

**SERIOUS INCIDENT**

<b>Aircraft Type and Registration:</b>	(1) Robin DR 400-180, F-GSBM (2) SAS Wildthing radio-controlled model glider
<b>No &amp; Type of Engines:</b>	(1) 1 Lycoming O-360-A3A piston engine (2) Unpowered
<b>Year of Manufacture:</b>	(1) 1997 (2) Unknown
<b>Date &amp; Time (UTC):</b>	30 April 2015 at 0953 hrs
<b>Location:</b>	Near Shoreham Airport, West Sussex
<b>Type of Flight:</b>	(1) Private (2) Private
<b>Persons on Board:</b>	(1) Crew - 1                      Passengers - 2 (2) Crew - N/A                  Passengers - N/A
<b>Injuries:</b>	(1) Crew - None                  Passengers - None (2) Crew - N/A                  Passengers - N/A
<b>Nature of Damage:</b>	(1) Right wing leading edge scrape damage (2) Minor damage to aileron and rudder
<b>Commander's Licence:</b>	(1) Private Pilot's Licence (2) N/A
<b>Commander's Age:</b>	(1) 32 years (2) Unknown
<b>Commander's Flying Experience:</b>	(1) 1,083 hours (of which 861 were on type) Last 90 days - 33 hours Last 28 days - 15 hours  (2) N/A
<b>Information Source:</b>	Aircraft Accident Report Forms submitted by both pilots and further enquiries by the AAIB

**Synopsis**

A Robin DR400 (F-GSBM) was descending on base leg to land on Runway 20 at Shoreham when its right wing struck a radio-controlled model glider. The Robin suffered minor damage and landed safely. The pilot of the Robin had not seen the glider and the pilot of the glider had not heard or seen the Robin approaching until it was too late to take avoiding action. The model glider is considered to be an unmanned aircraft and the Civil Aviation Authority and the European Aviation Safety Agency are considering new regulations on the operation of small light-weight unmanned aircraft. In the meantime, the Shoreham airport operator is taking steps to increase pilots' awareness of the model gliding site, located 1 nm from the Runway 20 threshold, near the turn from base leg to final.

## History of the flight

The pilot of F-GSBM was on a cross-country flight from Lille, France, to Shoreham Airport with two passengers. He had flown to Shoreham on three previous occasions in the past year and a half, and the last time was on 21 March 2015 in a Piper PA-28. He called the Shoreham tower and was instructed to join left base for Runway 20 and not to fly below 1,300 ft or 1,600 ft (he could not recall which) while arriving near the airport; he was later advised of no further height restriction after he passed the town of Shoreham-by-Sea. The pilot then started his descent on base leg. He was using the QNH setting passed by the controller which was effectively the same as the QFE as the airport's elevation is 7 ft amsl.

While on the base leg, at an estimated altitude of 600 to 800 ft amsl, the aircraft's right wing struck a model glider. The pilot initially thought he had been hit by a large bird, but the collision was caught on a passenger's video camera which revealed that it was a model glider (Figure 1). The aircraft continued to handle normally and the pilot turned final and landed uneventfully. He had not been aware that there was a model glider flying site on the base leg to Runway 20.



**Figure 1**

Moment before and at the time of the mid-air collision as captured from a video camera on F-GSBM

### *Report by model glider pilot*

The model glider pilot reported that he was on the lower slope of Mill Hill flying his SAS Wildthing radio-controlled glider. He estimated that the wind was from the southwest at 10 to 15 mph and so his glider was ridge-soaring on the south side of the hill. He had flown his glider over to the right side of the slope and had entered a loop to return to the left when a light aircraft suddenly appeared between him and his glider. The next thing he saw was his glider tumbling towards the ground, where it came to rest about 30 m away from him. At no point did he hear or see the light aircraft approaching; it suddenly appeared over the top of the hill above him and slightly to the right, leaving him no time to react and take avoiding action. He thought the aircraft had been flying low and further south on its approach compared to most light aircraft he had seen there.

He noted that because the wind was coming towards him and the aircraft was approaching from behind, the wind was carrying the sound of the aircraft away from him. He stated that aircraft would normally approach from his right and then pass in front, attracting his attention and leaving a large margin of separation.

### **Aircraft descriptions**

The Robin DR 400-180 is a four-seat fixed-wing piston-engined aircraft of wood and fabric construction.

The SAS Wildthing is a radio-controlled model glider constructed of expanded polypropylene (EPP) which is an engineered plastic foam material (Figure 2). It weighs 0.615 kg and has a wingspan of 1.17 m.



**Figure 2**

SAS Wildthing model glider

### **Damage to the aircraft**

The right wing leading edge of F-GSBM suffered scuffing and scraping damage which cost £1,400 to repair (Figure 3).

The model glider suffered minor damage to the right elevon and the rudder involving a £3 repair.

### **Mill Hill model glider site**

The model glider was being flown from the Mill Hill nature reserve (Figure 4). This is an area that is popular with model glider pilots and has been used for model glider flying since the 1970s. The pilot of the SAS Wildthing was standing on the south side of the hill, about 150 m south of the Mill Hill car park, within a few metres of his estimated location of the



**Figure 3**

Damage to right wing leading edge of F-GSBM

mid-air collision, as depicted in Figure 4. The approximate elevation of the area where he was standing was 180 ft amsl. The Mill Hill car park is at 260 ft amsl, and the highest point in the nature reserve, north of the car park, is at 295 ft amsl.

The Mill Hill car park is located 1.05 nm north-east of the Runway 20 threshold at Shoreham Airport, on a bearing of 033°. The approximate location of the mid-air collision was 0.98 nm north-east of the Runway 20 threshold on a bearing of 035°.

According to the Adur District Council byelaw<sup>1</sup> for the Mill Hill nature reserve, motorised model aircraft flying is prohibited. According to the 1977 Adur District Council byelaw<sup>2</sup> for the 'pleasure ground'<sup>3</sup> at Mill Hill a person shall not:

*'3(ii) take off, fly or land any glider, manned or unmanned weighing in total more than 4 kilogrammes or (except in the case of accident or other sufficient cause) any other aircraft manned or unmanned weighing in total more than 4 kilogrammes.'*

Beyond the 4 kg restriction there are no other restrictions, such as height restrictions, on flying model gliders in the Mill Hill nature reserve.

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#### Footnote

<sup>1</sup> Byelaw made under section 20, 21(4) and 106 of the National Parks and Access to the Countryside Act 1949.

<sup>2</sup> Byelaw made under section 164 of the Public Health Act, 1875.

<sup>3</sup> The council stated that the 'pleasure ground' at Mill Hill covers the same dimensions as the nature reserve.

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**Figure 4**

Location of Mill Hill nature reserve, Shoreham's Runway 20 and the approximate location of the mid-air collision  
(image copyright GoogleEarth)

### Airport information

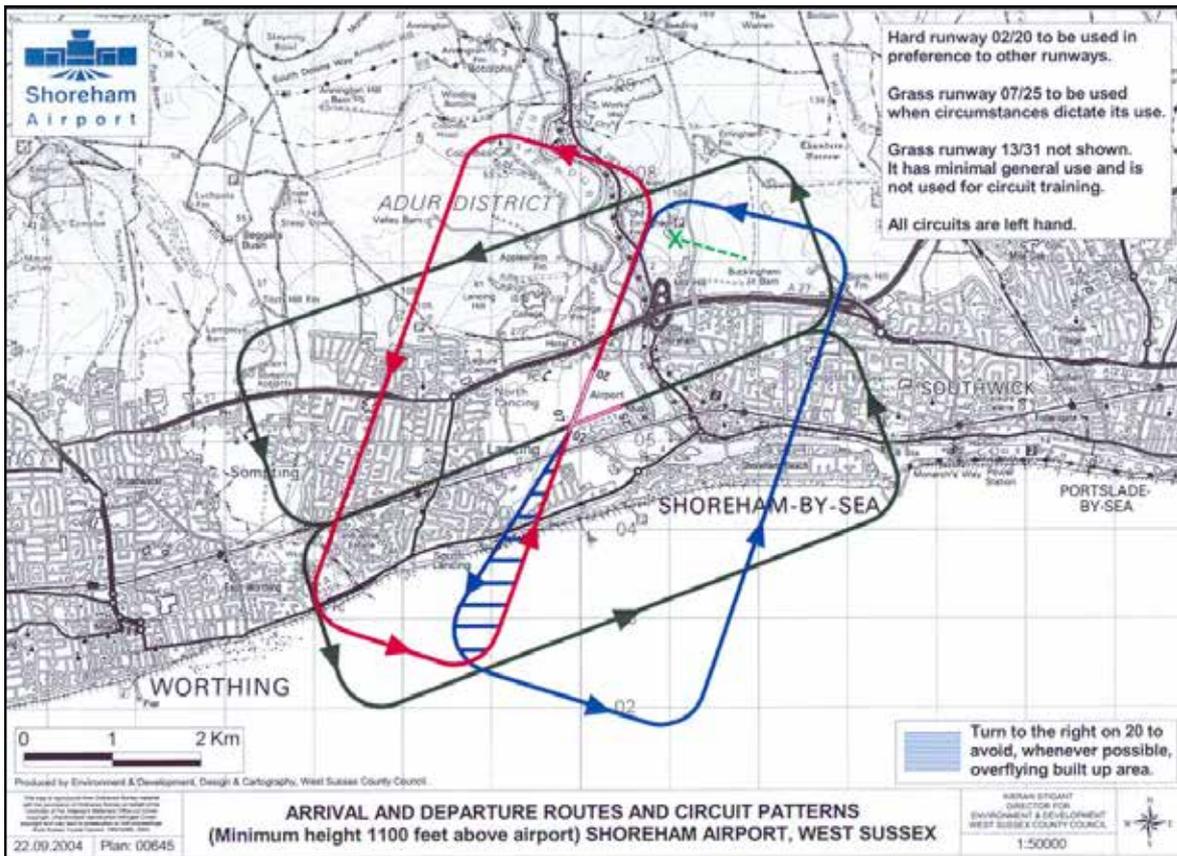
At the time of the accident the Aeronautical Information Publication (AIP) entry for Shoreham Airport contained the following statement under 'Warnings':

*'(e) Caution, model aircraft fly adjacent to Runway 20 approach at approximately 1 nm from the threshold up to 100 ft agl.'*

There was no similar statement or other caution about model aircraft in the Pooley's guide entry for Shoreham Airport.

The Shoreham Airport (also known as Brighton City Airport) website, flybrighton.com, contained a 'General Information' section for pilots. This section did not refer to the model aircraft site and it contained a circuit diagram (Figure 5) which did not highlight the location of the model aircraft site. The estimated track of F-GSBM has been added, as a dashed green line, in Figure 5 and the location of the mid-air collision has been added as a green 'X'.

The air traffic controllers at Shoreham Airport were aware that model gliders operated in the Mill Hill nature reserve, but they were not aware of any other mid-air collisions with model aircraft in that area. The airport operator had been managing the airport for a year and was not aware of anyone seeking permission to operate model gliders in that area, which was inside Shoreham's Aerodrome Traffic Zone (ATZ).



**Figure 5**

Circuit diagram from Shoreham Airport website with location of mid-air collision marked with a green 'X' and F-GSBM's estimated track marked with a dashed green line

There was evidence that the previous airport operator had come to an arrangement with the Sussex Radio Flying Club (SRFC) that would permit model gliders to be flown there at a height of no more than 50 ft above the hill (about 350 ft amsl). This was reflected in a section of the SRFC's Members Handbook 2015 which stated:

*'Shoreham Air Traffic Control (ATC) allow the use of model gliders on this hill provided they are NOT FLOWN AT MORE THAN 50 FEET ABOVE THE HILL. ATC have said that they have no problem with the small gliders that stay relatively close to the ridge, but anyone flying larger gliders should phone the control tower before flying, and again when they finish flying.'*

However, there is no requirement for a model glider pilot operating at Mill Hill to be a member of the SRFC and the SRFC has no control over who uses the site.

The pilot of the SAS Wildthing reported that many model glider pilots at the site considered 400 ft agl to be the limit.

In October 2015 the SRFC removed the above paragraph, and all references to the Mill Hill site, from its handbook and replaced it with the following:

*'There are many slope soaring sites within our area, none of which are administered by SRFC but may come under the control of other clubs. Members at these sites should make themselves aware of any local rules, byelaws or NOTAMs which may apply.'*

### **Regulations on small unmanned aircraft**

Any model aircraft of less than 20 kg is classified by the Civil Aviation Authority (CAA) as a Small Unmanned Aircraft (SUA). The Air Navigation Order<sup>4</sup> (ANO) contains the legal requirements for the operation of SUA. Article 166 states that:

*'(2) The person in charge of a small unmanned aircraft may only fly the aircraft if reasonably satisfied that the flight can safely be made.'*

*'(3) The person in charge of a small unmanned aircraft must maintain direct, unaided visual contact with the aircraft sufficient to monitor its flight path in relation to other aircraft, persons, vehicles, vessels and structures for the purpose of avoiding collisions.'*

There are height restrictions and airspace restrictions for SUA with a mass greater than 7 kg, but none for SUA of less than 7 kg. The SAS Wildthing, as it is less than 7 kg, can be operated inside an ATZ without obtaining permission from air traffic control and up to any height as long as it remains within unaided visual contact of the pilot.

However, the guidance in CAP 658<sup>5</sup> *'Model aircraft: A Guide to Safe Flying'* is that pilots of model aircraft should obtain permission from the appropriate air traffic control unit before flying inside controlled airspace or an ATZ.

The CAA has also published a 'Drone code' (CAP 1202) which states *'stay well clear of airports and airfields'*, although no distance guidelines are provided.

### **Similar event**

On 5 April 2015 a Pioneer 300 (G-OPFA) light aircraft collided with a 'Valenta Ray X' radio-controlled glider at a height of about 630 ft while flying in uncontrolled airspace near Upton-upon-Severn, Worcestershire. The Pioneer 300 sustained minor damage and landed uneventfully while the glider, which weighed 1.8 kg, sustained serious damage and crashed into a field. For further details see AAIB Bulletin 10/2015.

### **Proposed changes to regulations on small unmanned aircraft**

At present the regulations on unmanned aircraft below 150 kg are set by the CAA, but in future the regulations on all unmanned aircraft will be set by the European Aviation Safety Agency (EASA). In July 2015 EASA published A-NPA 2015-10 *'Introduction of a regulatory framework for the operation of drones'*. This document proposes creating an 'Open' category

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#### **Footnote**

<sup>4</sup> CAP 393 Air Navigation: The Order and the Regulations (30 April 2015).

<sup>5</sup> CAP 658 Model aircraft: A Guide to Safe Flying, 4th edition February 2012 including amendment 1/2013 dated June 2013.

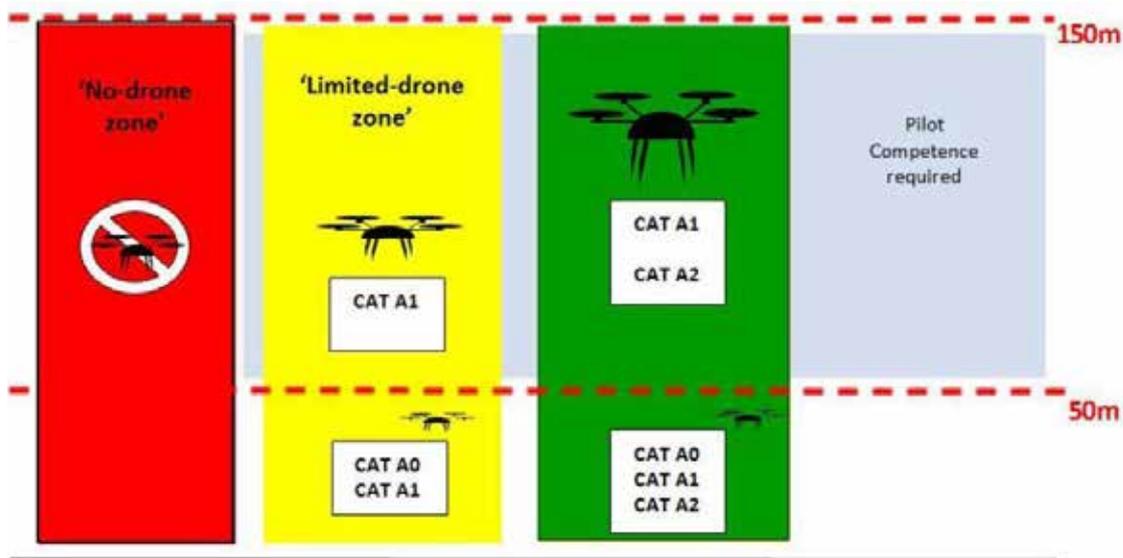
of a 'drone'<sup>6</sup>, which is any drone of less than 25 kg that is operated within visual line of sight, at a safe distance from persons on the ground and separated from other airspace users. It also proposes mandating 'geofencing' for 'open' category drones where 'geofencing' is an automatic system fitted to a drone, usually using GPS, which prevents the drone from being flown into certain airspace. Such features already exist in some commercially available drones. It proposes defining:

*"no-drone zones' where no operation is allowed without authority approval, and 'limited-drone zones' where drones must provide a function to enable easy identification and automatic limitation of the airspace they can enter and should have a limited mass.'*

The A-NPA also proposes that a drone in the 'open' category shall not operate at an altitude exceeding 150 m (492 ft) above the ground or water, and that for any drone operation over 50 m (164 ft) above ground, basic aviation awareness shall be required for the pilot. It also proposes establishing the following sub-categories in the 'open' category:

- CAT A0: 'Toys' and 'mini drones' < 1 kg
- CAT A1: 'Very small drones' < 4 kg
- CAT A2: 'Small drones' < 25 kg

It proposes restricting operation of Cat A0 drones to 50 m (164 ft) above the ground. Figure 6 summarises the proposed zones of operation for the three subcategories. These are only proposals and may change significantly after the consultation period.



**Figure 6**

EASA proposed zones of operation for the three subcategories of 'open' drones (A-NPA 2015-10)

#### Footnote

<sup>6</sup> A-NPA 2015-10 does not use the term SUA or unmanned aircraft but defines the term 'drone' to mean: 'an aircraft without a human pilot on board, whose flight is controlled either autonomously or under the remote control of a pilot on the ground or in another vehicle.' Full details of the A-NPA can be found at <http://easa.europa.eu/document-library/notices-of-proposed-amendment/npa-2015-10>.

## Safety action

### *The airport operator*

The airport operator at Shoreham has been in discussions with Adur district council on how to address the risk of mid-air collisions with model gliders at Mill Hill. The following new procedures have also been put in place:

A message is added to the ATIS<sup>7</sup> broadcast whenever model activity is observed or reported and air traffic controllers pass traffic information on models. The current ATIS message is '*Caution model aircraft operating in the ATZ*', but the airport operator intends to add more specific information about the model aircraft's location. An example message passed by air traffic controllers to pilots calling up is '*Caution model aircraft flying observed on left base*'.

The airport operator has also submitted an AIP amendment to say:

*'Caution, model aircraft fly adjacent to the RWY 20 approach on the hills approximately 1 nm from the threshold up to 700 ft amsl.'*

The airport operator would like the CAA to amend the ANO to prohibit all model/unmanned aircraft flying inside an ATZ without the permission of the air traffic control unit or airport operator.

### *Adur District Council*

Staff at Adur District Council intend to place signs at the Mill Hill Nature reserve which will state the byelaws for the area, so that people will be aware of the 4 kg model aircraft limit and the prohibition on operating powered model aircraft. They cannot impose any further restrictions without first amending or introducing new byelaws. They are, however, considering whether further restrictions should be introduced.

### CAA

The CAA are aware of this serious incident and are considering whether further weight or height restrictions need to be introduced for model/unmanned aircraft operating inside ATZs, or whether there should be a limit on the distance they can be operated from an airport or airfield.

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## Footnote

<sup>7</sup> ATIS is the Automatic Terminal Information Service which broadcasts weather and other information about an airport on an aviation radio frequency.

## Analysis

### *Cause of the mid-air collision*

This mid-air collision occurred because neither pilot saw the other aircraft until it was too late. It is unlikely that a light aircraft pilot, approaching at 80 to 100 kt, would be able to detect a 1 m size object that was on a direct collision course in sufficient time to take avoiding action. However, a model aircraft pilot would normally be able to hear and see a light aircraft in sufficient time to take avoiding action, but in this case the aircraft approached from behind a hill, downwind, so the model aircraft pilot did not see or hear F-GSBM until it was too late to take avoiding action.

The model aircraft pilot reported that most light aircraft turned behind the hill, more closely following the blue line on the circuit diagram (Figure 5) which passes outside the nature reserve, so separation was not an issue. It is probable that many locally-based pilots follow a circuit pattern closely matching the blue line, but there is no requirement to follow the blue line. The circuit diagram is not part of the AIP and therefore it only serves as guidance to pilots. There is no requirement to check an airfield's website so some visiting pilots will not be aware of the circuit diagram. Many visiting pilots will fly a circuit that is of similar size to the one at their home airport, and the circuit flown by the pilot of F-GSBM was well within what would be considered normal.

The pilot of F-GSBM estimated that he was at 600 to 800 ft amsl on left base when the collision occurred. The view of the surrounding terrain in Figure 1 indicates that he could have been as low as 400 to 500 ft amsl but probably not lower; this would have placed him about 220 to 320 ft agl at the point of collision. Although this might seem low, being at 400 to 500 ft aal (given that the runway was at sea-level) at 1 nm from the runway threshold is within the normal range. The PAPI<sup>8</sup> angle for Runway 20 is 4.5° which means that an aircraft would be on the correct flight path at 500 ft aal at 1 nm from the threshold.

There is evidence that the Sussex Radio Flying Club (SRFC) had agreed with the previous airport operator not to operate more than 50 ft above the hill. If the summit of the hill is taken to be the highest point in the nature reserve, then this is about 350 ft amsl. This provides for a very small safety margin if aircraft pass over at 400 ft to 500 ft amsl.

The pilot of F-GSBM was operating his aircraft within normal boundaries. The pilot of the model glider was operating his aircraft in accordance with the local byelaws and the ANO; however, he had not followed the CAP 658 guidance to request permission from air traffic control or the airport operator, and his glider was probably above the '*50 ft above hill*' (350 ft amsl) limit indicated in the SRFC Members Handbook at that time. There was evidence that many other model glider pilots operated above this height and without requesting permission from Shoreham Airport. As there was no requirement to be a member of the SRFC to operate from the site, many pilots would not have been aware of the limit. The pilot of the model glider appeared to be operating his aircraft in accordance with common practice at the Mill Hill site.

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### Footnote

<sup>8</sup> PAPI means Precision Approach Path Indicator and is a set of lights that helps guide aircraft along a set flightpath angle to the runway. The PAPI for Runway 20 at Shoreham is displaced 90 m beyond the threshold.

*Mid-air collision hazard and means to mitigate against it*

In this incident the damage caused to F-GSBM by the 0.6 kg glider was minor, albeit expensive to repair. However, according to the local byelaws the glider could have been as heavy as 4 kg, which would have caused significantly more damage to the aircraft, potentially affecting its safety of flight. At a relative speed of 90 kt<sup>9</sup> an impact with a 4 kg glider has 4.29 MJ of kinetic energy, which is 6.7 times more energy than a 0.6 kg glider at the same speed. The ANO permits unmanned aircraft up to 7 kg to operate in an ATZ without permission which would have a kinetic energy 11.7 times greater than a 0.6 kg glider at 90 kt.

If model aircraft were prevented from flying at the Mill Hill site the hazard would be eliminated and the Adur district council is considering taking such action. This would require a change to the byelaws, which could take some time and would not prevent other unmanned aircraft up to 7 kg operating in other ATZs without height restrictions. The CAA are considering whether further weight and/or height restrictions should be imposed on unmanned aircraft or whether there should be a limit on the distance they can be operated from an airport or airfield, but this would require a change to the ANO. The proposed changes to the EASA regulations on unmanned aircraft will also take time to be reviewed and implemented.

In the meantime, pilots of manned aircraft operating in and out of Shoreham Airport need knowledge about the location of the model glider site and knowledge about the altitudes the model gliders may be operating up to, so that pilots can avoid the area. The airport operator has submitted an amendment to the AIP to change the caution about model aircraft to include reference to the 'hills' at the site, and to change the height of operation from 100 ft agl to 700 ft amsl. However, the statement on location,

*'adjacent to the RWY 20 approach on the hills approximately 1 nm from the threshold,'*

would be made clearer by adding bearing information, which the airport operator is considering. Pilots would also be helped if the circuit diagram on the website were amended to highlight the Mill Hill model glider site; the airport operator will consider this and has said it will contact Pooley's to suggest they add information on the model glider site.

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**Footnote**

<sup>9</sup> 90 kt is within the typical range of a light aircraft's airspeed on base leg.