

## ACCIDENT

<b>Aircraft Type and Registration:</b>	Jabiru UL-450, G-ROYC	
<b>No &amp; Type of Engines:</b>	1 Jabiru 2200A piston engine	
<b>Year of Manufacture:</b>	2003 (Serial no: PFA 274A-13990)	
<b>Date &amp; Time (UTC):</b>	27 October 2019 at 1421 hrs	
<b>Location:</b>	Gransden Lodge Airfield, Sandy, Cambridgeshire	
<b>Type of Flight:</b>	Private	
<b>Persons on Board:</b>	Crew - 1	Passengers - 1
<b>Injuries:</b>	Crew - 1 (Minor)	Passengers - None
<b>Nature of Damage:</b>	Substantial	
<b>Commander's Licence:</b>	National Private Pilot's Licence	
<b>Commander's Age:</b>	57 years	
<b>Commander's Flying Experience:</b>	267 hours (of which 28 were on type) Last 90 days - 6 hours Last 28 days - 4 hours	
<b>Information Source:</b>	AAIB Field Investigation	

## Synopsis

G-ROYC was being flown with two pilots onboard. The pilot in the left seat had 28 hours on type and the pilot in the right seat had not flown the type before. The approach to the runway was flown by the pilot in the right seat. During the approach he decided the aircraft was not stable so elected to go around. During the go-around the aircraft descended and drifted to the left. The aircraft collided with a stationary glider which was waiting to launch. One of the occupants of G-ROYC sustained a minor injury; the glider pilot was uninjured.

The investigation found that it is likely that the aircraft did not climb due to a combination of the inadvertent retraction of the flaps, a brief delay in applying full power and the aircraft being slightly above the maximum takeoff weight.

The LAA provides a Pilot Coaching Scheme to enable pilots to safely learn new aircraft types and develop their flying skills with experienced instructors.

The BGA and the gliding club have taken safety action to ensure the risk of ground collisions continue to be minimised.

## History of the flight

On Sunday 27 October a local Scout group who frequently flew a motor glider from Gransden Lodge airfield had arranged for several powered aircraft to visit the airfield to provide air experience flights for them. G-ROYC flew from Old Warden airfield to Gransden Lodge airfield in the morning and completed several local flights with members of the Scout group without incident. On completion of the flights another pilot, who had also been providing experience flights for the Scouts in another aircraft, asked if he could fly G-ROYC as he had not flown the type before and was interested in the aircraft. G-ROYC's pilot agreed and gave him a briefing about the aircraft. G-ROYC's pilot sat in the left seat and the other pilot sat in the right seat. The pilot in the right seat operated the controls throughout the subsequent flight with the pilot in the left seat following through on the controls. The pilot in the left seat considered he was the pilot in command.

The aircraft took off from Runway 22 and flew in the local area for approximately 15 minutes. The weather conditions were good with a surface wind from approximately 290° at 10 kt giving a 9 kt crosswind from the right on Runway 22. As the aircraft returned to the airfield and joined the circuit the pilots heard a motor glider reporting downwind on the opposite side of the airfield. They extended downwind to position behind the other traffic. The motor glider landed on the far right of the runway, so the pilot of G-ROYC flew towards the centre of the runway. The pilot, sat in the right seat, started the approach with one stage of flap. The flap selector switch was on the far left of the cockpit so he had to ask the pilot in the left seat to select the flap as he could not reach it from the right seat. The throttle on G-ROYC was located on the seats between the pilot's legs. He reported that he kept operating the throttle in the incorrect sense then having to correct himself as he had not previously flown an aircraft with the throttle in this position. As the aircraft approached the runway, the pilot in the left seat thought the aircraft was too high, so asked the other pilot if he would like full flap. He said "yes" so the pilot in the left seat selected full flap. This caused the descent rate to increase significantly. The pilot in the right seat decided the approach was unstable so, at a low altitude, decided to go around.

The pilot tried to apply full power but inadvertently closed the throttle. The throttle had already been close to idle so this only caused a slight power reduction. He immediately realised his error and applied full power. He also recalled that he left the carburettor heat ON. The pilot in the left seat moved the flap selector switch to the FLAPS UP position but did not return the switch to OFF when the flaps reached the mid position, causing the flaps to fully retract. The pilot in the right seat reported that he was surprised by how much the nose pitched up. He recalled that the control effectiveness was minimal and he was unable to stop the aircraft sinking and drifting to the left.

Three gliders were parked on the left side of the runway in two queues waiting to be winch launched. Several members of the gliding club involved in launching the gliders were also standing in this area. G-CHEK, a SZD-51 single seat glider, was at the front of the queue. The pilot was strapped into the glider with the canopy closed waiting for his turn to launch.

Several people saw the aircraft approaching. They reported seeing G-ROYC drifting towards the glider with a high nose attitude. Several of them stated that the aircraft was heading towards the glider rather than into wind.

As G-ROYC drifted to the left and descended, it collided with the tail of G-CHEK. The glider spun round to the right and G-ROYC passed across its left wing. G-ROYC continued across the grass coming to rest approximately 25 m away from the glider. The glider pilot was uninjured and was assisted from the glider. The occupants of G-ROYC were able to exit the aircraft unaided; one suffered a minor back injury; the other was uninjured.

### Accident site

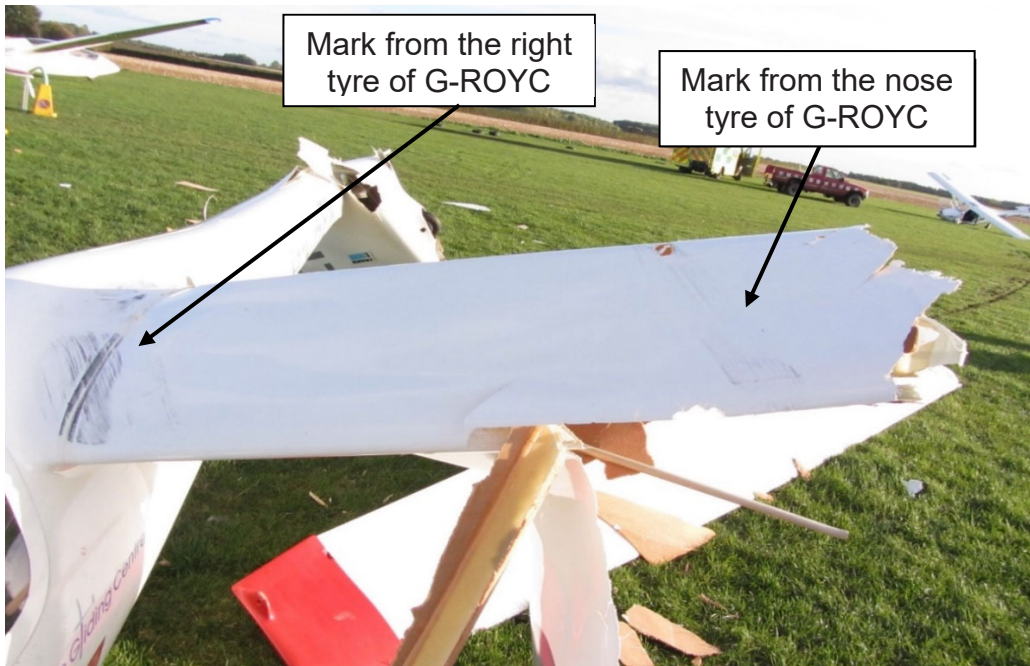
With agreement of the AAIB, gliding club members photographed the accident site and moved both aircraft off the runway.



**Figure 1**

G-CHEK SZD-51 glider showing damage to the tail and left wing

Figure 2 shows the left wing of the glider with marks from the tyres of G-ROYC. Measurement of the marks show that the right tyre of G-ROYC passed just behind the canopy of the glider. Figure 3 shows the final position of G-ROYC. Figure 4 shows G-ROYC after the accident with the flaps fully retracted.



Mark from the right  
tyre of G-ROYC

Mark from the nose  
tyre of G-ROYC

**Figure 2**

Left wing of G-CHEK showing tyre marks left by G-ROYC



**Figure 3**

Final position of G-ROYC



**Figure 4**

G-ROYC after the accident showing the flaps UP

### Recorded information

The accident was recorded on CCTV. However, the distance, frame rate and angle of the camera meant it was not possible to determine the aircraft speed, pitch angle or heading with any accuracy. The recording showed the landing motor glider touching down at 1420:19 hrs on the right side of the runway. After slowly rolling across a track that crosses the runway the motor glider started accelerating for another takeoff at 1421:09 hrs. G-ROYC entered the image at 1421:16 hrs and appeared to be in level flight at low level. At 1421:19 hrs G-ROYC started to sink and at 1421:22 hrs collided with the glider. Figure 5 is an image taken from the CCTV recording which shows G-ROYC in flight and the three gliders on the left of the runway. Several members of the gliding club can also be seen standing by the gliders.



**Figure 5**

CCTV image just prior to the accident

### Aircraft examination

G-ROYC was not examined in detail by the AAIB. However, both occupants of G-ROYC reported that the aircraft and engine appearing to be behaving normally. Photographs taken immediately after the accident show that the flaps were retracted, the flap switch was in the FLAPS UP position and the carburettor heat was pulled out.

### Weight and balance

The weight of the aircraft was calculated by the AAIB after the accident to be 463.5 kg as shown in Table 1. The company that recovered G-ROYC after the accident found there was 32 litres of fuel onboard.

The Jabiru UL-450 has a maximum permitted gross weight of 450 kg. The weight schedule displayed in the aircraft stated that the '*Maximum fuel load with two crew of 86 kg each [is] 16 litres.*'

A placard in the aircraft stated:

*'Provided that the limitations are observed, any combination of weight at the seat and fuel tank stations will keep the aircraft centre of gravity within the accepted limits which are described in the flight manual.'*

However, as the aircraft was slightly above the maximum weight it is not known if it remained within the centre of gravity limits.

ITEM	WEIGHT (kg)
Aircraft Basic Weight	266.5
Left Seat Pilot	89
Right Seat Pilot	84
Fuel (32 l)	23
Equipment (estimate)	1
<b>TOTAL</b>	<b>463.5</b>

**Table 1**  
Weight calculation for G-ROYC

### Aircraft information

The Jabiru UL-450 is a high-wing two-seat kit-built microlight primarily constructed from fibreglass. It is powered by a 4-stroke 4-cylinder Jabiru 2200A engine with a fixed-pitch wooden propeller. Fuel is stored in a tank behind the seats. The UL-450 kit was produced by Jabiru until 2007.

The flight controls are operated via standard rudder pedals and a single stick mounted centrally between the two seats (Figure 6). Throttle controls are located on both seats

between the occupant's legs. The throttle is pulled towards the pilot for idle power and pushed away for full power.



**Figure 6**

Jabiru UL-450 controls

G-ROYC was built in 2003. The aircraft had a valid LAA Permit to Fly. When the permit was last renewed, on 27 February 2019, documentation submitted to the LAA recorded that the aircraft had accumulated 471 hours.

The Jabiru UL-450 kit is supplied with manual flaps which are operated via a lever mounted on the side wall to the left of the pilot's head (Figure 7). The lever has a button which latches it in three positions to give flaps up, a mid position or full flap.



**Figure 7**

Jabiru manual flap lever

However, in 2012, G-ROYC was fitted with electric flaps using an LAA approved modification. The manual lever was replaced with an electric motor similar to that fitted

to other Jabiru models. The motor was controlled via a three-position switch mounted on the far left side of the instrument panel (Figure 8). The flaps were extended by holding the switch in the FLAPS DOWN position (the switch is spring loaded back to the middle position). To retract the flaps the switch is moved to the FLAPS UP position where the switch latches. If the switch is left in the FLAPS UP position, the flaps retract fully. To stop the flaps in the mid position the switch must be returned to the middle position.



**Figure 8**

G-ROYC flap switch (as found after the accident)

The LAA reported that G-ROYC was the only UL-450 in the UK which had been modified with electric flaps.

Jabiru Aircraft reported that all its aircraft are now designed with electric flaps. However, the control switch is spring loaded to the centre in both the retract and extend direction so the pilot must hold the switch up or down to move the flaps. On factory built models the flap switch is located centrally on the instrument panel so it can be easily accessed from either seat. However, Jabiru advised that some kit builders choose to put the flap switch on the left side of the instrument panel as it is easier to access whilst flying in the left seat with the pilot's right hand on the central control stick.

### **Aircraft handling and performance**

Jabiru Aircraft supplied the AAIB with an owner's manual for the UL-450 which was revised in 2005; a similar manual (last updated in 1999) was found in G-ROYC after the accident. The manual contains the following caveat:

*'This Owners Manual is provided by Jabiru Aircraft Pty Ltd as a guide to the operation of the Jabiru UL-450 kit aircraft. As the UL-450 is an experimental amateur built kitplane, the characteristics, performance, limitations and other information may vary between individual aircraft. As part of the test flight program, The Owner must verify the characteristics, performance limitations and other information is relevant to their particular aircraft and amend any guidance figures that are provided in this Manual.'*



### Stall speeds

Table 2 shows the stall speed given in the owner's manual and the speed recorded on G-ROYC during the most recent permit renewal flight test. These speeds assume idle power with the aircraft at the maximum gross weight of 450 kg.

	Owner's Manual (KIAS)	G-ROYC Flight Test (KIAS)
Flaps Up	45	48
Stage 1 (Takeoff)	39	Not recorded
Stage 2 (Landing)	35	35

**Table 2**  
Jabiru UL-450 Stall Speeds

### Go-around

The owner's manual found in G-ROYC provides the following guidance for performing a baulked landing or go-around:

*'In a baulked landing (go-around) climb, the wing flap setting should be reduced to the First Stage immediately after full power is applied and the aircraft has accelerated to a safe climb speed. Upon reaching a safe airspeed, the flaps should be slowly retracted to the full up position, whilst allowing the aircraft to accelerate to the best climb speed.'*

The manual provides the following speed guidance and checklist for a baulked landing<sup>1</sup>:

#### *'Airspeed*

*Apply full power; allow speed to increase to* 62 KIAS  
*Retract Flap to 1<sup>st</sup> Stage until clear of obstacles*  
*Then retract flap fully and continue to climb at or above* 62 KIAS

#### *Checklist*

- |   |                         |   |
|---|-------------------------|---|
| 1 | <i>Throttle</i>         | <i>FULL OPEN</i>  |
| 2 | <i>Carburettor Heat</i> | <i>COLD</i>   |
| 3 | <i>Wing Flaps</i>       | <i>RETRACT to ½ DOWN</i>  |
| 4 | <i>Airspeed</i>         | <i>50 KIAS until clear of obstacles</i>   |
| 5 | <i>Wing Flaps</i>       | <i>Retract to 1<sup>st</sup> Stage until clear of obstacles then retract fully and continue to climb at or above 62 KIAS'</i> |

#### Footnote

<sup>1</sup> The manual provided by Jabiru Aircraft (updated in 2005) contains the same procedure but with slightly different speeds.

Jabiru highlighted that if the flaps are fully retracted prior to obtaining the required speed the aircraft will not maintain height.

The manual recommends a normal approach speed with full flap of 57 KIAS. G-ROYC's pilot recalled that he had been trained to fly approaches and landings at 59 kt if using the first stage of flap and 50 kt if using full flap.

Another pilot with experience of the UL-450 commented that, during a go-around, the aircraft will pitch up as the flaps are retracted and will yaw to the left, but these are easily controllable with normal control inputs.

### *Crosswind landing*

The owner's manual states that the maximum crosswind in which a landing was demonstrated was 14 kt and recommends the use of the wing down crosswind landing method.

The LAA Type Acceptance Data Sheet (TADS) for the UL-450<sup>2</sup> highlights directional control problems that some pilots have experienced when landing in crosswind conditions. The TADS states that because of the relatively small size of the ailerons compared to the wingspan the aircraft suffers from a slow roll response and adverse yaw. G-ROYC had a larger rudder modification fitted which provides greater rudder control authority. Later versions of the Jabiru had a larger fin fitted which further improved the directional stability and reduced the adverse yaw.

### **Personnel**

The left seat pilot held a National Private Pilot's Licence with valid Microlight and Self Launching Motor Glider (SLMG) ratings. He held a valid medical declaration signed by his doctor. He first flew the aircraft 18 months before the accident and had completed differences training. He had accumulated 28 hours in G-ROYC prior to the accident. His total flying experience was 267 hours.

The right seat pilot held a National Private Pilot's Licence with valid Microlight, SLMG and Simple Single-Engine Aeroplane (SSEA(land)) ratings. Additionally, he held a Light Aircraft Pilot's Licence for Sailplanes (LAPL(S)) with valid flight instructor and flight examiner ratings. He held a valid LAPL medical. He had a total of 2,400 flying hours and had flown 54 hours in the 90 days prior to the accident and 9 hours in the previous 28 days. He had not previously flown a Jabiru aircraft.

### **Airfield information**

Gransden Lodge airfield is a former wartime airfield located 10 miles west of Cambridge. Cambridge Gliding Club moved to Gransden Lodge airfield in 1991. The airfield has three grass runways. Runway 22, in use on the day of the accident, is approximately 1,400 m long and 130 m wide (Figure 9). In addition to the powered aircraft providing air

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#### **Footnote**

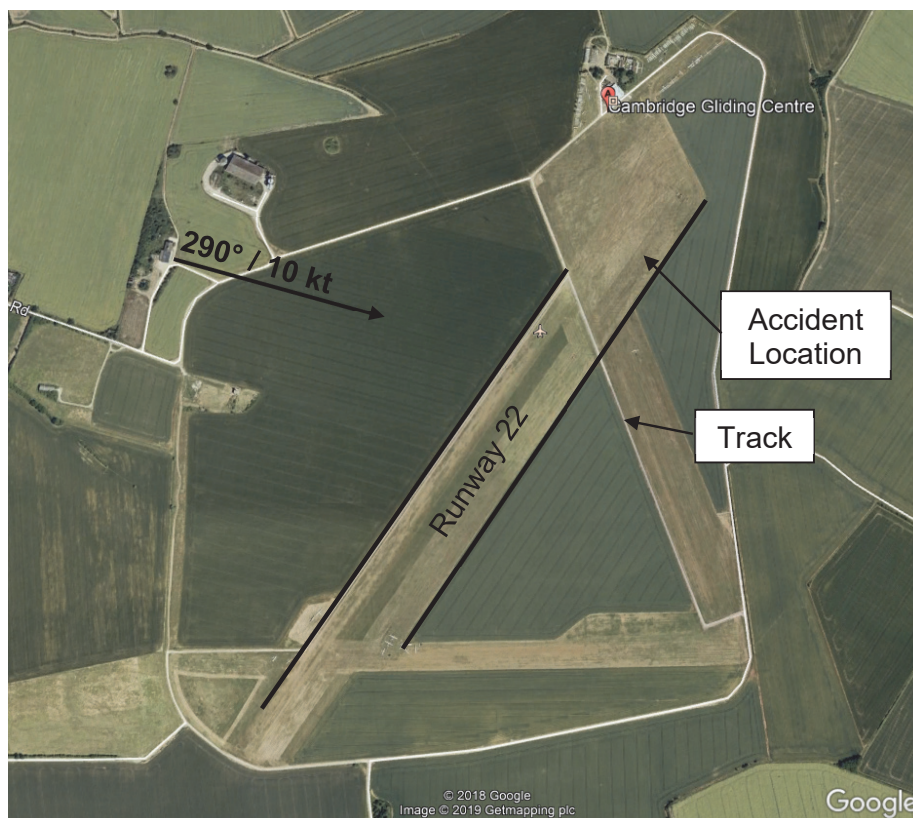
<sup>2</sup> LAA TADS 274A available at [http://www.lightaircraftassociation.co.uk/engineering/homebuilt\\_vintage.html](http://www.lightaircraftassociation.co.uk/engineering/homebuilt_vintage.html) (accessed 13 November 2019)

experience flights for the Scouts, the gliding club was conducting numerous training flights and supervising solo flights. A total of 48 flights were recorded at the airfield during the day. Flights were suspended after the accident occurred.

The airfield does not have an air traffic control service. Pilots monitored and reported their position on VHF frequency 131.280 MHz.

On the day of the accident, in accordance with the club's normal procedures, gliders were being winch launched from the left side of the runway. Two queues of gliders were established with winch cables run-out down the left side of the runway. Powered aircraft and gliders were landing on the remaining width.

A small track crosses the runway approximately 380 m from the threshold. All the aircraft and gliders seen on the CCTV were landing and stopping before the track. This enabled them to vacate, or be moved off, the runway quickly without needing to backtrack the runway. The gliding club highlighted that all pilots are taught that they should land further along the runway if there is any congestion at the start of the runway.



**Figure 9**

Gransden Lodge airfield with Runway 22 highlighted

## Human factors

### *Qualified pilots operating together*

It is common in general aviation for two qualified pilots to fly together in a single pilot aircraft. Doing so can be beneficial but it can also present a hazard if clearly defined roles and responsibilities are not established. In this accident the pilot who sat in the right seat commented that before the flight he did not establish clear roles with the other pilot and did not agree how any non-normal situation would be managed. He felt this contributed to the accident.

A feature published in Aviation Safety Magazine in February 2018 titled '*The Two-Pilot Problem*'<sup>3</sup> highlights this issue and offers advice to manage the risk.

### *Operating a control in the incorrect sense*

The pilot reported that he moved the throttle lever in the incorrect direction. The throttle on a UL-450 is in an unusual position. For an experienced pilot, the act of applying more (or less) throttle is done without conscious thought. This is normally helpful as it requires less mental effort to fly the aircraft, but, when presented with a different or unusual control it can cause a problem if the pilot's instinct is to move the control in the wrong sense.

This type of human error is discussed on page 47 of the CAA CAP 737<sup>4</sup> in the section entitled '*Human Error, Skill, Reliability and Error Management*'. It highlights that once a skill is learned to the point of being automatic it is reliable and robust, but it is also vulnerable to situational and contextual change. This type of human error is common when pilots operate unfamiliar aircraft.

## Organisational information

### *Ground collisions risk*

During gliding operations it is normal for several aircraft to be on the runway at the same time. This accident highlights the risk of collisions between landing aircraft and aircraft already on the runway. The BGA reviewed its accident database to determine how often collisions have occurred between landing aircraft and aircraft on the ground. The review showed there have been 35 accidents since 1974 during which time 16.5 million flights were recorded, suggesting the probability of occurrence is low. However, in 2019 alone the AAIB reported on 19 accidents in which a light aircraft deviated from its intended path on landing. The reasons for the deviations vary considerably and they did not result in collisions, but these events show that there is a risk that any landing aircraft may deviate from its intended path.

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## Footnote

<sup>3</sup> Aviation Safety Magazine available at [http://www.aviationsafetymagazine.com/issues/38\\_2/features/The-Two-Pilot-Problem\\_11459-1.html](http://www.aviationsafetymagazine.com/issues/38_2/features/The-Two-Pilot-Problem_11459-1.html) (accessed 13 November 2019)

<sup>4</sup> CAA CAP 737 available at <https://publicapps.caa.co.uk/docs/33/CAP%20737%20DEC16.pdf> (accessed 13 November 2019)

### *Supervision for flight operations*

The flying orders for Gransden Lodge state that all flying operations at the airfield are conducted under the supervision for the Chief Flying Instructor. Each day this responsibility is delegated to the Duty Instructor. However, on the day of the accident the duty instructor reported that he had not been briefed on the operations being conducted by the Scout group. It was reported that some of the pilots involved in the Scout operation had not attended the morning briefing. Discussion after the accident with members of the gliding club safety committee suggested that the Scout group had been operating under “arms-length” supervision for some time.

There was no evidence that the supervision in place contributed to the accident.

### **Other information**

#### *Learning a new aircraft type*

The LAA provide a Pilot Coaching Scheme (PCS) to enable pilots to learn new aircraft types and to develop flying skills. Details of the scheme are provided on their website<sup>5</sup>. Their website states that:

*‘Statistics show that for LAA aircraft the transition of a new pilot onto the type is a frequent source of accidents, more so than the aircraft’s initial test flying phase. The same is true of the first flight of any unfamiliar aircraft, whether it is a homebuilt, vintage, or microlight.’*

The PCS provides experienced instructors to help pilots safely learn to fly a new aircraft type.

### **Analysis**

#### *G-ROYC go-around*

The pilot flying G-ROYC decided to go around at low altitude as he considered the approach was unstable. During the go-around the aircraft descended and drifted to the left.

The pilot reported that he initially operated the throttle in the incorrect direction which, whilst only resulting in a brief delay in the application of full power, may have caused the airspeed to reduce as the pilot tried to maintain height. The flap switch was selected to the FLAPS UP position but was not returned to the central position, causing the flaps to fully retract.

The pilot reported that he was surprised by how much the aircraft pitched up as he initiated the go-around. Several witnesses reported that the aircraft appeared to be in a very nose high attitude. It is likely that the aircraft failed to climb due to the flaps fully retracting, the brief reduction in power and the high nose attitude causing the speed

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#### **Footnote**

<sup>5</sup> <http://lightaircraftassociation.co.uk/PCS/pcs.html> (accessed March 2020).

to reduce below the flaps up stall speed. The carburettor heat was left ON during the initiation of the go-around which would have slightly reduced the power available. The aircraft was slightly above the maximum permitted gross weight which would have further decreased its climb performance.

The combination of the crosswind from the right and the aircraft's natural tendency to yaw left when power is applied are likely to have caused the aircraft to drift left. The slow roll response and adverse yaw of the UL-450 combined with the low airspeed are likely to have made it difficult for the pilot to control the drift.

The aircraft had been modified with electric flaps, with a control switch that latched in the retraction position. This design meant that the flaps would retract fully once selected if the pilot was distracted and did not return the switch to the mid position.

Both pilots were licenced to fly the aircraft. The aircraft was being flown from the right seat by an experienced pilot who had not previously flown a Jabiru aircraft. The pilot in the left seat had 28 hours experience in G-ROYC. The right seat pilot reported that they did not clearly agree the roles and responsibilities of each person before the flight. This was particularly relevant in this aircraft because the flap switch could only be operated from the left seat. The accident highlights the importance, when two qualified pilots fly together, of agreeing clear roles and responsibilities particularly when critical controls can only be accessed from one seat.

The LAA provides a Pilot Coaching Scheme to enable pilots to safely learn new aircraft types and develop their flying skills with experienced instructors.

#### *Ground collision risk*

As G-ROYC descended and drifted left it collided with a parked glider. During gliding operations there are often multiple aircraft using the same runway, therefore, there is a greater risk of ground collisions. The BGA reviewed its accident database and reported that there have only been a few ground collisions recorded suggesting that historically this risk has been well managed. However, the BGA has taken safety action to highlight the risk to clubs and provide advice to ensure it is minimised. The gliding club will review its operating procedures in light of the advice from the BGA.

### **Conclusion**

Whilst attempting to go around from low height G-ROYC descended and drifted left and collided with a stationary glider which was waiting to launch.

It is likely that the aircraft did not climb due to the combination of the inadvertent retraction of the flaps, a brief delay in the application of full power and the aircraft being slightly above the maximum takeoff weight.

The BGA and the gliding club have taken safety action to ensure the risk of ground collisions is minimised.

## Safety actions

Following this accident the following safety actions have been taken:

The BGA has undertaken to remind all gliding clubs about the risk of landing aircraft colliding with aircraft on the ground and to provide advice on how to minimise the risk.

Cambridge Gliding Club will review its procedures and consider advice from the BGA to ensure that the risk of ground collision remains as low as is reasonably practical.

*Published: 16 April 2020.*