GLIDEPATH

The Journal of Wessex Soaring Association. October 2021
BMFA Club No 2759

From the Editor

After last month's bumper issue, the October edition of Glidepath is somewhat shorter. As well as the standard sections we have an article from Nigel Bennett on creation of flying wings, while I ponder a matter that I am sure many other people have wondered about, namely is it possible to fly a model glider on Mars !

From the Chair

Hi all, hope you are all keeping well, sadly still not so much flying this month due to the rather unfavourable conditions again.

Neil Bradbury passing

I was told the sad news that Neil Bradbury, of Spire Models, has passed away. I never had the opportunity to go to his shop, but I heard it was an excellent Aladdin's Cave of goodies. I am sure he will be fondly remembered by those that knew him and sadly missed.

E Soaring

The weather predictions for our comp were very variable ranging from nice to nasty ! So, when I woke up to pouring rain I thought the "nasty" had won. However, a few hours later the sun came out so I went to Chalbury for a fly, where I met up with Brian Adkins and we had a pleasant couple of hours.

Hopefully conditions will settle soon and we can have some thermal fun this month.

Picnic Site

I am told the MOD have not been forthcoming with any information on what they would like, so this matter cannot be pursed further at this time.

AGM

The AGM is fast approaching and please note that this year it will be at HORTON VILLAGE HALL, s0 keep an eye out for details as we get closer to December.

Slopeside by Pete Carpenter

As far as I am aware there is no change regarding the Oxo/Swallowcliffe situation. There is also still no change with Stoney Down so for the time being we can continue there as we have done. **Please note that Death Valley is no longer available for use this year.** The situation regarding the other slopes is shown below. Please use your own common sense and apply the countryside rules. Therefore if things look different at a site, particularly if it involves crops or livestock, please do not enter and contact me on pete.carpenter12@gmail.com or 01722 328728.

1) Winklebury (W to NE wind) - Available.
2) Norrington Down (S to SW wind) - Available.
3) Donkey Valley (SE wind) - Available.
4) Swallowcliffe (NW to NNE wind) - Not Available.
5) Quarry (W to WNW wind) - Available. Access to the slope must be via the Stony Down / Berwick St John route only. Launching and landing from the slope face is OK, but the slope is perfectly flyable from the Berwick St John field. You may encounter some paragliders as they also have permission from the farmer to fly there. In this case it is best to have a friendly chat with them and see if you can agree separate airspaces for models and paragliders.
6) Oxo (WNW to NW wind) - Not Available.
7) Horses/Barbara's Field (WNW to NW wind):- Available.
8) Daltons 1&2 (NW to NNW wind) - Available.
9) Crockerton (NW to NNW wind) - Available subject to rules in slope guide.
10) Death Valley (SW wind) - Not Available.
11) Berwick St John (SW wind), Stony Down (ESE to SE wind) - Available. Code on gate padlock is 5823 . Please do not over fly the parked cars on your landing approach at Stony Down.
12) East Bowl (NEE to E wind) - Available. There is a gate with a keycode, which is 7850. The shepherd is Mr.Fletcher (red Toyota pick-up) and he has asked that anyone parking on the track put a little note on the dashboard of their car, letting him know that they are a WSA member.

There are also a number of public slope sites, particularly in the Purbecks that anybody can fly form. A list of these is maintained on Christchurch Club's website so please have a look there for details.

Flat Field Update

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If you are the first to arrive at Chalbury go to the green box in the farm yard.

1.The field number is shown on the small plate on the box front . LEAVE THAT WHERE IT IS.
2. Remove the large red plate from inside the box and place it on the box front. It indicates the WSA are on site.
3. Also take the required equipment out of the box and to the flying field, i.e peg board, bungees etc.
4. If it is an event where you are expecting a large number of people take the corresponding field number out of the box and place it on the fence hook at the road entrance to the drive. There is no need to put the number on the hook if you are flying there alone or with just a few other people
5. The last to leave the site, ensure everything is replaced in the box, including the red plate and number on hook if used, but LEAVING THE FIELD NUMBER INDICATOR ON THE BOX FRONT.

Be aware of the field condition, e.g. after rain. Do NOT leave wheel spin marks. If in doubt, park off the lane outside the field. Leave space for farm traffic.
Be aware of footpaths across the fields, Do not launch if walkers are on the paths. Do not launch if horse riders are nearby.
No low flying over power lines. **No flying over farm buildings and the cottage, AT ANY HEIGHT, or immediately upwind of the farm complex.**
Fly SAFELY at all times. Especially launching and landing. Do not launch over cars and do not approach a landing over other flyers, fly a proper circuit.

Report any problems to the flat field rep, Doug Bowmann.

A Wing and a Prayer by Nigel Bennett

A few months ago I was having a clear out and advertised an ancient hot wire foam cutting rig, which was taken up by Bill Ebdon. In return for the rig and a plank of blue foam, he cut me a pair of wings for a flying wing I designed.

I have got a few flying wings including an M60 plank from North County Flying Machines. This is a very fast 2m model with great energy retention, but very sensitive indeed to its CoG position; by sensitive I mean 2mm back from the preferred position and it is virtually unflyable. The direct opposite to the M60 is an E Flight Opterra 2m delta powered wing, which is a very well mannered and graceful flier.

I wanted a smaller model, that would pack away easily for holiday entertainment, with some sweep back to give more tail moment pitch authority, and I wanted it electric powered. I measured the M60 wing section and it looked very similar to HS130 which is described as a fast flying plank wing section, so that seemed a good choice. It has some reflex at the trailing edge, necessary with wings of little or no sweep back.

So the blue foam cores of span 1.3 m were skinned with 1/16 in medium balsa and fitted with carbon tube spars. They had a little wash out twist built in. The fuselage was made from 3/16 balsa, skinned with 25 g/m^2 fibre glass and epoxy. The wing and fuselage break down into 3 sections and the fin and tip fins are removable. I covered it with an assortment of film covering gathering dust in my workshop.The motor is a tiny 21 g outrunner from Hyperflight with a 6x 3 prop, and power comes from a 450mAh 3S Lipo.

Although I initially fixed the CoG at just forward of the Mean Area Chord, as advised in articles on flying wing designs, attempts at flight were a disaster. There was no directional or longitudinal stability and all launches resulted in crashes of varying violence. It was somewhat better with a lump of lead in the nose, but what with the fuselage damage a new longer nosed fuselage was needed, plus a larger fin.

A month later a second attempt, success! With the longer, lighter nose it flew very well indeed at a recent outing to Wyn Green. Quite fast, but when it was slowed down it climbed well in the odd thermals coming through on the light NW breeze. The climb under power was spectacular, almost vertical with rolls on the way up if desired. It turned out the new CoG is only 5 mm forward of the one which resulted in uncontrolled crashes.

In conclusion this little model is showing a lot of promise and if anyone wants any details of the design, just let me know.

Martian Gliding by Roger Crickmore

I was recently watching a news article of NASA's Ingenuity helicopter that has recently been making a number of flights on Mars. This got me wondering whether it would be possible to fly a model glider on Mars, and if so what would be the main issues to overcome.

As I am sure you all know a glider must create enough lift from its wings to balance the force of gravity trying to pull it back down to earth, and the lift is generated by the way the wings interact with the airflow moving over them.

One difference between Mars and Earth that acts in our favour is that Martian gravity is only 38% of that on Earth and so less lift is required to keep the glider aloft. However definitely not working in our favour is that the density of the Martian atmosphere is only about 1% of that found on Earth, which means that much less lift is produced by the wings.

The lift (L) produced by the a wing is proportional to its area (A), the atmospheric density (D), the square of the airspeed (v) and a factor known as the lift coefficient (C_l) which is mainly determined by the aerofoil section and angle of attack. As many of you know I always like an equation or two so we can write,

$$L = A \times D \times C_l \times v^2$$

Due to the low atmospheric density on Mars, to be able to generate enough lift you need to have high airspeed and a large wing area, whilst keeping the weight down. Ingenuity achieves this by having rotors blades with a 1.2 m span that spin at around 2400 rpm, which is about 8 times faster than those on a similar size helicopter would on Earth. The motors are powered by lithium ion batteries that store enough energy for it to fly for 90 secs drawing an average of 350W. These batteries are then recharged by solar cells taking a whole Martian day , which is actually very similar in length to an Earth day. If you work it out the the energy for the flight can actually be supplied by just an 800mAh 3S battery.

At this point we have to worry about the difference between weight and mass which are are often, though incorrectly, used interchangeably. The mass of an object is simply how much matter is in it, while its weight the force of gravity acting on. Thus if we take a model with a mass of 1kg from Earth to Mars, it will still have a mass of 1kg (as it has the same amount of matter in it) but its weight will only be 38% of that on Earth due to the lower Martian gravity. The weight of the plane is given by Mg where M is the mass of the plane and g is the acceleration due to gravity

In steady flight the lift must equal the weight of the plane thus we can write

$$L=Mg=A \times D \times C_l \times v^2$$

This equation can be rearranged to calculate the speed that the plane must fly at ,which is given by

$$v=\text{square root} \left(M/(A \times C_l) \times g/D \right)$$

To avoid any additional complications we will assume that the lift coefficient is the same on Mars as on Earth, though in practice it is likely to differ somewhat due to the much lower atmospheric density. Thus all the variables in the first term of the above equation namely; mass, wing area and lift coefficient are the same as on Earth, so the speed the glider must fly at is just proportional to square root of (g/D). As the gravity on Mars is 38% of that on Earth while the density is just 1% of our

atmosphere, the ratio between the speeds at which the glider must fly at is given by square root (0.38/0.01) ~ 6 .

Thus a glider that flies at 15 mph on Earth would zoom around on Mars at about 90mph. Of course those dynamic soaring folks fly round on Earth at much higher speeds than this, presumably by trimming the plane to have a very low lift coefficient. However by adjusting the control surfaces they are able to slow the planes down to a much more reasonable speed for take off and landing; an option that would not be available for a Martian flight. If you come in for a heavy landing, which is quite likely at 90 mph, then it is the mass rather than the weight of the plane that is important so the damage would be the same as if the same landing occurred on Earth. Thus gliding on Mars is possible but not for the faint hearted.

Calendar

Sun 17th Oct Multitask
(Each following Sunday will be the fallback date for the e-soaring events)

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