Aviation at Bicester Airfield (v1.1)

An aviation assessment co-authored and reviewed by:

- Richard (Dickie) Feakes
- Derren Francis
- Jon Gatfield
- Alister Kay
- Andrew Reid
- Steve Slater
- Pete Stratten

whose CV's are appended.

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Bicester Gliding Centre

Bicester Airfield
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Introduction

The first record of an aircraft landing at Bicester was a Bristol Boxkite in 1911. The airfield was used by the RFC and then the RAF during the First War and up until 1920. The site was identified for development in 1926 and permanent construction commenced with the field becoming operational in January 1928. From 1928, the airfield was in continuous use by the RAF with further expansion during the 1930's leaving the building layout much as it was when the airfield was sold by Defence Estates to Bicester Heritage in 2013. English Heritage describes RAF Bicester as "retaining better than any other military airbase in Britain, the layout and fabric relating to pre-1930s military aviation… it comprises the best preserved bomber airfield dating from the period up to 1945 … It also comprises the best preserved and most strongly representative of the bomber stations built as part of Sir Hugh Trenchard's 1920s Home Defence Expansion Scheme."

The layout is typical of pre WW2 RAF airfields being a grass field surrounded by a perimeter track with, in principle, the ability to take-off and land in any direction – generally this means 'into wind'.

In practice, the field is not circular and the hangars have always provided an obstruction when taking off or landing directly east – west. The shape of the airfield has provided six run directions known, from their approximate magnetic headings, as 06-24, 13-31, and 18-36 as illustrated on the drawing below. Although the north south run has historically been known as 18-36 its actual orientation is close to 17-35. This plan shows the current locations of the runs. Originally 13-31 was located further to the south west but later housing development at Caversfield to the north west of the airfield has forced it to its present position.

Figure 1 – Airfield Runs 2020 (Source Google Earth with Bicester Gliding Centre Overlay)

Airfield Status

All of Bicester Airfield, but not the adjacent quarries, fall within the RAF Bicester Conservation Area.. The Conservation area was designated in 2002.

A planning brief for Bicester Airfield was written by Cherwell District Council in 2009 prior to the sale of the airfield by Defence Estates and focusses on reuse of the existing buildings. The Cherwell Local Plan 2011-2031 effectively incorporates the planning brief and includes the following text:

Policy Bicester 8 seeks to secure appropriate uses for a long-lasting 'conservation-led' approach to the technical site and flying field. It aims to establish uses that will be complementary to, and help enhance, the character and appearance of the conservation area and the nationally important heritage value of the site. It seeks to encourage a mix of uses that will best preserve the sensitive historic fabric and layout of the buildings and the openness of the grass airfield.

Policy 8 states … *All proposals will be required to accord with the approved Planning Brief for the site and take into account the Bicester Masterplan. They must maintain and enhance the character and appearance of the conservation area, protect listed, scheduled and other important buildings, their setting, and protect the sensitive historic fabric of the buildings and preserve the openness of the airfield… The continuation of gliding use will be supported*

The airfield is protected by a safeguarding plan which requires the Local Planning Authority to take account of the impact of any development proposal on the airfield. This was filed in 2009.

Non-Official Aerodrome Safeguarding

Bicester Airfield is the subject of a safeguarding map filed with Cherwell District Council in 2009. Aerodrome safeguarding obliges the Local Planning Authority to consider the impact of any proposed development that might impact on aviation from the airfield when considering whether to grant planning permission. Cherwell District Council failed to advise Bicester Gliding Centre, as the initiators of the airfield safeguarding map and current airfield operator, of relevant planning applications until the middle of 2019 meaning that earlier applications may not have received the proper scrutiny necessary to assess their impact on the safety of airfield operations.

Further information on airfield safeguarding is available here.

The airfield has also been designated by the British Gliding Association, the National Govening Body for gliding in the UK as a Nationally Significant Area for Sport (SASP) and registered as such by Sport England in the gliding category. This provides the airfield with additional protection from development which might impact on gliding activity on the airfield.

The Sport England SASP register is available here.

Operational Considerations for Aviators

All pilots consider emergency options before take-off. Emergencies can occur as a result of unforeseen precursor events (UPE), for example engine failure after take-off (where a landing area is needed immediately), undershoot (where an aircraft lands short of the intended landing area) or bird strike (where a bird collides with the aircraft). The objective during any UPE is to ensure that a safe emergency landing can be undertaken that carries the best chance of a successful outcome.

Operational Considerations – Aero-tows

An aerotow is where a glider is towed by an aeroplane. The glider releases itself from the tow rope when it reaches the desired height. Take-off and landing considerations for aero tow take-offs are

more restrictive than those for unencumbered powered aircraft due to the lower climb rates of the tug-glider combination, the reduced ability of the glider to manoeuvre sharply and the need to provide safe landing options for both glider and tug in the event of an emergency. These factors are included in the recommendations of the British Gliding Association which have been developed based on many years of experience. The BGA recommended criteria state amongst other factors that:

- A critical issue is take-off and climb to clear obstacles…
- There is a clear need to ensure safe and unobstructed arrival and departure routes for aircraft using a runway or strip in accordance with Civil Aviation standards.
- No significant obstacles or hazards on approach at either end of the strip.

A further factor that must be taken into account is that aero-tow tug aircraft produce noise. Built-up areas are generally avoided below 1500' in order to minimise environmental impact in the vicinity of the airfield.

Operational Considerations – Winch Launching

A winch launch is where a ground-based winch pulls in a thin cable against which the glider pilot flies the glider to a height of typically between 1000 and 1500 feet where the glider pilot releases the cable. Around 80% of launches at Bicester are by winch. Winches provide a low cost and environmentally friendly means of launching gliders and are particularly attractive for training where teaching circuits and landings is important.

Because the launch is contained within the boundary of the airfield, in the event of a launch failure the flight can generally be contained within the airfield boundary. Pilots are trained to consider the need to land off airfield if faced with a UPE (eg a launch failure) that requires that course of action. So built-up areas outside the boundary are a consideration but less than they are for aerotows. So long as any obstacles within the airfield are of minimal height, they can probably be accommodated.

Crosswind limits are defined through aircraft certification. From a practical perspective, because they rapidly accelerate into flight, gliders can launch by winch in cross winds that would not be practical for aerotow operations.

The BGA gliding strip criteria (previously referenced) recommends a minimum width of 100m for a single mode of launching. When aero-towing or powered aircraft are operating alongside winching, a minimum separation of 50m is applied at Bicester to minimise the risk of powered aircraft fouling winch cables.

If winching in a cross wind, due consideration must be given to where the cable is going to fall, not only during normal launches, but also in the event of a launch failure of some description. There is always a need to mitigate the potential hazard of a cable falling outside of the area used for gliding operations.

Operational Considerations – Powered Aircraft

In addition to gliding, a number of other powered sport flying aircraft have also been based at and operated from Bicester, both during its MoD occupation and since the site's acquisition by Bicester Heritage. The owners of these aircraft pay hangar rent to Bicester Heritage via an associated company while flying operations are overseen by Bicester Gliding Centre. When gliding is underway, these aircraft are integrated with these operations, taking off and landing parallel to the gliding

operations, with the primary responsibility being with the pilots to maintain separation and safe operating practices.

Most modern powered aircraft are capable of taking off and landing in significant cross-winds – typically up to 15 knots. However, when doing so, they require a longer take-off and landing run. Subject to the standard CAA recommendations on take-off and landing obstructions, they may also be able to climb over obstructions and built-up areas more readily than tug-glider combinations.

However, the powered aircraft based at Bicester are predominantly vintage light aircraft whose owners are attracted by both flying from a heritage site in keeping with the aircraft and also the facility of operating from one of the UK's last omni-directional all-grass airfields, with no marked runways and take-off runs of up to 800m in the prime into-wind directions.

Vintage aircraft including Tiger Moths and even earlier types which operate at Bicester, have no brakes and rely on a steel or wooden tailskid to act as a plough on the grass surface, providing braking and stability particularly during the landing roll. This makes these aircraft much less capable of handling crosswind conditions and normally precludes their use of surfaced runways. Bicester's omni-directional design therefore makes it one of the best places in the country for vintage aircraft operations.

Typically the older aircraft based at Bicester, such as a de Havilland Gipsy Moth, were designed to operate into wind, have a maximum crosswind tolerance of 5 knots, above which there is a risk of insufficient aileron control to hold an into-wind wing down and insufficient rudder authority to keep straight. In addition, the narrow wire-spoked wheels will not withstand lateral loads from crosswind landings. de Havilland Tiger Moths and Piper Cub have slightly higher tolerances on the grass surface and dependent on pilot experience can probably be flown with a 10-15 knot crosswind component, although lower limitations will be applied by pilots with less experience.

Typically these aircraft use around 400m for their take-off and landing runs with the remainder offering an appropriate landing or take off safety margin. Most of the light aircraft operating from Bicester are single engine, and pilots are very aware of the need to 'glide clear' and land safely in the event of a post-take off engine failure. Approach and climb out routes are therefore constrained by the need not to overfly buildings and habitation.

Over many years there have been very welcome visits by WWII fighter aircraft. These have been popular reminders of Bicester's important RAF heritage. Run 24 is no longer suitable for these aircraft to take-off from, due to the limited options following an engine failure (See the analysis in the following paragraphs. The safe directions for these aircraft to take-off are realistically limited to runs 36, 13 or 06.) The days of these historic aircraft being able to visit Bicester would end with the proposed development.

Factors affecting choice of runs at Bicester

When Bicester Airfield was constructed there were few buildings in the vicinity of the airfield other than those concentrated on the technical site on the west of the airfield, and a limited amount of accommodation associated with the airfield on the opposite side of the road to the technical site.

Figure 2 – Airfield and surroundings 1946 (Source Bicester Heritage website) – note that this picture has been rotated from the original so that it is 'North Up'.

A wind rose for the Oxford Airport indicates that the wind is predominantly from the south western quadrant. This would normally favour take-offs on run 24.

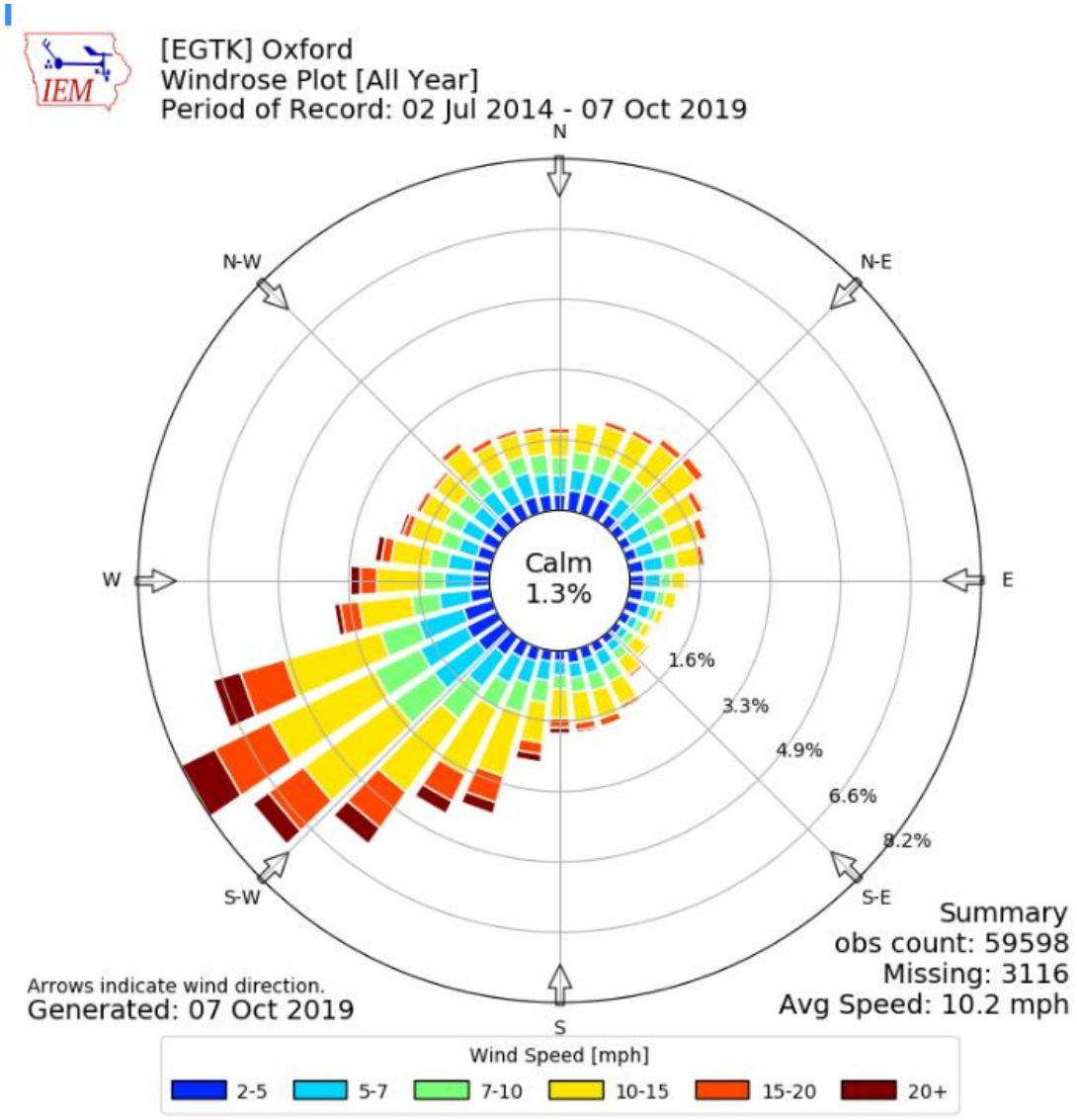

Figure 3 – Wind Rose for Oxford Airport

However, the wind is only one consideration when assessing the preferred take-off direction. Consideration of the environment around Bicester Airfield shows that development has significantly altered the safe take-off directions since 1946.

Figure 4 – Aerial View May 2018 (Source Google Earth)

The warehouse area to the south of the airfield has been extended over the brown area to the south since the aerial view was taken in 2018. There has also been development infilling much of the green area to the south west of the airfield immediately west of Skimmingdish Lane as well as the construction of the 'New Technical Site' on Skimmingdish Lane by Bicester Motion.

The following figure has the built up areas that are normally avoided by aircraft taking off outlined in red:

Figure 5 – Built up areas around Bicester Airfield

Overlaying figure 5 with the airfield runs and departure routes avoiding the built up areas shows the restrictions on possible take-offs.

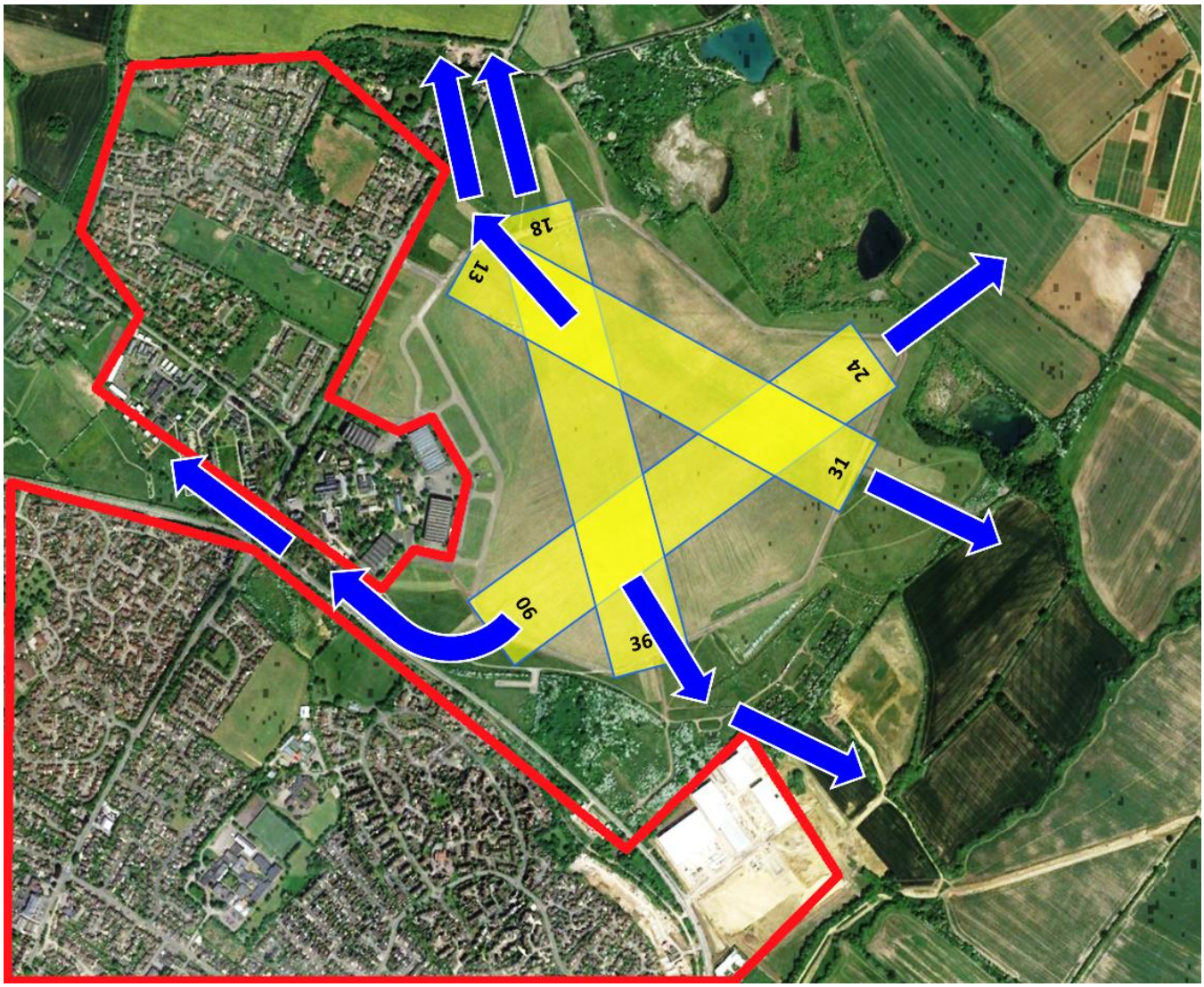

Figure 6 – Take-off and departure routes from Bicester Airfield

It will be seen that in order to avoid the built up area of Bicester, a take-off from Run 24 requires a tight right turn after departure. This is only possible if sufficient height has been gained by the edge of the airfield to enable this turn to be made safely. BGC standard procedure is to consider this take-off direction only if the headwind component is at least 10 knots. Even then, it may not be possible with certain tug and glider combinations. Whilst a headwind apparently favouring 24 is present much of the time (see figure 3), BGC estimate that less than 20% of aero-tow take-offs are made on this run. The 'New Technical Site' currently under construction by Bicester Motion under the first section of this departure route is likely to favour this departure even less frequently in future by creating an additional obstruction to be cleared.

Where take-off in south westerly winds from 24 is not possible, 31 or 18 will be used, depending which run gives the best headwind component.

BGC has analysed 871 aero-towed flight logs available from 2018 and 2019 to determine which run was actually used on each occasion. These logs are available from 2018 Logs, 2019 Logs and BGA Ladder Logs

The result of the analysis was as follows:

Run used in order of frequency		
Run	No of tows	Percent tows
36	244	28%
18	205	24%
24	147	17%
31	125	14%
13	109	13%
06	41	5%
Total	871	100%

Most used runs (adding both directions)		
Run	No of tows	Percent tows
18-36	449	52%
13-31	234	27%
06-24	188	22%
	871	100%

Table 1 – Take-off run directions used in 2018 and 2019 (source BGC analysis of flight logs)

It is acknowledged that flights for which logs area available represent only a proportion of aero-towed flights undertaken (those for routine training flights are not retained). The analysis included 871 flights in 2018 and 2019 whilst Club logs indicate that there were a total of 1214 aero-towed launches undertaken in 2019. So the analysis covers about 35% of aero-towed launches. However, at 17%, it confirms the best pre-analysis estimate of BGC experts that no more than 20% of aero-tow launches are undertaken on Run 24. The analysis shows that the most used run is 18-36 accounting for 52% of tows. It is notable that whilst 36 currently allows a near straight departure, the recent construction of warehouses to the south of Bicester airfield forces departing aircraft to make a left turn after take-off to keep clear of obstructions.

Airfield Utilisation

Bicester Gliding Centre makes intensive use of the available airfield. All flights are logged. An analysis of the daily flying logs provides the following statistics for 2019:

Days Flown	
Flying days all year	237 of 365 (65%)
Flying days Apr-Sept	149 of 183 (81%)

Launch Type				
	Aerotow	Winch	Self Launch	Total
Full year				
Movements	3642	15190	542	19374
Percentage	19%	78%	3%	100%
April-September				
Movements	3081	10196	278	13555
Percentage	23%	75%	2%	100%

69% of movements occurred during the key summer period, April-September.

Table 2 – Bicester Gliding Centre Activity (Source BGC daily flight logs)

Note that in the above table, an aero-tow is counted in accordance with CAA convention as 3 movements (one take-off and two landings) whilst a winch or self launched flight consists of two movements.

During the key flying season, BGC is set up to operate 7 days a week and offers many trial lessons to visitors mid-week. When good weather is available, club members are able to obtain launches during the week 'on-demand' taking advantage of opportunities offered by British weather. As can be seen, during the period April-September 2019, we flew on 81% of available days. Outside the peak period, operations are wound down with flying restricted to weekends only during most of December-February. Nonetheless, flying took place on 65% of available days over the whole year.

British Gliding Association latest Club Annual Statistics show that Bicester Gliding Centre is the UK's leading site for flying visitors (Temporary Members) and is second only to the UK's largest gliding centre at Lasham in terms of number of launches. (Source BGA Club Annual Statistics, Sailplane and Gliding Magazine Vol 70.3 p62).

Bicester has an enviable record for training young pilots and has a high proportion of young pilots with 47% under 26 at the end of the last membership year. From 2018 to 2019, the Club's membership grew by 13%. During 2019, the Club sent 12 members under the age of 16 off on their first solo flight, some on their 14th birthday. The BGA's latest published statistics show that Bicester was second only to Lasham for the number of new solo pilots. Many Bicester trained pilots have gone on to careers in aviation.

Gliding Members at year end 30 June 2019	
Adult (Full, Country, Overseas, Flying Start, Learn2Glide, OUGC staff & Oxford Staff)	121
Under 26 (Junior, OUGC and Cadet)	109
Total	**230**
Community Volunteers, Power and Social members (excluded from the total above)	82
Grand total	**312**
Growth from 2018:	13.3%
Under 26's as percentage of total	**47%**

Table 3 – Bicester Gliding Centre Membership Statistics (Source BGC Membership Database)

Bicester Motion Masterplan

In January 2019, Bicester Heritage was renamed Bicester Motion and soon after, a vision for the airfield, the 'Masterplan' was shown to the Chairman of Bicester Gliding Centre. In its initial form it included two vehicle tracks roughly along run 13-31 and cutting across run 06-24. These tracks were to be sunk into the ground in order to meet the Historic England listing requiring undisturbed views across the airfield. Bicester Motion was advised that this arrangement would be incompatible with continued gliding on the airfield. The tracks were modified to avoid cutting across 06-24. After consideration by the Club's experts, Bicester Motion was advised that the Masterplan was still incompatible with continued gliding at Bicester, and most probably, on most aviation from the field. Despite the advice of the Club, the vision was published along with statements that Bicester

Motion's objective was to make the site the UK's number one Automotive Resort and a 'Top-20' visitor attraction.

In June 2019, Bicester Gliding Centre held an open day to celebrate completion of works to its new premises. At that open day, concern was again raised about the Masterplan. A representative of Bicester Motion stated that it was 'only one idea'.

In December 2019, Bicester Motion applied for planning permission for the Future Automotive Speed and Technology Hub (F.A.S.T.), a range of 6 linked buildings along Skimmingdish Lane, roughly between the 06 and 36 run thresholds. Bicester Motion's own aviation assessment identified that the height of the buildings would have an impact on run 18-36 using CAA criteria which would have the effect of shortening the safe usable length of the run. Despite some concern about development on the perimeter of the airfield and BMs own aviation assessment, Bicester Gliding Centre's experts felt that this was one section of the airfield perimeter that had some potential for development with only a small negative additional impact on gliding from the airfield. However, the planning application for the F.A.S.T. development was set in the wider context of a Masterplan little changed from that revealed early in 2019.

Figure 7 – Bicester Motion Masterplan from F.A.S.T. Planning Application)

Overlaying the Masterplan with the runs used at Bicester Airfield, it is immediately apparent that the plan is incompatible with continued airfield operations. The two most used runs, 18-36 and 06-24 run over the vehicle tracks whist the northern end of both of these runs are obstructed by the buildings of the Automotive Demonstration and Experience Centre. Bicester Motion's own aviation assessment acknowledges that the FAST development has an impact on 18-36 being an obstruction to the south of the run. In practice, the last point is of relatively limited concern to Bicester Gliding Centre because of the need to avoid the warehouses, although the height of the proposed buildings is an issue for aircraft making straight in approaches to 36 or departing 18 effectively shortening the available run and may be an issue for gliders returning to the airfield from the south with minimum energy.

Figure 8 Masterplan with runs overlaid.

Proposal

It can be seen that there is room for development of a track on the airfield to the west of run 18-36 – some of which area is currently fenced off and already used for events. This would join the hard surfaced area already used as a track by Bicester Motion. If run 06-24 was completely unavailable, it could prevent aero-towed gliding operations on around 20% of days, the days when there is a strong south west wind. However, it would, potentially give room for building developments between FAST and existing hangar 137. With a low level development, it might be possible to continue to have a short run 06-24 which would be usable by vintage type aircraft unable to accept a cross wind. The possible development is sketched in the figure which follows shaded in blue.

An alternative possibility which we have not considered in any detail but we feel should be fully explored, is to use the quarry area to the north east of the field, outside of the Conservation Area, for a track and the Automotive Demonstration and Experience Centre leaving the airfield substantially undisturbed. This area is already included in the Bicester Motion masterplan.

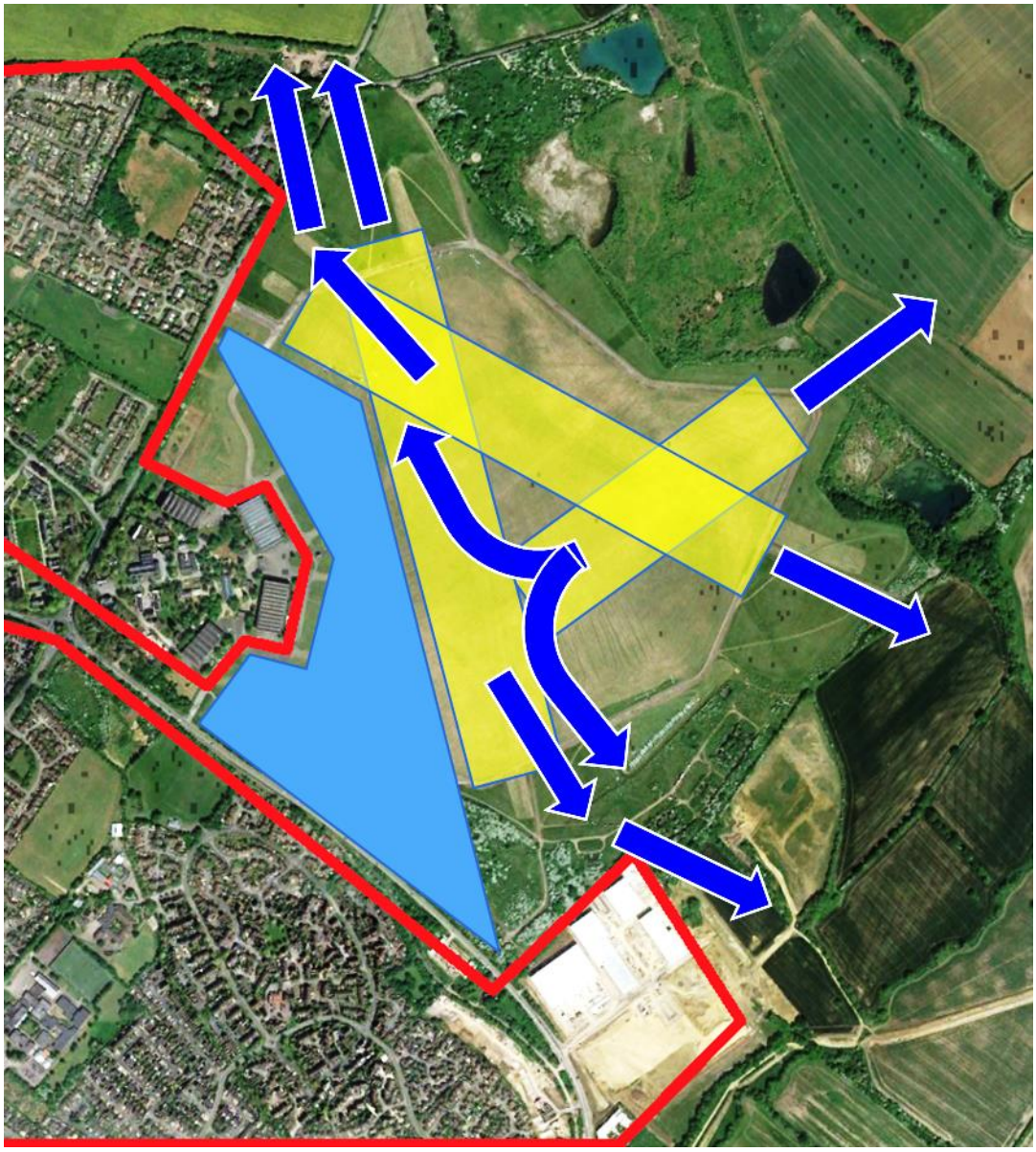

Figure 9 Potentially developable area for tracks and buildings

Appendix 1 – Brief CVs of those co-authoring and reviewing this paper:

Richard (Dickie) Feakes – RAF Officer - Retired

Richard first went solo in a glider in 1952, and a Tiger Moth in 1953. This was followed by a full career as a pilot in the RAF. During the intervening 68 years Richard has acquired over 4500hrs as an RAF pilot and 3500hrs in gliding, flying over 10 types of aircraft from Tiger Moth to Hunters, and over 76 different types of gliders. Appointments include two tours at the Central Flying School, as well as the leader of the RAF team that audited Air Cadet Gliding operations at over 26 airfields, including some with concurrent power operations. As well as a qualified flying instructor, Richards career also included a period as a British Gliding Association Instructor Examiner. Richard retired from the RAF, as a senior officer, after 30 years of service, and has continued to fly regularly since his retirement.

Derren Francis – Commercial Pilot, Gliding instructor and BGA senior tug pilot

Derren started gliding aged 14 and went solo on his 16th birthday at Lee-on-Solent. He joined the RAF in 1989 and in 1997 became a pilot flying helicopters for the Army Air Corps. Derren left the Army in 2002 and became a commercial pilot and today flies the new A350 and A330 for Virgin Atlantic. Outside work he is a member of the British Gliding Team where he has competed in World and European Gliding Championships. Derren is the current British Gliding Association Senior Tug Pilot, Bicester Gliding Centre Chief Tug Pilot and instructs and examines in both Aeroplanes and Gliders. Over this period, he has flown over 15,000 hrs.

Jon Gatfield – GA pilot and Gliding instructor

Jon first flew solo in 1987 and his since gained over 5300hrs total, flying regularly from seven different clubs. Jon holds an EASA SPL (sailplane License) and an NPPL (national private pilots license). Jon has all three FAI diamonds, is an assistant rated gliding instructor and carries qualifications for instructing in other countries. Jon is also a very experienced competition pilot, flying multiple UK regional and national competitions. Jon has also competed in two Sail plane Grand Prix World finals

Alister Kay – Air Display pilot and Gliding instructor

Alister began flying, aged 16, as an RAF cadet. He has held 14 UK gliding records including a height climb to 36,600'; he has been UK Gliding Champion 8 times and represented the UK at 8 World/European Championships.

In 1987 Alister entered and won his first aerobatic competition in a Pitts Special and began air-display flying. He was based at the Imperial War Museum - Duxford, displaying the Spitfire '*MH434',* P-51D Mustang '*Ferocious Frankie'* and the P-40 Kittyhawk, performing throughout Europe (including 8 years at the *Goodwood Revival*). He has flown in films including 'Fury', 'Flyboys' and 'Harts War' and on TV 'Midsomer Murders'. He became a specialist in close formation aerobatics and operated his own successful display team; he has performed 500 aerobatic displays.

Alister held a CPL/IR and has 10,000 flying hours on 150 types of SEP aircraft and gliders. He worked as a management consultant and for 20 years was MD of a PLC telecoms company.

Andrew Reid – GA pilot, Gliding instructor and BGC financial Director

Andrew has been involved in aviation since 1970, flying gliders initially, before gaining a PPL in 1972. Andrew has flown over fifty types of aircraft, from over 200 different airfields, and has 2500hrs gliding experience and 1200hrs power flying. Andrew holds all three FAI diamonds and is assistant category gliding instructor. Andrew has flown in, and directed, gliding competitions, and is often in charge of an airfield where very large movements of aircraft are occurring.

Stephen Slater – CEO, Light Aircraft Association

Stephen Slater initially started flying as a teenager in the early 1970s, then returned to aviation as a private pilot in 2003. He has been involved in the restoration and ownership of a number of vintage aircraft, including a 1914 BE-2c replica, 1938 Tipsy monoplane, Piper Cub and a Currie Wot biplane. The latter two are based at Bicester, from where Stephen has operated vintage aircraft since 2005. Stephen is the Chief Executive of the Light Aircraft Association, the UK's largest powered sport flying association with 7,800 members, is an advisor to the All-Party Parliamentary Working Groups on GA airfields and aviation heritage and is also a columnist and aviation historian writing for Aeroplane Monthly and Pilot magazines.

Pete Stratten – CEO, British Gliding Association

Pete Stratten has been flying gliders and other recreational aviation aircraft since the late 1970's. Pete has over 7600 hours and is a senior flying instructor and CAA flight examiner. During the 1990's, he was the Chief Flying Instructor at the MoD's Joint Services Adventure Training Gliding Centre based at Bicester airfield, with the primary task of safely and effectively delivering gliding training for 500 student glider pilots each year. Pete is currently the Chief Executive Officer of the British Gliding Association, advises the CAA on gliding related matters including operations and licensing rule-making, and is the cochair of the All-Party Parliamentary Group on GA (APPG GA) airspace group.

Appendix 2 – Hyperlinks quoted in this paper

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RAF Bicester Conservations Area
https://cherwell.maps.arcgis.com/apps/webappviewer/index.html?id=79616c90743d4da98b291ebd1683fe50&extent=457055.1027%2C223418.4071%2C462135.1128%2C225722.9325%2C27700

Information on airfield safeguarding
http://www.gaac.org.uk/wp-content/uploads/2015/10/GAAC-Safeguarding-Intro.pdf

Sport England Safeguarding Register
https://sportengland-production-files.s3.eu-west-2.amazonaws.com/s3fs-public/2020-02/Significant%20Areas%20for%20Sport%20Register_0.pdf?XXiZkb2l7NwmVo9Hcghiq6hiAIR4ZTgD

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The recommendations of the British Gliding Association
https://members.gliding.co.uk/library/flying-operations/gliding-strip-criteria

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Oxford Wind Rose
https://mesonet.agron.iastate.edu/sites/windrose.phtml?station=EGTK&network=GB__ASOS

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2018 logs https://www.soaringspot.com/en/bicester-regionals-2018-bicester-2018/
2019 logs https://www.soaringspot.com/en/bicester-regionals-2019-bicester-2019/
BGA Ladder logs https://www.bgaladder.net/

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Bicester Motion Masterplan from FAST Planning Application
https://planningregister.cherwell.gov.uk/Document/Download?module=PLA&recordNumber=139994&planId=1517965&imageId=22&isPlan=False&fileName=FAST%20LVIA%20Figure%209%20Indicative%20Framework%20Plan%281%29.pdf