance Survey Map used for the briefing on the day of the accident

The pilot first launched at 1154 hrs but did not achieve sufficient height to transit to the ridge. On the second launch, at 1230 hrs, he achieved sufficient height and on the way to the ridge encountered a strong thermal which allowed him to reach a height of approximately 3,000 ft. Witnesses at the launch site reported that the glider was initially sighted along the lower ridge near Wildboar Scar. Pilots in a glider airborne at the same time reported seeing the glider between Muska Hill and Kirkland Fell.

Two walkers, who were beside the stone shelter near the trig point at the summit of Cross Fell, (Figure 3) reported that there was a “really strong wind” across the valley from the west. They saw a glider climbing to the west of the ridge before later seeing the same glider fly low in a straight line behind the windward[2] edge of the ridge in a north-westerly direction. The pilot gave a wave as he passed the walkers, who could see a clear silhouette of the pilot and waved back. The walkers reported seeing the glider being “bounced up and down” during the later stages of the first pass, with one exclaiming how close the glider was as it passed. On seeing the glider turn back along the ridge and line up for a second pass, one of the walkers started a video recording of the flight; they stated that this time the glider flew slightly higher and further away at a distance of about 60 m (200 ft) (Image from video at Figure 2.) After the glider passed, the walkers saw the tail oscillate,

Footnote

[2] The walkers annotated an ordnance survey map with the gliders track which was later analysed by the AAIB.

heard a crack and the tail then separated from the glider. The glider pitched nose-down with the right wing hitting the ground first. One of the hill walkers ran to attend to the pilot, who was severely injured and unconscious, while the other walker called the emergency services.

Figure 2

Still taken from video of the second pass (Image used with permission)

Previous flights

When the group arrived on 2 August 2019, the CFI briefed them on operating from the airfield and gave an overview on the techniques to adopt when flying the ridge. He reviewed the knowledge and experience of the accident pilot, who had not flown from the airfield before, by examining his logbook and training record card, and made his initial assessment following a discussion with him.

The CFI conducted two check flights with the pilot, the first of which lasted 26 minutes and covered general handling, stalling and wing drop recovery technique. The CFI stated that he showed the pilot the ridge, while airborne, and as the ridge was "not working" explained the challenges and techniques, and the best areas to fly on the ridge; however, they did not fly along any part of the ridge. On the second winch launch, the CFI initiated a practice cable break which the pilot handled correctly. The CFI assessed the pilot as Check Level 2[3], that allowed him to fly G-DEJH which is a single seat, SB-5E glider.

On 3 August 2019, the wind conditions were still not suitable to fly the ridge. In the morning, the pilot flew a third check flight with a different instructor which lasted 4 minutes and, in the afternoon, flew G-DEJH for the first time for 29 minutes during which he soared in thermals. Later in the day he flew with another 15 year old from the same group on two short flights each lasting 5 minutes. The pilot was the commander for one of these flights.

On the morning of 4 August 2019, the conditions for flying the ridge were marginal; therefore, the pilot flew a short 17 minute flight with one of the older members of the group. In the afternoon, the weather conditions had improved, and so the pilot flew for a second time with

Footnote

[3] The club system of Check Levels is explained later in this report.

the other 15 year old who acted as commander for the flight. This 15 year old had earlier flown along the ridge with the CFI and passed on the information about the ridge that he had received from the CFI to the pilot. They mainly flew around Muska Hill, but as the wind was not strong enough they did not attempt to fly further south along the ridge towards Cross Fell.

On 5 August 2019, the pilot flew G-DEJH for 93 minutes along the whole of the ridge, including the area of Cross Fell. However, he did not fly along the summit as he only gained enough height to cross over to the north-west. Weather conditions prevented any flying from taking place on 6 August 2019.

The pilot flew the dual flights in a twin seat ASK13 glider and the solo flights in G-DEJH.

Accident site

The summit of Cross Fell (Figure 3) marks the highest point in the Pennines. The lower slope below the summit rises gently upwards towards the plateau whose western and south-western sides form a curved ridge. The ridge is a steep escarpment with a gradient at times in excess of 30%; at its steepest point the escarpment has a gradient of 40% rising approximately 40 m in height.

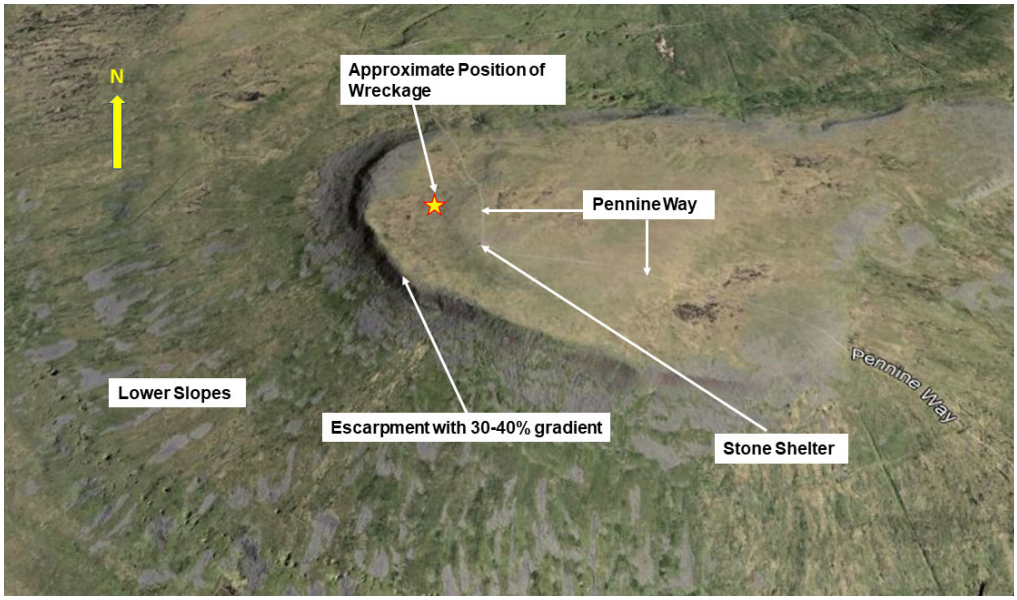


Figure 3

The plateau of Cross Fell Summit, with approximate position of wreckage (Google Earth)

The main wreckage was on an area of relatively flat ground approximately 170 m north-west of the trig point on the summit plateau of Cross Fell. This was approximately 80 m west of the Pennine Way path. The accident site was compact with the main sections of the aircraft located together. Deep impact marks were present in the ground from the nose, right wingtip and wing leading edge. However, the fuselage of the glider had largely disintegrated in the impact, and lightweight sections of plywood skin had been blown by the wind across a large area.

The nose of the glider was destroyed in the impact and sections of the plywood skin were found buried almost vertically in the ground. Little of the cockpit fuselage structure remained intact. The mid-fuselage wing box area was largely intact and lay inverted, as did the wings which were heavily disrupted, particularly the right wing. The tail boom had largely disintegrated, but the V-tail remained relatively intact and connected to the control mixing unit by the control rods, although these were significantly twisted and distorted.

The instrument panel had detached from the aircraft but remained at the point of impact. Control continuity was observed from the V-tail to the mixing unit, but the control rods from the wing and forward of the mixing unit were heavily damaged and no longer connected.

Recorded information

Mobile phone video

The Pennine Way is a popular hiking route that crosses the summit of Cross Fell, where the trig point and stone shelter are used as scenic viewpoints by walkers using the path. On the day of the accident two walkers had stopped at the stone shelter. They became aware of the glider manoeuvring at relatively low level around the hill and started to take pictures. They then used a mobile phone to film the glider as the pilot commenced the second low level pass across the summit plateau, which ended in the accident sequence. The video was a panning shot of the aircraft initially at low level to the left of the walkers' position, passing directly abeam and then continuing to their right.

Analysis using specialist video software showed that shortly after the glider passed the camera position, both surfaces of the V-tail began to oscillate laterally. When viewed frame by frame the ruddervators on each side of the V-tail were seen to lag the motion of the fixed tail structure. The oscillation continued to increase in amplitude until approximately three seconds later when the whole tail section broke away from the fuselage and continued to rotate clockwise (viewed from behind) attached only by the control rods. Immediately after the structural failure, the aircraft nose and right wingtip dropped to point at the ground and the glider fell vertically until it passed below the level of the summit and hit the ground.

The glider was not fitted with a data logging device, nor a transponder. So, no other recorded data of the flight path was available to the investigation.

Analysis of the video footage gave an estimated ground speed during the low-level pass of between 85 and 95 kt with the glider flying on a north-westerly heading. The glider was estimated to be flying at less than 100 ft over part of the ridge that the CFI had not highlighted as green on his briefing map as an area that was likely to be good for soaring.

Aircraft information

General

G-DEJH is a SB-5E single-seat, wooden glider with a distinctive V-tail (Figure 4). It was manufactured in 1970, imported to the UK in 1981 and the last logbook entry in April 2019 showed it had flown 2,261 flying hours. Following this accident only one other model of this type, an SB-5B, remained operational in the UK.

Figure 4

SB-5E glider, registration G-DEJH (Image used with permission)

Design and certification

The original model, the SB-5A, was designed by an academic flying group at a German university and the prototype first flown in 1959. The German Luftfahrt-Bundesamt (LBA)[4] certified the type in May 1964. Later models were manufactured under licence by a German manufacturer who continues to provide airworthiness support.

The design was certified to the German national regulations issued in 1939 *'Airworthiness requirements for sailplanes (BVS), books 1 to 3'* and flight tested in accordance with UK regulations *'BCAR, Section E "Gliders", Subsection E2*[5]*'*. The glider was not checked against other elements of BCAR Section E. When the EASA took responsibility for European Type Certificates, the SB-5E was transferred to an EASA Type Certificate; however, the technical documentation remained in the original German language format.

The SB-5E glider was available in kit form or completely assembled by the German manufacturer who is the current EASA Type Certificate holder. The BFU advised that the original academic flying group no longer held any documentation relating to the design and the manufacturer had no record of G-DEJH (serial number 5041A). It is, therefore, possible that G-DEJH was assembled from a kit.

Construction

The main fuselage, wings and V-tail structures are constructed from plywood with a plywood skin covered in a glass fibre coating. The ailerons and ruddervators (combined rudder and elevators) are plywood framed with a fabric skin. There is a small non-retractable centre wheel and metal skids on the tail and wingtips. The wings are fitted with retractable airbrakes.

Footnote

[4] The Luftfahrt-Bundesamt is the national civil aviation authority in Germany.
[5] BCAR Sub-section E3 covers structures and flutter prevention.

Aircraft examination

Structure

Following a review of the video of the accident, given the extent of the disruption to the airframe, the empennage structure became the focus for a detailed inspection. The recovered tail section showed evidence of tearing of the plywood fuselage skin and shear failures of the skin from the underlying frames, stringers and longerons. The control rods linking the V-tail ruddervators to the cockpit controls were twisted and distorted in a spiral manner. It was not possible to check the amount of play in the control linkages due to the extent of the damage. It was also not possible from the wreckage to assess how the aeroelastic[6] properties of the wooden structure may have changed with time, or to eliminate the possibility that there had been some pre-existing damage.

Kaurite glue

In 2006, the BGA issued a mandatory inspection (047/02/2006) relating to the use of Kaurite glue in the construction of predominantly post-war, German, wooden gliders. This required an inspection for loss of structural integrity as a result of degradation of the glue over time. Records for the 2006 annual maintenance check on G-DEJH showed that this mandatory inspection had been carried out and confirmed that Kaurite glue had not been used in the construction of the aircraft. An inspection of the wreckage did not identify any issues with the pre-impact integrity of the bonded joints on the aircraft.

Ruddervators

It was observed that the ruddervators were not mass balanced and it was found that the centre of gravity (CG) was aft of the hinge line; this was later confirmed by the manufacturer to be by design.

Air speed limitations

The ASI had been annotated with a green band around the outside of the dial, transitioning to amber at 85 kt and with a broad red line between approximately 108 kt and 110 kt (Figure 5).[7]

The limitations placard in the cockpit had a section entitled *'Speed Limitations (Knots)'* and indicated that the maximum operating speed (V_{NE}) was 108 kt and the Rough Air speed limit was 85 kt (Figure 6). The placard was dated 03/09/2016 and had been issued by a BGA Inspector.

Footnote

[6] Aeroelastic analysis is concerned with the aerodynamic forces and the deformation of the structure.

[7] The red line indicates the Never Exceed Speed (V_{NE}) for the glider and should not be exceeded in any circumstances. The amber section starts at the Rough Air limit and indicates the speed range which should only be flown in calm air and with caution. The green section indicates the normal operating speed range for the glider.

Figure 5

ASI from G-DEJH showing speed range markings

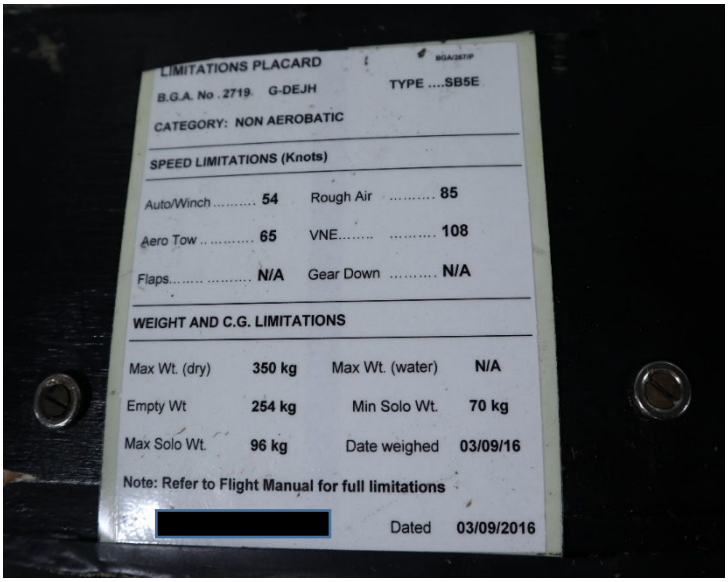


Figure 6

Cockpit placard from G-DEJH

Placarding and ASI maintenance tasks

The BGA Inspector who conducted the annual maintenance check on G-DEJH in 2016 confirmed that he reissued the limitations placard in the cockpit and had applied the green, amber and red markings on the ASI.

G-DEJH's maintenance records contained old placards dating back to 1992, which had previously been removed and these also quoted the Rough Air speed limit as 85 kt. This speed was also quoted on the Certificate of Airworthiness that was issued by the BGA when the glider was imported into the UK in 1981. This suggested that the glider had probably operated with a placard and ASI stating the Rough Air speed limit as 85 kt for most of its time in the UK. The original airworthiness documents issued for the glider included the Type Certificate Data Sheet (TCDS) and the Flight Manual. Both these documents

were only available in German. The TCDS provided the operating limitations for the glider, including the maximum operating speed (V_{NE})[8] of 200 km/h and the maximum speed in strong turbulence (V_{RA})[9] of 140 km/h. Conversion of these speeds into knots gives a V_{NE} of 108 kt and V_{RA} of 75 kt. Hence the placard and ASI markings correctly reflected the certified V_{NE} limit, but indicated an incorrect V_{RA} that was 10 kt higher than the certified limit. The Flight Manual referred to the *'maximum speed in gusty weather'* rather than V_{RA} and gave a speed limit of 140 km/h.

The BGA datasheet for the glider is in English and quotes a V_{NE} of 108 kt and a Rough Air Maximum speed of 75 kt / 140 Kph. The datasheet did not use the term V_{RA}.

The incorrect placard and ASI markings were not identified when the glider was checked during the annual Airworthiness Review Certificate (ARC) renewal, which only requires the inspector to check that the '*placards are properly installed*'.

The BGA advised that they would use this accident to highlight to their inspectors in the September 2020 edition of their Technical News Sheet, the importance of always referring to source documents when reissuing limitation placards or annotating ASIs.

Airworthiness documents

Airworthiness Directives

The manufacturer's website[10] contains links to documents relating to the operation and maintenance of the glider, including the Flight Manual and Technical Notes. Two of these Technical Notes related to issues with the structure of the tail section (where the ruddervators are attached) and compliance with the requirements of the notes was mandated by LBA Airworthiness Directives (ADs).

The first AD[11] was issued in 1986 and detailed a one-off check of frame 25 for cracking prior to the next flight; if a crack was found, the frame was to be replaced before the glider flew again. The second AD[12] was issued in 1993 and required the re-enforcement of frame 26 before the end of the year. While the AAIB found no reference to the ADs in the glider maintenance records or logbook, examination of the wreckage showed no cracks in the affected areas of frame 25, and frame 26 had been re-enforced. A Technical News Sheet on the BGA website[13] issued in 2010 stated that:

Footnote

[8] EASA CS-22 Book 2 defines V_{NE} as the Never exceed speed: *(Do not exceed this speed in any operation and do not use more than 1/3 of control deflection.)*

[9] EASA CS-22 Book 2 defines V_{RA} as the Rough-air speed: *(Do not exceed this speed except in smooth air, and then only with caution. Examples of rough air are lee-waves rotor, thunder clouds etc.)*

[10] Service page of the Eichelsdorfer GmbH website, https://www.flugzeug-eichelsdoerfer.de/service.html (Accessed 9 June 2020)

[11] LBA Airworthiness Directive LTA 1986-023, https://www2.lba.de/ltadocs/1986-023.pdf (Accessed 9 June 2020)

[12] LBA Airworthiness Directive LTA 1993-133, https://www2.lba.de/ltadocs/1991-133.pdf (Accessed 9 June 2020)

[13] British Gliding Association Technical News Sheet Issue 5-2010, https://members.gliding.co.uk/wp-content/uploads/sites/3/2015/04/1430312314_tns-5-2010.pdf (Accessed 27 May 2020)

> *'There has always been a requirement to record compliance with Airworthiness Directives, however it has been observed during BGA and CAA audits that compliance with this requirement is poor in some areas.'*

The news sheet also stated that:

> *'Owners using the old style BGA Glider logbook must also maintain a BGA AD status report (BGA 280).'*

This requirement was applicable to G-DEJH, but the investigation could not find a BGA Form 280 in the glider records. EASA type certified gliders issued with a non-expiring Certificate of Airworthiness are checked annually and an ARC is issued accordingly. BGA approved inspectors check the glider against the requirements of an Airworthiness Review Checklist (BGA 276). The investigation identified that although this checklist has an item to confirm that all relevant Airworthiness Directive's (AD) have been complied with, it does not reference a check that the logbook or BGA Form 280 is present and complete as a record of that compliance.

The BGA have reviewed the BGA 276 checklist and advised that they intend to amend it so that the section relating to ADs specifically refers to a check of the glider logbook and the BGA Form 280. Any amendments have to be agreed with the CAA, and the BGA indicated that the proposed change would be submitted in November 2020.

The online EASA Safety Publications Tool[14] contains a list of mandatory continuing airworthiness information for all aircraft that hold an EASA Type Certificate. However, the LBA ADs pre-dated the formation of EASA and there were no publications on the EASA website specifically applicable to the SB-5 series of gliders.

Crashworthiness

The glider was not designed with any specific crashworthiness features, other than a seat harness. However, the level of disruption to the airframe during the impact rendered the seat harness ineffective.

Airfield information

The gliding club operated from an unlicensed field (Figure 7), approximately 4 nm west-north-west from the summit of Cross Fell. The ridges used by the club lie beneath the summit of Cross Fell and are recognised as ideal, but challenging, due to the complex ridge structure[15] and its gullies. After entering the area at Muska Hill, pilots are advised to be above 1,500 ft aal before either crossing in front of Man at Edge to the south, or into Ousby Dale to the north.

Footnote

[14] EASA Safety Publications Tool, https://ad.easa.europa.eu/ (Accessed 9 June 2020)

[15] The ridge structure consists of: Melmerby Ball, Cuns Fell, Ousby Dale, Sharp Sheafs, Muska Hill, Man at Edge, High Cap and Wildboar Scar.

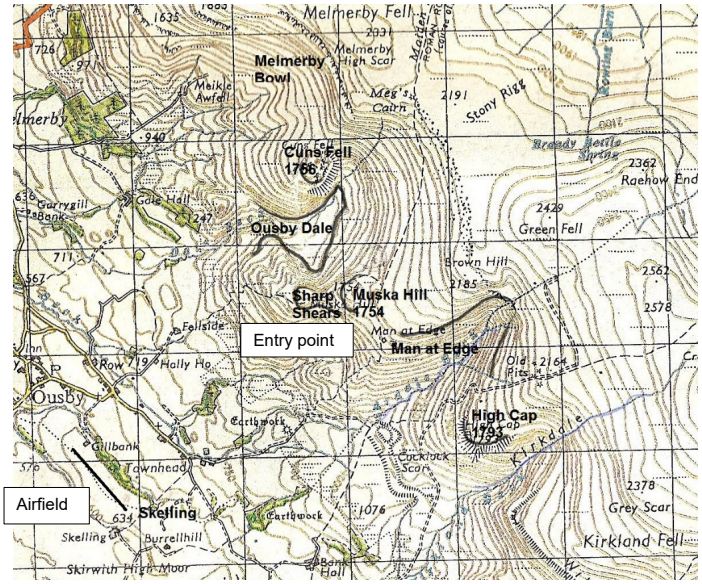


Figure 7

The ridge structure below Cross Fell

Meteorology

CFI's assessment of the weather

The CFI gave the daily briefing at about 0800 hrs on the day of the accident, during which he briefed a wind direction of 260° with an estimated strength of 20 kt and the possibility of showers and cumulus cloud. This was an estimate of the highest wind strength likely to be encountered throughout the day. The CFI considered the day to be an "easy ridge day" on the basis that the wind, which was steady and perpendicular to the ridge, would provide clean uplifting air and assessed it as suitable for pilots with Check Level 2 and above.

The wind strength and direction were based on the judgement of the Duty Instructor (DI) drawing upon the Met Office data, briefings for the area and actual readings from the Warcop military training area.

Aftercast provided by the Met Office

An aftercast provided by the Met Office reported that the area would have been dry with good visibility and convective clouds, likely to be cumulus. This correlated well with evidence from the video of the accident, which indicated a cloud base a few hundred feet above the summit of Cross Fell.

The area would also have experienced a moderate to strong westerly to south-westerly flow, with winds of around 15 kt at the surface and 25 kt at the summit of Cross Fell. The aftercast highlighted that there would have been local wind effects around the Fells with lee waves[16], which may have caused unexpectedly higher gusts and variability in wind direction.

Footnote

[16] Lee waves are also known as mountain waves. These occur in the lee of hills or mountains and consists of a turbulent vortex that is parallel to the ridgeline. Often this is accompanied by clouds which are referred to as rotor clouds.

Effects of wind on a ridge

Wind follows the contours of a hill on the windward side and, due to the venturi effect, its strength will increase as it passes over the summit. As a result, the wind strength on the summit of a hill is greater than the ambient wind speed away from the summit at the same height. The strength of the ambient wind governs the degree of turbulence created. The airflow curls over and around features creating mechanical turbulence[17] behind the demarcation line[18]; this line moves forward to the leading edge of the ridge and becomes progressively steeper as the wind strengthens. Slight changes in wind direction can significantly alter the lift characteristics of a ridge.

A view of the plateau (Figure 8) in the approximate direction that the glider was flying immediately prior to the accident, shows the wind effects that the glider likely encountered. It illustrates the area of best lift in the smoother uplifting air on the windward side of the ridge (left of the demarcation line) and the more turbulent air behind (right of the demarcation line). On the north-western edge, where the ridge curved round to the east, the turbulence would have been greater as the wind direction became less perpendicular to the ridge. The direction of the wind is also likely to have been affected as it flowed around the plateau, possibly resulting in a slightly more south-westerly flow. The plateau at the summit of Cross Fell, sitting above the main ridge, would likely have experienced stronger winds than the ambient wind at the same level.

The pilot from the air ambulance, who landed 75 m downwind of the accident site on the summit of Cross Fell about 45 minutes after the accident, reported that he experienced light turbulence.

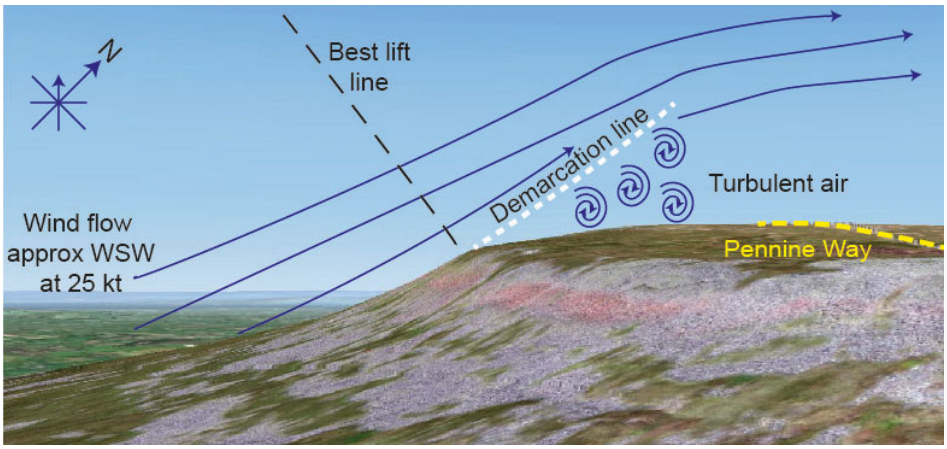


Figure 8

Likely effect of the wind on the summit of Cross Fell where the accident occurred

Footnote

[17] Mechanical turbulence is the result of the friction between the airflow and the ground, especially irregular terrain and obstacles, which causes eddies and therefore turbulence in the lower levels.

[18] The demarcation line is a term used by helicopter pilots in mountain flying. It is a line which separates the clean up-draughting airflow and the turbulent down-draughting airflow.

Estimation of headwind

Based on the estimated heading of the glider, and taking into account the wind conditions in the aftercast, the glider is likely to have encountered a headwind of between 5 and 10 kt. However, the variations in wind direction and speed, arising from the effects of the ridge on the airflow, might have resulted in a range between as little as no headwind to greater than 15 kt.

Pilot's qualifications and experience

Pilot's gliding clubs

The pilot's home gliding club operated from Lee-on-Solent until May 2018 when the club became dormant; the pilot then flew from other clubs, mainly at Lasham and Upavon, where he continued his flying training.

Gliding qualifications

The relevant Gilding Certificate, endorsements and badges awarded by the Fédération Aeronautique Internationale (FAI) and issued by the BGA are at Appendix A.

The pilot gained his Solo endorsement in December 2017 when he was 14 years old and the Bronze endorsement in June 2019. He had achieved the requirements for both the Duration and Height legs for the Silver and Gold badges, but these attainments had not been endorsed due to his age. He had also completed the soaring elements of the Cross-country endorsement; these consisted of one thermalling and one wave flying flight. The pilot was not able to complete the other requirements due to age restrictions. All these flights had been completed either at Lasham or Aboyne.

Logbook and BGA training progress card

The pilot's logbook detailed 69 hours of flying over 200 flights. However, the entries only provided the basic information of each flight such as date, location, length of flight and name of instructor (if dual). The entries lacked additional details in the remarks column which, if entered, could have provided information on the gliding activity undertaken (eg training exercise, thermal or ridge flying). No entries had been counter-signed by an instructor, except for the check flights the pilot had flown at the gliding club at Skelling, which had been endorsed by the CFI. Other documentation showed that the pilot had met the requirements for the Height and Duration legs for both the Silver and Gold badges.

The BGA training progress card is used to track the progress of unqualified pilots. The pilot held training cards issued by Lee-on-Solent and Lasham which recorded three attempts at hill soaring, but these had not been endorsed by an instructor. The pilot confirmed that he had made these entries in his training card and showed the AAIB the supporting entries in his logbook. The training cards only recorded that he had passed the theoretical knowledge and oral test for the Bronze endorsement but not the relevant skills test. The CFI of the pilot's home gliding club confirmed that he had completed all the elements, including the skills test, for his Bronze endorsement in June 2019.

Knowledge and experience

Prior to the expedition, the pilot had flown from other sites where he would have experienced thermal, wave and ridge flying. Examination of his logbook showed two dual flights from Denbigh[19] Airfield, only one of which involved around 30 minutes of ridge flying. There was no evidence that the pilot had received any other practical training or theoretical knowledge covering ridge flying.

Relevant airspeed limits

The pilot understood the speeds to be flown in differing conditions in the SB-5E glider and quoted 108 kt for V_{NE} and 85 kt for the Rough Air speed limit. Although he could not recall the speed he had been flying just prior to the accident, he believed that it would have been about 80 to 85 kt.

The BGA advised the investigation that the required speed to fly a ridge is commensurate with the conditions at the time. When flying along a ridge, particularly at a low height, handling is an important factor alongside a minimum airspeed of 50 kt which would give a reasonable stall margin for a glider such as the SB-5. The Rough Air speed limit would only be relevant if the pilot expected to encounter rough air.

The gliding club at Skelling

Check level

The gliding club at Skelling is a member of the BGA and operates in accordance with their policies and guidance. The Club's Flying Orders include a grading system of four levels based on experience, known as a Check Level, which is applied to all pilots operating from the airfield. A pilot's Check Level is set by the Duty Instructor (DI) following completion of a satisfactory check flight. When the weather conditions for the day are assessed, a Check Level is assigned by the DI thereby determining who is permitted to fly. This check level can be reviewed at any time during the day and promulgated by radio to any gliders airborne at the time.

Check Level 2 is defined as:

1. 'Qualifying Criteria: 15 hours and 25 launches P1 plus satisfactory check flight with an approved, rated instructor.
2. Currency allowance: 21 days.
3. Privileges: May convert to SB-5E.
4. Must receive a daily briefing from approved instructor to fly solo and read the posted daily briefing notes.
5. *X/C*[20] [cross-country flying]: *Not allowed'.*

Footnote

[19] Also known as Lleweni Parc Airfield.
[20] The ridge is within gliding range of the airfield and therefore a Check Level 2 pilot would not need the X/C endorsement.

The section in the Flying Orders entitled '*DI Guidelines for setting the days Check Level*' stated:

> *'An easy ridge day may be check 2. A strong crosswind of 15 knots plus would probably be check 3 or possibly check 4. This will depend upon the actual wind direction and runway selected.'*

Requirement for a ridge check

In the section for visiting pilots, the Flying Orders state:

> *'The check system will be operated at the launch point for all visiting pilots (non-instructors) after a review of their logbook and subject to normal checks (Winch currency, Launch failures, site and ridge checks).'*

There was no other mention in the Flying Orders for a flight check on the ridge to be carried out.

Following this accident, the gliding club amended the section on Supervision in the Flying Orders as follows:

> *'Junior pilots under the age of 18 yrs may only*[21] *fly on the ridge when the conditions for the day have been deemed suitable. A check flight may or may not be required at the discretion of the DI. A specific pre-flight briefing by the DI must be obtained prior to launching.'*

Airfield briefing

The Flying Orders stated that visiting pilots must be given an airfield briefing and receive a copy of Appendix A to the Flying Orders, which outlined the details of the airfield. In addition, pilots should have received a copy of *'Flying the Fell',* a locally produced guidance document containing guidance for flying along the ridge, which included a map of the area. However, this document did not cover the threats or hazards, such as the wind effects, when flying the ridge. Both documents were accessible through the club's website.

British Gliding Association

Governance

The BGA is the national governing body for gliding and is self-regulated by its membership of 80 independent clubs which are primarily run by volunteers. Governance is delivered through BGA Laws and rules that endeavour to foster an environment that provides the freedom for clubs to operate independently. The BGA is the national governing body of gliding. In addition to governing the sport in the UK, the BGA highlights applicable law, provides self-regulation through 'Operational Regulations', and provides guidance on acceptable means of compliance and safety. The 80 gliding clubs in the UK are members of the BGA. Complying with BGA operational regulations is a membership requirement.

Footnote

[21] The entry in the Flying Order book was in normal font with *'may only'* in italics and not underlined.

Laws and rules

The BGA publishes its '*Laws and Rules'* under a number of documents such as its Operational Regulations (ORs)[22]. It also publishes other documents which includes the '*Instructor's Manual'* (IM)[23] and '*Managing Flying Risk – Guidance for Pilots and Clubs'* (MFR)[24].

Definition of a qualified glider pilot

The BGA Gliding Certificate is issued when a pilot achieves the Solo endorsement.

A student pilot becomes a qualified glider pilot when they have achieved both the Bronze and Cross-country endorsements, or an equivalent licence. Pilots who do not hold these endorsements are still under training. This requirement was stated in the IM and MFR, but was not stated in the ORs, nor the document that outlines the requirements to qualify for the Gliding Certificate and endorsements[25].

Flying with other pilots

The BGA considers that two pilots flying together, when neither is an instructor, is the same as flying with a passenger. The commander must be a fully qualified glider pilot holding both the Bronze and Cross-country endorsements. However, at the time of the accident, BGA ORs only stated that pilots must hold a Bronze endorsement to fly together.

The MFR included a section entitled *'Flying with other Pilots'* which highlighted the threats that could be present with this type of flying and provided guidance on how pilots could manage these effectively. It did not state the level of qualification required to fly with other pilots.

Supervision

The BGA provided guidance in the MFR on supervision and the factors that should be considered by a supervising instructor. It stated:

> *'An unqualified pilot should be supervised by an instructor approved to do so by the CFI and that young pilots under 18 should be individually supervised as they have a different attitude to risk and little experience taking important decisions.'*

The IM provided more detailed guidance to instructors on supervision, particularly of unqualified pilots in the transition stage from post solo to achieving Bronze and Cross-country endorsements.

Visiting Pilots

While the MFR contained a section on supervision, there was no recognition of the supervisory challenges for CFIs concerning visiting pilots. However, the MFR did cover the need for a briefing document for visiting pilots.

Footnote

[22] BGA Laws and Rules *Operational Regulations,* Version 1 effective date 8 Mar 2015.
[23] BGA (2017) *Instructors' Manual*, 4th edition.
[24] BGA *Managing Flying Risks – Guidance for Pilots and Clubs,* Version 10 effective date 26 Apr 2019.
[25] BGA Laws and Rules *Gliding Certificate and endorsements requirements*, Version 1.2 effective date 1 Oct 2017.

Training records

The ORs covered the logging of personal flying and stated:

> *'…glider pilots are required to keep an adequate record of their flying to prove they meet, as appropriate, BGA requirements for training and solo flying...'*

The IM also contained a chapter on '*How to read a logbook*' and other sections on the management of student training records and pilot's logbooks.

Training material

The BGA recommended a study guide titled *'Bronze and Beyond – A Glider Pilot's Guide'*, which covered the theoretical knowledge required for the Bronze endorsement. This guide covered air law, operational procedures, principles of flight and weather, and was used by the pilot for his theoretical studies. Neither the study guide, the syllabus published by the BGA for the attainment of the Bronze and Cross-country endorsement nor the IM provide guidance on ridge flying. However, the BGA website did provided links to a number of documents and books that covered ridge flying.

Following this accident, the BGA included references in the MFR to a chapter in the FAA Glider handbook[26] on soaring techniques, and a publication by the Fédération Française de Voile called '*Safety in Mountain Flying*'[27].

Standardised European Rules of the Air

Standardised European Rules of the Air (SERA) stipulates a number of rules for the protection of persons and property[28], which includes:

> SERA.3101 which specifies that no aircraft shall be operated in a negligent or reckless manner so as to endanger life or property of others.
>
> SERA.3105 which specifies that the minimum height for VFR flights shall be those specified in SERA 5005(f), except when necessary for take-off or landing.
>
> SERA. 5005(f) which specifies that the minimum height as 500 ft agl for flights operating under VFR when not operating over congested cities towns or settlements, or over an open-air assembly of persons.

Under ORS 4 No 1174[29] the CAA permits a glider to fly below 500 ft above the ground or water, or closer than 500 ft to any person, vehicle, or structure when hill soaring. Neither the CAA nor the BGA had published guidance on how this permission should be safely applied.

Footnote

[26] FAA (2013) Chapter 10 '*Soaring Techniques*', *Glider Flying Handbook*, 2013. Available at https://www.faa.gov/regulations_policies/handbooks_manuals/aircraft/glider_handbook/ [accessed Aug 2020].

[27] FFVP, *Safety in Mountain Flying*, 1st edition, December 2011. Available at https://members.gliding.co.uk/wp-content/uploads/sites/3/2015/04/1430312053_mountainflyingsafety.pdf

[28] Chapter 1 '*Protection of Persons and Property*' under Section 3 '*General Rules and Collision avoidance*' of the Annex '*Rules of the Air*'.

[29] Paragraph 4 of Official Record Series (ORS) 4, No 1174 *'Standardised European Rules of the Air – Exceptions to minimum height requirements*' published by the UK Civil Aviation Authority (CAA) on 6 June 2016

Flutter

Causes of flutter in aircraft structures and control systems

Flutter is defined as an oscillation of a structure under the interaction of aerodynamic and aeroelastic forces. It occurs when aerodynamic loads cause the deflection of a structure in bending and/or twist and is typically seen in cantilevered aerofoil structures such as wings and vertical and horizontal stabilisers on the tail. The frequency of oscillation can become very rapid and, in some cases, divergent where the amplitude (maximum deflection) of the oscillation increases with each cycle. Divergent flutter can very rapidly result in structural failure due to overload.

Several factors can contribute to the susceptibility of an aircraft structure to flutter, the most significant being structural stiffness with susceptibility reducing as stiffness increases. Flutter can also be induced by the combination of an aerodynamic structure and a control surface, such as a wing and aileron, or vertical stabiliser and rudder. Turbulent airflow can induce deflection of the fixed structure which is not immediately matched by the control surface. If the CG of the control surface is behind the hinge line when the structure deflects, for example due to an aerodynamic disturbance or turbulent airflow, the control surface will lag behind in its response due to inertia. To counteract this effect, control surfaces can be mass balanced with weights to bring the CG of the control surface in-line with or forward of the hinge line.

EASA certification requirements

The EASA sets out its current certification specifications for Sailplanes and Powered Sailplanes in CS-22. CS 22.629 states that the sailplane must be free from flutter up to at least the maximum design speed (V_D). CS 22.1505 states that V_{NE} should not exceed 0.9 times the maximum speed demonstrated in flight tests (V_{DF}), which in turn must not be less than 0.9 x V_D. Therefore, sailplanes should be free of flutter up to V_{NE}.

CS 22.1517 states that V_{RA} may not exceed the design gust speed in free flight (V_B). CS 22.335 (c) states that V_B must not be less than the manoeuvring speed (V_A[30]).

SB-5 certification requirements

The regulations (BVS Books 1 to 3) to which the SB-5 was certified did not specify a speed below which the glider should be flutter free.

The regulations contained four certification groups (BGR) numbered 1 to 4. BGR 1 is categorised as low stress, which the regulations define as beginner / training gliders which should not be used for towing or aerobatics or operated above an altitude of 300 m (980 ft)[31]. The remaining three groups are defined by increasing load levels and have fewer operational restrictions allowing them to be used for activities such as aerobatics.

Footnote

[30] EASA CS-22 Book 2 defines V_A as the Manoeuvring Speed: (*Do not make full or abrupt control movement above this speed, because under certain conditions the sailplane may be overstressed by full control movement.*)

[31] Translated from the original German.

Certification Requirement 3302, in Book 3 of the regulations, states:

> *'All gliders except BGR 1 require mass balancing for all rudders around their axes of rotation.'*

Neither the EASA TCDS, the Flight Manual, nor the BGA datasheet documented a height restriction for operation of the SB-5.

Previous structural failures of SB-5 gliders

The BFU advised that they had investigated several serious incidents and accidents involving SB-5 gliders, and stated that '*often the problem was that pilots did not observe the speed and became too fast.'* One fatal accident which occurred on 9 August 1976 involved a SB-5 glider, registration D-0087, where the tail broke off during '*cruise*'. Another fatal accident in 1992 involved the structural failure of the right wing, which detached when the glider was in a spin. The BFU were unable to provide detailed information on the cause of these accidents as, owing to their age, the relevant investigation files had been destroyed. The BFU had no other records of structural failures involving the SB-5.

In 1993, as a result of in-service reports that had not resulted in an accident, the BFU published a flight safety information notice the title of which translated as '*Glider Pilots on SB-5 Watch Out!*': an English translation of the notice provided by the BFU is at Appendix B. The notice referred to a fatal accident where an SB-5 glider suffered a structural failure after the student pilot entered a spin shortly after a winch launch. It also cited two other accidents where similar gliders had broken-up due to structural overload and stated that exceeding the limitations in the Flight Manual '*could be deadly*.'

The notice highlighted that the maximum permissible speed of the SB-5 is low when compared with modern high-performance gliders and can easily be achieved in routine manoeuvres. The notice recommended that:

> *'The flight operating limitations should be known and adhered to.'*
> *'Overload of any kind should be avoided.'*

The investigation consulted the EASA, BFU and the EASA Type Certificate holder and was unable to identify any other occurrences of flutter leading to the structural failure of the tail section of the SB-5 glider.

Analysis

G-DEJH suffered a structural failure of its tail while being flown across the plateau at the summit of Cross Fell.

Flight path

Analysis of the video indicates that the flight path of the glider was most likely behind the escarpment and the demarcation line, at a low height where turbulent airflow was likely to be encountered. The walkers reported seeing the glider "bouncing up and down" during the

first pass, which was not seen on the video during the second pass. However, the video did show the sudden excitation of the tail section and onset of divergent flutter, which led to the detachment of the tail approximately three seconds later. The air ambulance pilot stated that he experienced light turbulence when he landed on the summit of Cross Fell, downwind of the accident site. It was not possible to establish the degree of turbulence encountered during the two passes that the glider made.

Airspeed

The pilot believed that just prior to the structural failure he would have been flying at approximately 85 kt. This was the placarded Rough Air speed limit for G-DEJH and where the marker around the ASI changed from green to amber. The glider is only certified to be flown above the Rough Air speed limit in calm air and then with caution.

Analysis of the glider's flight path, based on the video, derived a groundspeed of between 85 and 95 kt. The low level wind conditions around the ridge are complicated and it is difficult to accurately determine the wind speed in order to calculate the airspeed of the glider, though the walkers did report that there was a really strong wind from the west. While it was not possible to determine the actual airspeed that the glider was being flown, it is likely to have been between the incorrectly marked Rough Air speed limit of 85 kt and V_{NE}, which was correctly placarded at 108 kt.

The ASI and cockpit placard had been incorrectly annotated with a Rough Air speed limit of 85 kt since at least 1992, and possibly since the glider was imported to the UK in 1981. This discrepancy had not been detected when the limitations placard in the cockpit and ASI markers were replaced at the 2016 annual maintenance check. It is, therefore, likely that the glider had operated above the actual certified Rough Air speed limit of 75 kt on previous occasions in rough air.

Structural failure of the tail section

Examination of the wreckage determined that the tail section failed as a result of overload and that there was no visual evidence of pre-existing damage or weakening of the glue that bonded the skin to the structure. However, it was not possible from the wreckage to determine if there had been any change to the aeroelastic properties of the wooden structure resulting from the glider's age, or to eliminate the possibility that there had been pre-existing damage. Such damage might have occurred since the last annual maintenance, the last daily check, or during the accident flight; however, the annual and pre-flight inspections did not identify any damage. It was also not possible to assess the amount of play in the control linkages due to the extent of the damage, but this was an inspection item that had been signed as '*acceptable for continued operation'* during the last annual maintenance check.

The walkers reported that during the latter stages of the first pass the glider was seen to bounce up and down, which was consistent with the glider flying in an area of turbulent air. At a similar position on the second pass, the tail started to oscillate laterally before it structurally detached from the glider, though it remained attached by its control rods. From analysis of the movement of the structure and control surfaces, using specialist video software, it was concluded that this was flutter.

It is possible that the flutter was initiated by the deflection of the V-tail structure as the glider encountered turbulence as it flew across the plateau at low level. As the V-tail surfaces oscillated laterally, the video showed the ruddervator control surfaces, likely due to a lack of mass balancing, lagging the movement of the main tail structure and driving an increase in amplitude. The flutter became divergent and led to a rapid overload and detachment of the tail structure.

Certification

The SB-5A was Type Certified by the LBA in 1964 to German airworthiness regulations dating from 1939. The lack of mass balancing would have made the ruddervators more susceptible to flutter suggesting that G-DEJH had originally been classified as BGR1, which was intended as a limited flight envelope, low stress trainer. However, unlike current EASA regulations, the investigation could find no requirement for the glider to remain flutter free up to a specified airspeed.

The investigation was unable to determine when or on what basis the glider was allowed to operate beyond the restricted envelope of BGR1.

Advisory information

The flight safety information notice issued by the BFU in 1993 advised that the glider type had a history of structural failure in overload following relatively small speed excursions above the approved limits. They advised that the flight limitations should be adhered to and overload of the structure avoided.

The circumstances leading to the structural failure on G-DEJH were consistent with the findings from previous investigations conducted by the BFU where failure occurred after speed limits were exceeded.

Pilot's training and attainment

The pilot had achieved a relatively high level of attainment very quickly and had only been constrained by the age restrictions in gaining additional endorsements. However, he had only recently achieved his Bronze qualification and was not a qualified glider pilot.

While the pilot believed he had a reasonable level of ridge flying experience, examination of his logbook and training cards, and discussions with an instructor, revealed that prior to the visit his experience was limited to about 30 minutes during a single flight with an instructor. Therefore, he would not have acquired the skills, knowledge or experience necessary to identify the hazards of flying the ridge at Cross Fell or to assess the risk to himself and third parties from his chosen flight path: the glider was flown at a very low level behind the escarpment and close to walkers on the Pennine Way.

BGA training syllabus for ridge flying

There was no BGA approved training syllabus for ridge flying. Ridge flying can expose glider pilots to hazards which are not encountered during thermalling and wave soaring; specifically, the localised effects of the wind on the ridge and the challenges of low-flying

in close proximity to the terrain and other obstacles. The completion of a training syllabus by the pilot would have provided assurance that he had gained the necessary level of knowledge and skills to fly the ridge solo.

Following this accident, the BGA amended the MFR to include guidance on the knowledge and training required to conduct ridge flying safely. The guidance addressed the CAA permission to fly closer than 500 ft, but did not include guidance on how to ensure that third parties on the ground are not put at risk. The BGA is also revising its training syllabus to align with EASA Part-SFCL, which includes the theoretical knowledge and practical techniques to be taught for ridge flying.

Pilot's logbook and BGA training progress card

The pilot's logbook and training card had not been completed in accordance with the BGA guidance and therefore did not present a clear record of his actual experience of ridge flying. The ORs require all glider pilots to keep an *'adequate'* record of their flying as evidence of the level of experience attained. The IM encourages instructors to make comments in the student's logbook on the content of the flight.

Following this accident, the pilot's home gliding club reviewed its requirements for completion of the logbook and training card to ensure robust records of a pilot's training are kept. The BGA is also reviewing the requirement for training record-keeping in preparation of the implementation of EASA sailplane regulations.

CFI's assessment of the pilot's experience

The CFI's assessment of the pilot based on his training card, logbook and discussion with him, was that the pilot had achieved a high level of attainment for his age with a breadth of experience that included ridge flying. This perception was supported by the quality of flying demonstrated during the check flights and by observation of the pilot over the following days. On this basis the CFI believed that he had satisfactorily assessed the pilot's ability to fly the ridge safely and classified him as Check Level 2.

Since this accident, the BGA has updated the MFR to include a requirement for home clubs to provide information on their pilots to the CFI of clubs that they intend to visit. The BGA advised that while the number of club visits to other airfields has reduced, there is an increasing number of visits by individual pilots or informal groups. To address this change, they have published a *'Site Hazards and Mitigations Template'* in the MFR to assist clubs in assessing the hazards and risks when hosting visiting pilots.

Check flights

The pilot flew the check flights required, which could include a flight on the ridge if the wind conditions were suitable; if not the instructor would show the ridge from the air and discuss the techniques to be used. The conditions on the first day were not suitable to fly the ridge and so while the CFI briefed the pilot while airborne, the pilot had no opportunity to demonstrate the techniques on the ridge with an instructor. Instead, his practical understanding of flying the ridge was gained during the mutual flight with another 15 year old pilot.

Check Level

The Check Level system used by the club is an important mechanism for managing the risks associated with the challenges of flying the ridge and considers the pilot's experience and the weather conditions. However, the guidance to DIs in the Club's Flying Orders on how to set the Check Level for the day was generic. It did not provide guidance for the differing wind conditions that may be experienced between the airfield, the lower ridge line and the summit of Cross Fell.

On the day of the accident the CFI assessed the conditions to be Check Level 2 based on his assessment that the conditions made it an easy ridge day. However, the increasing strength of wind towards the summit, with its associated increase in turbulence, meant that a higher Check Level could have been more appropriate.

Following this accident, the gliding club reviewed their Check Level requirements and amended the guidance in the Flying Orders for the DI when setting the day's Check Level to *'Take into account what the upper wind is forecast to be as this can affect the turbulence one can encounter in the various gulleys.'*

Flying with other pilots

On two occasions the CFI authorised the pilot to fly with another 15 year old who also only held a Bronze endorsement without a cross-country endorsement, which meant they were both unqualified. The situation at the time of the accident was unclear as to whether two unqualified pilots flying together was permissible with the ORs stating that a pilot was only required to hold a Bronze endorsement to fly with passengers.

The BGA has since reviewed their ORs to clarify that passenger flying is only to be undertaken by qualified glider pilots over 16 years of age who have been authorised by the CFI.

Supervision

The BGA state in the MFR that '*Pilots under the age of 18 may have exemplary handling skill but a different attitude to risk and little experience of taking important decisions. Clubs should provide their young pilots with individual supervision'.* However, on this occasion the level of supervision may not have been adequate. This is evident by: the incomplete logbook and training card entries; two young unqualified pilots flying together; the choice of flight path which placed the glider in an area where the pilot was likely to encounter turbulent air; flying in close proximity to persons on the ground.

The issues that are likely to have influenced the level of supervision are:

- The absence of a syllabus covering the theoretical knowledge and practical training required for ridge flying meant there was no evidence that the pilot had received the necessary knowledge and experience.
- The logbook and training cards did not provide a clear picture of the level of experience that the pilot had gained.

- The BGA regulations surrounding the level of qualifications required to fly with another pilot were inconsistent.
- The club's guidance to DIs on the criteria for setting the Check Level for the day was unclear.

As a result of these findings, the additional following actions were taken:

> The BGA sent an e-mail to all BGA Club CFIs and Chairmen emphasising the guidance in place for the supervision of young solo pilots and pilots under training. It re-stated that pilots remain unqualified, requiring close supervision, until they have been awarded both the Bronze and Cross-country endorsements.
>
> Clarification was provided in the BGA ORs on the need for a qualified instructor to exercise appropriate supervision during training, including solo flying of unqualified pilots and paid passenger flying.

UK CAA general permission under ORS 4 No 1174 minimum heights

The CAA has issued a permission for glider pilots to fly below 500 ft agl or closer than 500 ft to a person when hill soaring; however, pilots must still comply with their responsibilities under SERA.3101 not to endanger third parties.

The pilot twice flew in close proximity to walkers on the Pennine Way. He was aware of the walkers during the first pass when he waved to them and could have chosen to fly on a different part of the ridge to maintain greater separation. However, his briefings on ridge flying had focused on where to fly to obtain lift rather than how to use the permission.

Following this accident, the BGA issued a new section to the MFR titled '*Hill, Ridge and Mountain Soaring'* which addressed the CAA permission under ORS 4 No 1174 . The amendment drew attention to the requirement that '*an aircraft shall not be operated in a negligent or reckless manner so as to endanger life or property of others'*. It also states that '*Public/third-party safety is the absolute priority*' and gave a number of protocols for hill soaring which included: '*Do not fly lower than necessary to utilise the soaring conditions*' and '*NEVER fly close to, towards or directly over any person on the ground*'.

Conclusion

This accident occurred as a result of a structural failure of the tail section of the glider due to flutter, which likely occurred when the glider was flying between the Maximum Rough Air speed limit and V_{NE}.

Divergent flutter of the V-tail developed when the glider flew low into an area where turbulence might be encountered. The investigation was unable to discount the possibility that there was pre-existing damage or that the aeroelastic properties of the structure had changed over time. It was also not possible to eliminate the possibility that there had been free play in the control system or structural damage having occurred prior to, or during

the accident flight. The glider also had design features which made it more susceptible to flutter than gliders certified to current regulations.

The pilot reported that he had flown to the Rough Air speed limit displayed on the cockpit placard and marked on the ASI; however, he would not have known that this limit was incorrect, and the permitted limit was 10 kt lower. Given that the BGA Certificate of Airworthiness quoted the same, incorrect, speed limit when the glider was imported to the UK in 1981, it is likely that the placard and ASI had been incorrectly annotated since this time. This suggested that individuals who replaced the placards and ASI markings had copied the limits across, rather than referring to a source document.

The pilot had received limited training and practical experience of ridge flying. His practical understanding of flying the ridges near Cross Fell was provided by another 15 year old pilot while flying together in the same glider. The BGA is addressing the absence of formal training on ridge flying by introducing a training syllabus which will bring it in-line with the requirements of EASA Part-SFCL.

The pilot's logbook and training cards were not complete, leaving the CFI to partially base his assessment of the pilot's abilities on the check flights and discussion with the pilot, which led the CFI to believe that his experience was greater than it actually was. The BGA has advised that the increasing trend is for small groups of pilots to visit and fly from other sites, which reinforces the need for pilots' records to be complete and for host clubs to have robust processes in place to accurately assess the ability of visiting pilots.

The investigation also found that while the airframe was compliant with two relevant ADs, there was no record of these having been carried out as there was no AD Status Form (BGA 280) available for G-DEJH. Maintaining an accurate record of the status of ADs is an essential part of ensuring the airworthiness of an aircraft.

Safety actions

The following safety actions have been carried out:

The gliding club near Skelling has:

- Amended their Flying Orders such that for junior pilots under the age of 18 years wishing to fly on the ridge:
  - They may only fly on the ridge when the conditions for the day have been deemed suitable.
  - A check flight may be required at the discretion of the Duty Instructor.
  - A specific pre-flight briefing by the Duty Instructor must be obtained prior to launching.
- Reviewed the Check Level requirements and the guidance to Duty Instructors for setting the day's Check Level

The pilot's home club has reviewed its requirements for completion of pilot logbooks and training cards to ensure robust records of a pilot's training are kept.

The BGA has:

- Initiated a review of their Form 276 Airworthiness Review Checklist to ensure the section relating to Airworthiness Directives specifically refers to a check of the glider logbook and the BGA Form 280. The BGA is expected to submit their proposed amendment to the CAA, for approval in November 2020.
- Highlighted in the September 2020 edition of their Technical News Sheet, the importance of always referring to source documents when reissuing limitation placards or annotating ASIs.
- Reminded all BGA Club chairmen and Chief Flying Instructors on the guidance in place for the supervision of young solo pilots and pilots under training.
- Reviewed their Operations Regulations to clarify:
  - That passenger flying is only to be undertaken by qualified glider pilots aged 16 years or over and who have been authorised by the Chief Flying Instructor.
  - The need for a qualified instructor to exercise appropriate supervision during training, including solo flying of unqualified pilots and paid passenger flying.
- Updated their document Managing Flying Risk – Guidance for Pilots and Clubs to include:
  - The requirement for home clubs to provide information on their pilots to the CFI of the club that they intend to visit.
  - References on soaring techniques and Safety in Mountain Flying.
  - Guidance on the knowledge and training required to safely conduct ridge flying.
  - Guidance on the permission for gliders to fly lower than 500 ft when hill soaring.
  - A template for clubs to use when assessing the hazards and risks when hosting visiting pilots.
- Initiated a review of the requirement for training record-keeping in preparation for the implementation of EASA Part-DTO.

- Revised the BGA training syllabus to comply with EASA Part-SFCL, which includes the theoretical knowledge and practical techniques to be taught for ridge flying.

Published: 25 March 2021.

APPENDIX A

RELEVANT GLIDING CERTIFICATES, ENDORSEMENTS AND BADGES

BGA Endorsements		
Endorsement	**Minimum Age to award**	**Remarks**
Solo	14 years	BGA Glider Certificate is issued on completion of first solo flight.
Bronze	14 years	Issued on completion of the training syllabus, theoretical knowledge test and general flying skills test.
Cross-country	16 years for the completion of the field landing and navigation tests. Other elements can be completed earlier.	
FAI Silver	16 years. Only awarded to a qualified glider pilot; the Duration and Height gain flight can be completed before that age.	Consists of three qualifying flights: duration, distance and height gain.
FAI Gold	16 years. Only awarded to a pilot holding a Silver Badge. The Duration and Height gain elements can be completed before the age of 16.	Consists of three qualifying flights: duration, distance and height gain.
FAI Diamond	16 years. Only awarded to a pilot holding a Gold badge. The height gain can be completed before the age of 16.	Consists of three qualifying flights: goal, distance and height gain.

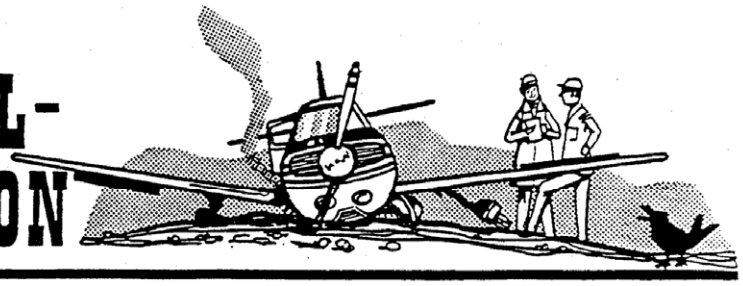
Table 1

Relevant BGA endorsements and FAI sporting badges

APPENDIX B

FLUGUNFALLUNTERSUCHUNGSSTELLE BEIM LUFTFAHRT-BUNDESAMT
Postfach 30 54, D-38020 Braunschweig, Tel. 05 31/23 55 - 0

FLUGUNFALL-INFORMATION



V 112
Braunschweig, May 1993

Glider Pilots on SB-5 Watch Out!

Shortly after winch launching with the glider type SB-5E; a student pilot entered spinning.

After the spinning movement stopped the lower spar cap of the right wing spar fractured at the mounting during the flare phase. The entire wing section was torn out of the fuselage mid-air and crashed to the ground 50 m next to the fuselage. The student pilot was fatally injured by the impact.

Two other accidents with SB-5 are known where the glider fragmented mid-air after overload.

The operations manual of the SB-5 indicates adherence to the operating limitations of the glider. This basically also applies to other types. To count on a "secret reserve" beyond these limitations could be deadly.

Test flights with the SB-5, the results of which were published in the Aerokurier 3/1964, showed two additional points which should be heeded during training flights.

1. Even with a slight increase of pitch angle speeds of more than 150 km/h are reached.

2. While exiting spinning after one turn, speeds of 200 km/h can be reached, i.e. maximum speed is exceeded.

Even if the weather conditions are very good for thermal flight and invites flying with high downhill speeds the SB-5 pilot should be aware that the permissible speeds are comparatively low compared with modern high performance aircraft.

We do not intend to dampen the spirits of SB-5 pilots, but we urgently recommend the following to prevent accidents of the kind described:

- **The flight operating limitations should not only be known but adhered to**
- **The flight characteristics especially during entry and exit of uncontrolled flight attitudes should be known**
- **Overload of any kind should be avoided**
- **The SB-5 which is a good and reliable glider for skilled pilots should not be used during training of less experienced student pilots.**