Powered Hang Gliders: Climbing & Airspeed

By Andy Buchan

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Andy Buchan with some advice to the growing breed of powered hang glider pilots (reprinted courtesy of Skywings magazine) (http://www.bmaa.org/powhang.htm)

There are now around 100 powered hang gliders in the UK. Many pilots new to power flying are making a common error: they are tempted to fly with too low an airspeed just after take-off. Andy Buchan explains the problem. Although the illustrations depict a Mosquito-type harness, the lesson is just as important for Doodlebug fliers.

Watch an experienced pilot fly a powered hang glider. They make it look so easy - pick up the wing, rev the engine and run. Off they zoom, climbing smoothly towards that building Cu while those left behind grit their teeth in frustration.

But watch someone new to powered flight and the story is often very different. They may take off nicely, but once in the air something seems to go wrong.

To an observer on the ground they appear to wobble around and lose directional control. To the pilot there is a feeling that the glider wants to wind into turns and the wing feels unstable, but why? The answer is simple: a lack of airspeed.

Hang gliders are designed to fly over a range of airspeeds. A marked effect of flying at low airspeed is that the wing becomes more difficult to control. If you are unsure about this, go and find a bit of empty sky, high up, and fly slowly. Try a turn or two. How does the wing feel? Is it heavy and sluggish? Does it drop into turns? Now fly a bit faster and see how much more easily the wing responds to your inputs and how much nicer it is to fly.

For the sake of argument let's say that your wing needs an airspeed of 25mph to keep flying properly and that when flying in your normal hang gliding harness the control bar position is as shown in Fig.1.

Hang glider pilot at 25mph in normal harness. Control bar position is close to pilot's chin.

Now think of the situation when you fly the same wing wearing a powered hang gliding harness with the motor switched off. The weight of the motor behind your feet effectively pushes you forwards through the control frame as in Fig.2. What the pilot notices is that the bar has to be further back for the same 25mph airspeed.

Hang glider pilot at 25mph in powered harness (motor off). Control bar position is by pilot's chest

Now add power! The thrust pushes the pilot still further forwards as shown in Fig.3, even though the wing is still flying at 25mph. But because the engine power is adding energy to the aircraft it will be climbing. Weird! The bar is far back but the glider is climbing!

Hang glider pilots often think that in order to climb they have to push the control bar forwards, but if they do that with power applied the airspeed will reduce much more than anticipated. The wing may stall; even if it doesn't it will certainly exhibit those nasty characteristics of slow speed flight - dropping into turns and feeling unstable in roll.

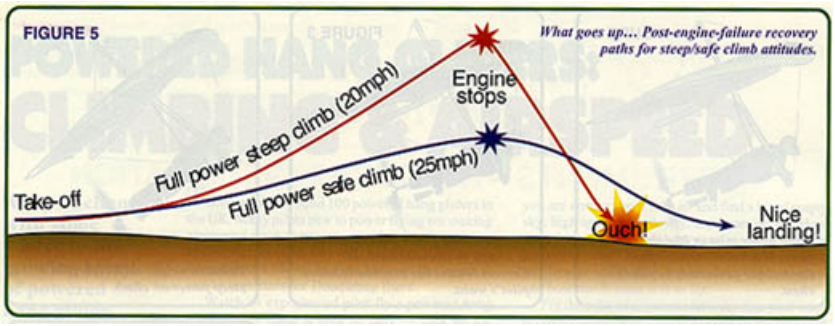
Powered hang glider pilot climbing at 25mph in powered harness. Correct control bar position is under pilot's waist

On a powered wing there is no need to reduce the airspeed to climb. Most flexwing microlights climb at 15 - 25mph above their stall speed. It is important to remember that it is the power which makes the aircraft climb, not a reduction in airspeed. Today's power packs develop around 45kg thrust; adequate for around 300 - 400ft/min climb at full power even when flying at airspeeds well above min-sink.

The other effect of having the bar too far forwards when climbing is that the aircraft will have its nose very high. The pilot is in front of the wing rather than underneath it; weight shift has less effect and the glider becomes harder to control (see Fig.4).

Reduced weight-shift control in a steep power-on climb

There is also the rule of thumb that 'what goes up steep comes down steep'. If you experience an engine failure when climbing steeply the aircraft will lose a lot of height before recovering; climbing at a flatter angle at a higher airspeed makes recovery easier (see Fig.5)



What goes up... Post-engine-failure recovery paths for steep/safe climb attitudes

I have converted over 50 hang glider pilots onto the Mosquito powered harness. Their wings have ranged from Discovery and Target floaters to Topless Laminars and Scandals - and just about everything in between.

I have yet to see a pilot pull the bar in too far when climbing!

Sure, at take-off the aircraft has to build speed flying level, but self preservation usually stops pilots from pulling the bar in too hard and nose diving downwards! Once they are airborne it is vital that they get into prone as soon as possible as only then can they pull the bar back far enough to have good pitch control.

Flying in prone also gives them control over where the motor is pointing - ideally parallel with the keel of the wing - so that the power pushes forwards and not sideways!

A useful trick which helps at take-off is to look ahead at a far target. As well as keeping you flying straight it helps you judge just how steeply you are climbing. If it's too steep - pull in!