VERTICAL PROFILE OF UK GLIDER FLIGHT

Background

The CAA met with representatives from several air sports organisations on 25 January, 2007, to discuss interoperability in UK airspace. During the meeting, the CAA asked for altitude data for flights in the UK by those air sport disciplines in attendance. The intent understood in this request was for the CAA to be able to understand better the typical altitude profile of air sport activity. This would then ultimately inform discussions on options for ensuring appropriate interoperability at different altitude levels in UK airspace.

This paper is the British Gliding Association's response to that request.

The BGA holds a certain amount of individual flight data centrally. This information is collected for two specific reasons:

- To allow for the assessment of claims of height gain for FAI badges and national and international records
- For the BGA's national ladder contests. These are a number of informal competitions that run throughout the year where pilots are awarded points for individual flights based on distance covered or altitude gained, type of task, speed, etc. The system, however, is initially based on honest reporting and pilots do not have to submit flight logs unless they are in contention for an award

The BGA does not collect centrally any other flight data. Furthermore:

- Whilst flight logs are required for regional and national competitions, these are processed by the relevant competition organisers and there is no requirement for flight data to be sent to the BGA
- The vast majority of glider flights in the UK are either club or personal flights for which there is no requirement for a flight trace to be kept

Were the BGA to simply provide the data it holds to the CAA then it would not have provided an appropriately valid, statistically or otherwise, analysis of UK glider flights.

Given the important nature of the matter at hand, the BGA has elected to provide the CAA with a more comprehensive and informed analysis of UK glider flights and flying. It has, as a consequence, supplemented the analysis that its current data will support with further, newly gathered input from a number of sources, including:

- An analysis of UK soaring conditions by one of the BGA's leading meteorologists who assesses soaring conditions year-round and seeks post-ante reports from pilots to corroborate their analysis
- A survey of typical flight activity across BGA clubs

This paper has been kept purposely brief. It:

- explains the relevance and importance of altitude management in glider flying
- profiles the soaring altitudes that are both possible and typically made use of by glider pilots
- summarises the current impact of vertical airspace restrictions on glider flying – the horizontal constraints are well know and not discussed further here

The BGA can provide back-up data and material for any area where further investigation might be required.

Importance of Altitude to Glider Flight

Gliders gain height in vertically moving air, and by converting height into distance as efficiently as possible they can fly and race over long distances. Closed circuits in excess of 500km are flown routinely. The UK distance record is 1000 km and BGA data shows that glider flights are made over almost the entire land area of the UK. Gliders are raced competitively as well flown for personal sporting achievement.

Making maximum use of the height available given the soaring conditions is a central concern for glider pilots:

- the primary objective of most local soaring flights is to maximize the time airborne and this is primarily done by achieving and maintaining the maximum height possible
- cross-country flying demands very efficient altitude management. Generally, pilots will use the upper half of the height available to make progress cross-country. The priority in the lower half is finding lift to remain airborne or to locate to an area that would allow for a safe outlanding
- it reduces the average density of gliders flying in any given area

A core part of glider pilot training and progress, therefore, is linked to the ability to demonstrate safe and efficient climbing skills. The different FAI badges awarded to glider pilots all require height gains – 1,000 meters for the Silver Badge, regarded as a base level of qualification, and 5,000 meters in the case of the Diamond Badge.

It is, in essence, a key ingredient for the sport.

Gliding Altitude Potential in the UK

The topography of the UK and the prevailing weather produce some of the most challenging and ultimately rewarding gliding conditions in northern Europe. As a consequence of the variable weather conditions in particular, gliding only thrives in the UK by maximizing vertical access to airspace and thereby horizontal access to good gliding weather.

Soaring is made possible by a variety of meteorological conditions:

- ***Wave***

  Wave effects are triggered by a stable air mass flowing over a physical or meteorological barrier. The UK height record for wave soaring is above 35,000' and flights up to and in excess of FL195 are commonplace.

  The principle areas in which lee waves are prevalent are the Scottish Highlands, the North of England above and to the East of the Pennine's and Wales, although useable lee waves naturally flow downstream into the flat countryside.

  It is apparent that accomplished pilots at most gliding clubs located *within* lee wave areas are recording significant height during approximately 30% of their flying. Gliding training generally occurs at lower heights, but the same club sample demonstrates that 5% of training occurs at height. Based on the total flying carried out, approximately 15% of all gliding in this sample occurs well above FL60.

  However, data from clubs located closest to the best soaring areas, for example in Scotland and Wales, demonstrate a higher percentage of gliding at height. The majority of soaring flights from Aboyne (N5704.52 W00250.08) attain heights in excess of 4500' above the site. Flights from Aboyne by height band in 2006 are approximated below.

Height above site	Number of flights
5000	900
10000	500
15000	150
20000	50
25000	5
Total	1605
Total Launches	2600

- ***Thermal Convection***

  Thermals are generated by surprisingly minimal levels of solar heating. Meteorological analysis shows that:

  - where lee wave conditions are not a factor, flight above FL85 is possible on approximately 50 days a year
  - in areas *benefiting* from lee wave – which covers a surprisingly large area of the UK - sailplane flying to heights in excess of FL85 occur on about 150 days per year in either lee wave or convective conditions. In these areas, data shows that approximately 20% of gliding flight takes place above FL85, for example:
    - Portsmouth Naval Gliding Club (Lee-on-Solent) - occasional flights to 7,500'
    - Borders Gliding Club (Northumberland) – regularly above 10,000' and site record of 27,000'
  - in the more mountainous areas (Wales, Scotland, N England), thermal conditions regularly allow soaring to heights well in excess of FL100. High flight has become the primary focus for many of the gliding participants within these mountain area based clubs

  This analysis is corroborated by information provided by clubs where it is clear that, throughout accessible UK airspace, a significant amount of gliding activity occurs above FL85 up to FL100.

  Above FL100 a lack of supplementing oxygen system will often preclude further climbs.

- **Local Factors**

  Many parts of the country have local topographic/meteorological conditions that allow for soaring to higher than normal levels, for example:

  - Severn Estuary convergence zone – climbs recorder to FL85
  - Chester Gap Sea Breeze – climbs recorded above FL85
  - Pocklington Ridge – climbs to in excess of 8,000'
  - Crowland (Lincolnshire) – climbs to 10,000' recorded during summer months
  - Mendip Hills – allow for climbs to 10'000'
  - Dartmoor – 7,000'-10,000' common
  - RAF Marham – regularly fly to heights in excess of 11,000'

Impact of Airspace

In the UK, meteorological conditions are such that gliding only thrives as a sport because gliders can access a limited amount of airspace in which they can climb to near optimal heights.

The structure of UK airspace is such that on an increasing basis gliders can only access airspace by routing over, under or around inaccessible controlled airspace. Even minor changes to vertical restrictions invariably have significant effects in terms of optimized gliding flight and risk associated with traffic density.

Until the recent expansion of class C airspace across all existing airspace above the new divisional flight level of FL195, in many areas gliders had very few significant limitations on flight above FL195. Glider flight can now only take place above FL195 with permission and within prescribed geographical and time limitations.

The lee wave areas in Wales are almost unchanged under the new arrangements but in Scotland the available areas where flight can take place above FL195 are now significantly constrained.

Below FL195, the growth of controlled airspace to meet the perceived needs of CAT continues to reduce the available airspace in which sailplanes can operate. Existing controlled airspace is already highly restrictive in terms of gliding.

In reviewing the southern UK airspace situation, an area bounded by a western line from Bournemouth to Birmingham and up to Liverpool and an eastern line from Ipswich to Bedford and up to Sheffield is effectively inaccessible to gliders above FL85. Of the total, approximately 45 % of the landmass is covered by controlled airspace above FL85 that is inaccessible to sailplanes and a significant proportion of the remaining 55% is coastal and therefore generally unsuitable for gliding or outside significant areas of habitation.

An area of controlled airspace with a large footprint, for example a CTR around a regional airport, results in glider pilots needing to fly as high as possible to reach accessible airspace with no restrictions down to ground level.

Clearly any growth in the on-route structure has a directly limiting effect on availability of airspace accessible by gliders. This is becoming an increasing threat to the viability of UK gliding as the lower airspace accessible to gliders is effectively segmented into isolated areas by controlled airspace around regional airports. It is increasingly the case that gliders have to be flown to heights that enable them to glide over inaccessible airspace.

Airspace accessibility to gliders could theoretically improve with *appropriate, affordable and operationally feasible* technical interoperability. The specific issues relating to the carriage of transponders in gliders has been articulated in detail in the BGA response to the recent CAA interoperability consultation. These issues still apply and in broad terms relate to safety, operational, technical and cost. The overall crippling economic and social impact of mandating transponders in gliders is also detailed within the interoperability consultation BGA response.

A mandatory mode S transition altitude has been suggested as a starting point for implementation of mode S in all UK airspace. This will of course only reduce the negative impact if it does not require a significant proportion of UK gliders to carry a transponder during normal operations. A mandatory mode S transition altitude would effectively curtail gliding operations above that altitude and if that level was lower than FL100 it would impose a significantly negative economic and social impact on *all* UK gliding businesses, clubs and their participants.