

THE EXP PI

■ In the distance, under the wing, you can see the launch point near Keswick and Derwentwater and also the hills used to ridge soar to Bow Fell at the head of the Langdale, where wave allowed some peace and this photo. In the foreground is the unlandable Langstrath valley and, on the right, the west flank of the Helvellyn range (Pete Whitehead)

EDITION GLIDER LOT'S GUIDE TO LAUNCHING

Edensoaring's Pete Whitehead explains how you can have your own bungee system plus modified autotow system for under £1,000

HAVE you ever wondered if you could glide from those hills, cliffs, or even sand dunes you come across? You, and a friend or two with gliders (because it is a bit lonely doing it on your own) could do this, you know, using the minimum of help from the ground. And you could carry everything you need in your glider tow vehicle, maybe best a 4WD because you would almost certainly need to launch from the grass. If, on the other hand, you haven't wondered, or haven't been excited by the YouTube videos of fast soaring on the cliffs, then this article is not really of interest...

You will need some kit:

■ **Pilot.** Let's just say that this kind of flying is at the challenging end of the spectrum, and it is for

"self-authorising" pilots. Specific training is not appropriate; it's better to have an "understanding of how things work" (or "Physics"). It is not for all glider pilots. Our flying orders say very little, but include: "You must obey Aviation Law and The Laws of Physics to avoid breaking anything or hurting anyone". The principles you have learned during your BGA approved training are still relevant, indeed these and your flying skills, and "feel", must be second nature. It goes without saying that ability to land in any suitable place is important. Please perfect your field landing skills elsewhere before you try all this.

■ **Glider.** You would be best served by a glider with highish wingtips, and ailerons which work at 10kts. And one with good airbrakes for an ✎

Illustration by Steve Longland

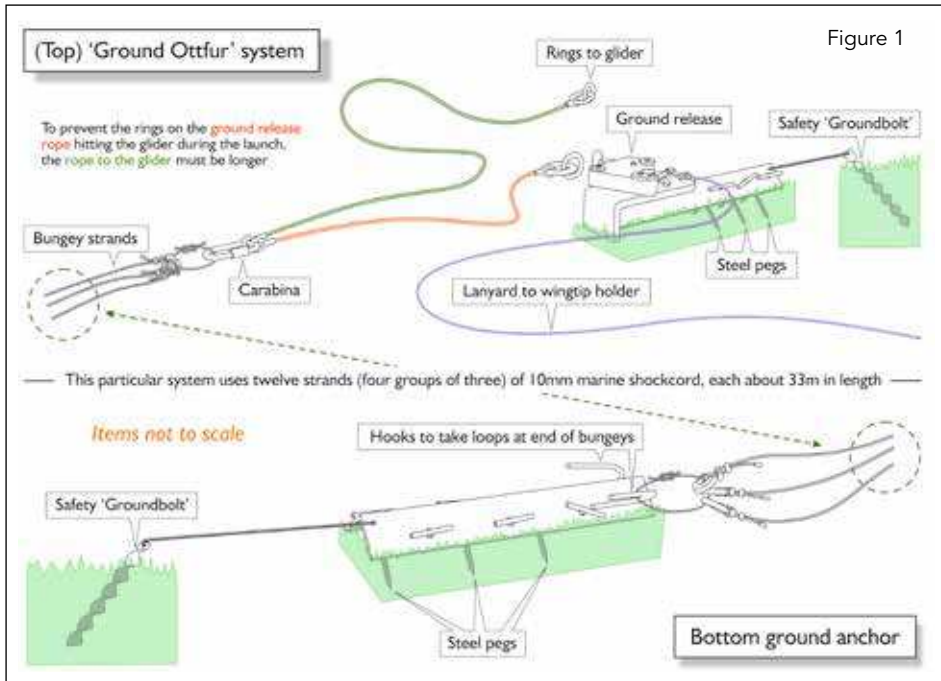


Figure 1

Illustration by Matt Wright

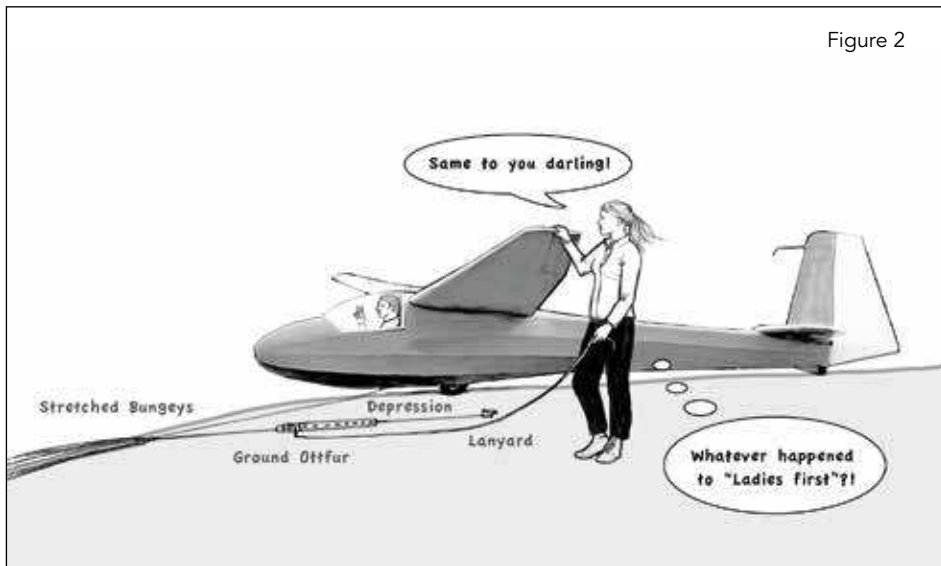


Figure 2

easy field landing, as well as confidence in exploring the nooks and crannies safely. Leave the Arcus at home and take your K-8, or K-6, Oly 463, or similar. This is more for inverted snobs. You may, however, bring along the Range Rover, but careful, please, to keep mud – or worse – off the cream upholstery.

Launching equipment

1. Bungeeing. This is the cherry on the bun. Good sites are not that common, and they are rather wind-direction critical, but this is THE way to launch if possible.

I am not suggesting the uncouth method using teams of people, as at The Mynd, more the elegance of having one person on the ground; in the ideal case using one walker or passer-by to hold the wingtip and pull the release of the ground Ottfur so this way all the pilots in the expedition can fly.

You will need some bungees; new ones rather than some tired and rotting old gear from a school which used to do ground slides in a Primary. I did buy some new 1-inch diameter bungees years ago, but they are now prohibitively expensive thanks, I think, to all those people doing bungee jumping in their gap-years. I have now sourced good value marine shockcord, the best value being 10mm diameter and coming in rolls of 100m. About £60 delivered. Cut these into 33m lengths, have four rolls worth, or 12 strands of 33m and you have a powerful set of bungees (at £240) which will launch a single-seater in no wind – on a slope, of course, because gravity is your friend in bungeeing.

Luke Roberts and I have tested the force delivered at full stretch (double the resting length) at 12kg force per strand, or 144kg force total. To compare with this, my once new, but now old, 25mm bungees pulled at



(Left to right): black plastic hook applied to an end of the shockcord; group of three strands of shockcord with hooks attached to the loop of rope; the top 'ground Ottfur' is attached to a piece of steel angle, held by steel pins to the ground (Pete Whitehead/Luke Roberts)

101kg force, and Luke's better, but "used", bungees pulled at 120kg force. I intend to add to my new bungee set by adding in a new roll of 10mm shockcord each year (not bad at £60 a year to maintain the force), and later retiring the older sections as they age, thus keeping the set in good shape. For a few years, the launching force can increase until I am near the limit for my Oly 463 (white link, 500kg force). There is no need to use a weak link in the system, though.

Making up a strand has been revolutionised by my discovery of some quick-fit plastic hook ends for each strand; one strand can be sorted in minutes, see photo below. The old way was to form a loop and seize the ends with "whipping" twine – very laborious and off-putting. See photos 1 and 2, facing page, showing the hook applied to a cut end of shockcord, and a group of three strands connected to one loop for handling.

By the way, I am not going to get side-tracked into the engineering properties of the shockcord, such as hysteresis loops and the like. Play around with them and measure this and that if you wish, but there is no substitute for just USING them.

The essential elements of this beautifully elegant set-up are shown in figures 1 and 2 (facing page). You will need some form of Ottfur or Tost hook, or "bomb release", or whatever, for what we call the "ground Ottfur" (photo 3 below). The bottom ground anchor can be seen in photo 4.

Two people – that's you (the pilot) and one helper – stretch each group of three stands to the bottom ground anchor, so that's four gentle strolls downhill pulling 36kg force between you; quite easy. The bungees are now stretched (between the ground Ottfur and the bottom ground anchor) and ready for you to get into your glider and do



A collection of handling ropes, with bottom ground anchor and top 'ground Ottfur'

your checks. When you are really ready, the helper attaches the launching rings, removes the safety pin from the ground Ottfur, and goes to the wingtip, ready to simply pull the lanyard when the pilot says "Go" (the standard two-fingers sign for all out will do). And that's it; as nice a launch as any cultured pilot would want. YEHA!

(Bungee, bungy, bungee, it matters not what you call it, so don't please don't get your knicker elastic in a twist over the semantics).

2. The double and triple pulley autotow.

Whilst bungee sites are rare, the potential sites for doing this kind of modified autotow are numerous. There are plenty of hill and cliff sites with fields at the top, and here we can use the modified autotow. I thought I had invented this until I found the reference in the USA *Soaring* magazine from 1946, which related to the double pulley system, with the final pulley mounted on the back of a sports car rather than on the ground.

Look up "double pulley autotow" on Google. Not quite as elegant as mine (I would like to think, because the rope to the glider leaves the pulley on the back of the car, rather than a ground-anchored pulley), but it shows that others have used a similar system, and it worked. So until an historian in the gliding world tells me otherwise, I shall take the credit for the systems I shall describe.

Autotow, either direct from car to glider or via a reverse pulley (anchored at the "far end" of the runway) is well known. Once you realise that kinetic energy of a body is $\frac{1}{2} m v^2$ (that's half m times v squared) you will understand the value in slowing down the vehicle to $\frac{1}{2}$ the speed, or better $\frac{1}{3}$ the speed, of the glider rope, so that one wastes only $\frac{1}{4}$ or $\frac{1}{9}$ of the energy normally put into the tow-car. Also, perhaps a lot more importantly for expedition pilots because we operate from lumpy fields, we hit the bumps with $\frac{1}{4}$ or $\frac{1}{9}$ the energy with which we would otherwise hit them. The car and one's teeth can stay intact, and the whole experience is calm.

It is tried and tested. It is low stress for the pilot, who gets a nice smooth launch, and also the driver, who stays at slow speed, but with suitable power applied via the right foot.

Photo 5 (overleaf) shows the ground anchors and pulleys used. Photos 6

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Why we do it...the view looking north in the Lake District, climbing in wave in the lee of Conistone Old Man, after a launch from Latrigg, near Keswick, 29 September 2013, into a lovely, clear easterly breeze (Pete Whitehead)

DETAILS OF SUPPLY OF EQUIPMENT

- **Ground anchors.** "Groundbolt" supply "Erdanker ground anchors" 50x680mm. £17 each, delivered.
- **Blocks (pulleys).** Try "14 tonne snatch pulley block" on the internet, £23 each, delivered.
- **Shockcord.** 10mm marine bungee/shockcord. I used "stainlessdirect.com" on eBay. £59.99 each roll of 100m, delivered.
- **Quick-fit plastic hooks for shockcord.** Look for "Auto-locking, Adjustable, Heavy Duty Plastic hooks for 8-10mm bungee/shockcord". Approx. £18 for 24 hooks.
- **Skyrope is available from Skylaunch Ltd, of winch building fame.**



(Above left-right): 'groundbolts' and pulleys; 2 to 1 pulley autotow system; 3 to 1 pulley autotow system (Pete Whitehead)



Pete Whitehead was inspired to start expedition gliding by Anthony (S&G's Armchair Pilot) and Catharina Edwards in 1974, joining the Cambridge expedition to Cross Fell in 1974. One of the founders of Edensoaring, Pete continues expedition flying in the northern Lake District and Yorkshire Dales, using his bungees, home-built winch and now the modified autotow system described here. Luke Roberts from Bicester has joined in and provides new energy, so watch out down south!

6 and 7 should explain the two systems, the first is the double pulley system which doubles the rope speed at the glider, and the second is the triple pulley system which triples the rope speed. As figure 3 (facing page) shows, one can position the tow-car in various starting positions and directions, and also off-set the tow-car using an extra pulley (with extra rope) if required. The towing vehicle can use gravity and go downhill to get some free energy.

A few more comments

Ground anchors must be up to the job. I use "Groundbolts", which are hammered in with a lump hammer and in an "array" pattern with a running rope to join them up (and thus spread the load). These are effective, but cheap and quick to set up and remove, the latter simply by unscrewing them (using a bar or screwdriver through the hole). Mine cost approximately £17 each. A box of big bow shackles is very handy for joining things up.

The pulleys or "blocks" have to be of reasonable diameter and kind to the rope, low friction, and preferably snatch blocks, which make easy loading/unloading of the rope. Mine are excellent value 14-tonne

blocks obtained via the internet at approximately £23 each, delivered. Keep them greased.

The launching rope. I use pre-stretched Polypropylene rope, 10mm diameter, called Skyrope, obtainable from Skylaunch. A 1,200m length cost me £330 delivered. A 200m length would suffice for most expedition purposes. The aim is to get airborne with a safe speed and perhaps 50-100ft (above the hill top), or a maximum of 200ft (Aviation Law – 60m is legal without CAA winch launching permission, so this makes for spontaneity in your expeditions. Go when the conditions are right and aim for 100 per cent soaring success).

You must have a weak link strop and some proper Tost rings. You don't need a drogue chute or other paraphenalia if using the Skyrope. The less ironmongery, the better.

Some numbers

It is not difficult to do the calculations of launching speed, target speed for tow car, etc. Using mph, because cars have mph on the speedo... Most old-fashioned gliders want 50mph launch speed as a minimum, so the rope speed must be this less the wind speed, at least. Say 10mph wind, that's a minimum rope speed of 40mph, so the car must do 20mph with a rope-speed doubling system, or 14mph if using a triple rope speed system. You can do your own calculations on the fag-packet equivalent for different wind speeds. Err on the side of safety.

It is not too critical to overspeed a little, the glider is aiming for a launch not a world height record on the rope. Stay in a low climb angle and pull off early before the "top" of the launch (where the safe winch speed is important) and all will be fine. Extra speed can be converted to height or used to move to the soarable part of the slope. It is self-evident that you will achieve a higher



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launch with this system compared with that from a bungee launch.

Eventualities. E is for eventualities. No change here then, but one must work things out carefully, especially for the first part of the launch, pulling off early if necessary (hand on the “bung” as per BGA advice). Landing ahead in the field, or neighbouring field, has to be prepared for, but even a low launch is usually sufficient to achieve a soaring flight or flight to a safety field down below. Remember we are almost certainly launching near the edge of the hill, cliff, etc. There will be a field or beach at the foot of the slope, otherwise the site is not suitable. Option B is never crossing one’s fingers in hope.

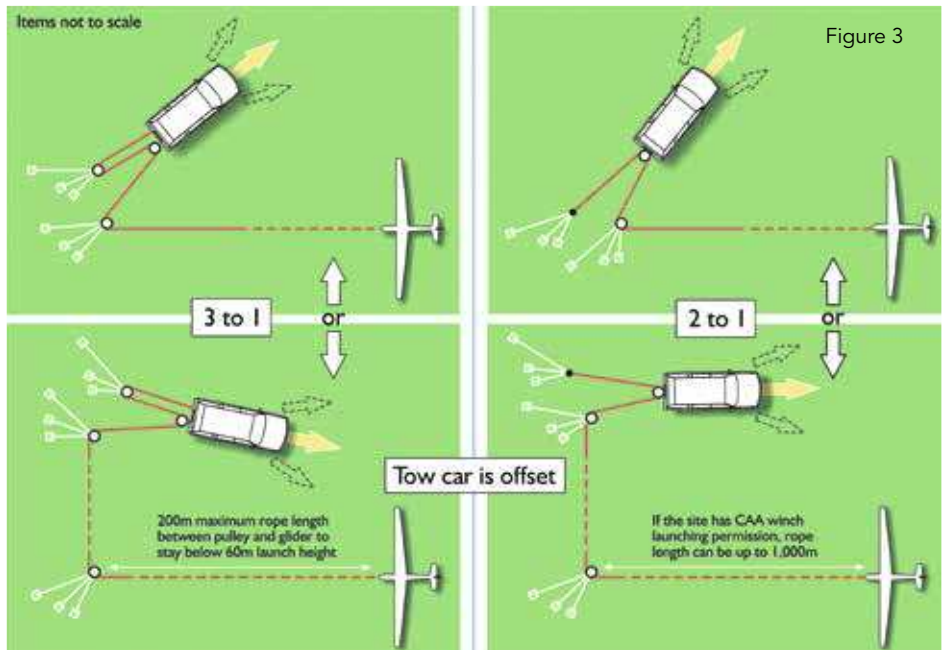
Consider appropriate communications between launch point/pilot and tow-car.

Could one launch from the bottom of a hill? Of course one could, but then one would need CAA permission to launch to higher than 60m above ground level, so it detracts from the idea of doing all this when the weather is just right.

Clubs may be wondering if this system could be used “full-size” on their airfield. It could be used this way, perhaps as a back-up for the winch. The rope spends quite a lot of time being pulled on the ground, thus wearing out quicker in regular club use, so I would advise the choice of winch in this setting.

Clubs doing larger numbers of bungee launches would need to consider sheathing the group of shockcord strands in some form of loose sock, eg spinnaker sail material, to protect and also make handling them easier.

You can have the bungee gear and a double or triple pulley autotow system ready



and waiting in your car for under £1,000. Sources of the gear are noted on p41, but feel free to contact me if you wish for more detailed advice (edenpete@gmail.com). It wouldn't be a bad idea to ask your club if you can try out your system on your home airfield.

In expedition launching it is self-evident that you will need cooperation from the landowner and the farmer too, if not the same person. Here your greatest asset will be your charm. (Or the book *How to Win Friends and Influence People* by Dale Carnegie, if you're let down in this department, like me!).

Have fun (with a capital F), and fly safe(ly).

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