

Time for lateral thinking

Figure 1: longitudinal C of G couple

This figure is well known, and a full explanation can be found in the British Gliding Association Manual, Gliding (A&C Black, 2002, page 110). This couple is significant but can be managed by a competent pilot as soon as the aircraft accelerates and the elevator becomes sufficiently effective

A recent incident has prompted Don Puttock to devote some serious thought to the first few seconds of the winch launch

THIS ARTICLE addresses the issue of wing drop during the ground run of a winch launch. It aims to produce a compelling argument for the pilot having his or her hand on the release knob during the ground run of the launch.

It is commonplace to see pilots picking up a dropped wing and continuing the launch, with apparently very little risk. To them it may seem a contradiction that in some countries, for instance, aerotow launches may even start with a wing down.

How is it that a wing touching the ground is so hazardous, and yet we see them picked up routinely with no apparent difficulty?

C of G couple

During the initial ground run, a tendency for the nose to pitch up is created by the couple between the cable pull and the relationship between the hook and the centre of gravity (C of G) – see Figure 1.

Gliders that start the launch with the front skid on the ground (for example, the K-13), are prone to slam the tail against the ground if the winch driver snatches the glider by delivering power too quickly. The reader should reflect how quickly the tail hits the ground in this situation. The elevator has no authority at this stage and the pilot is powerless to stop the tail hitting the ground.

What is less well known is the lateral C of G couple. This couple tends to roll the glider (see Figure 2).

Wet or low-friction surface conditions will make matters worse; this reduces the grip of the tyre, and allows the wheel to drag sideways. Any situation that causes the glider to be out of alignment with the line between the winch and the glider will allow a turn to commence.

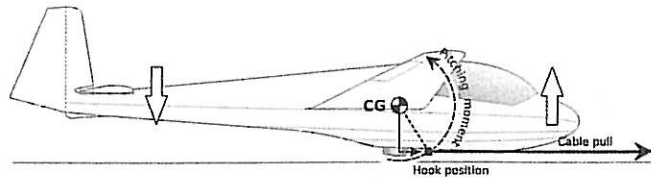
When the misalignment is increased, the lateral C of G couple is correspondingly increased (see Figure 3).

After the wing touches the ground, the turn continues and the rolling forces increase. What follows is a take off with sideslip (see Figure 4). As the wing takes the load, the tyre grip reduces and the wheel begins to slide sideways. The turn and rolling continues until the centre of gravity and the hook are aligned (see Figure 5).

If the glider is allowed to climb a mere half wingspan, just a matter of seconds, it will probably cartwheel.

When it happens there is insufficient time to reach for the release and pull it.

This is not a good time to be fumbling for the release knob.

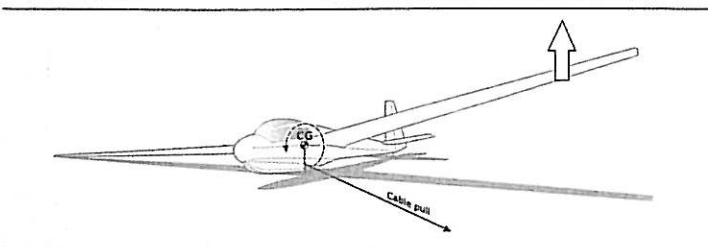
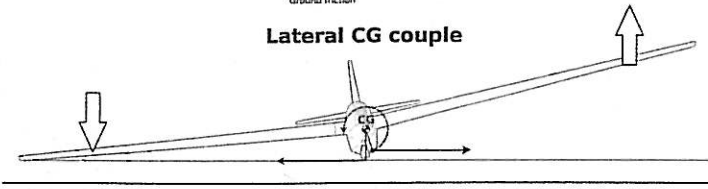
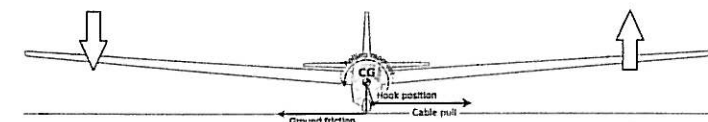


Longitudinal CG couple



Lateral CG couple

Figures 2 and 4: lateral C of G couple. Figure 2 is less well known. This couple is significant but, I believe, cannot be managed by the pilot. Once the wing touches the ground, the cable pull is relentless; the only solution is for the pilot to disconnect from the cable. Any sideways snatch will cause a rolling moment. Figure 4: The result is a take-off with sideslip. The glider is now airborne and climbing rapidly. The lower wing, in the shadow of the fuselage, produces less lift



Maximum lateral couple
Minimum longitudinal couple

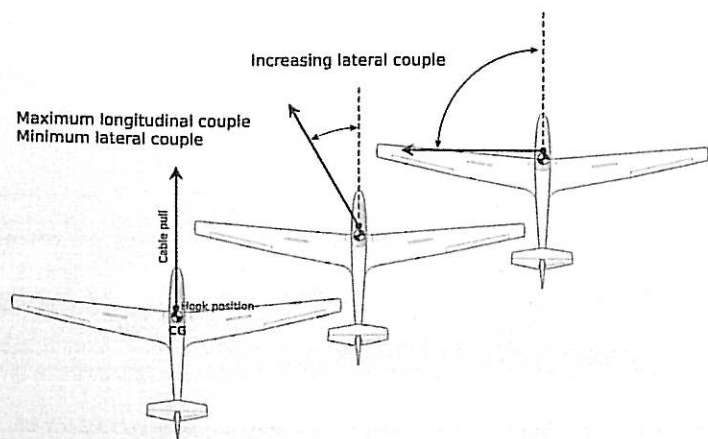
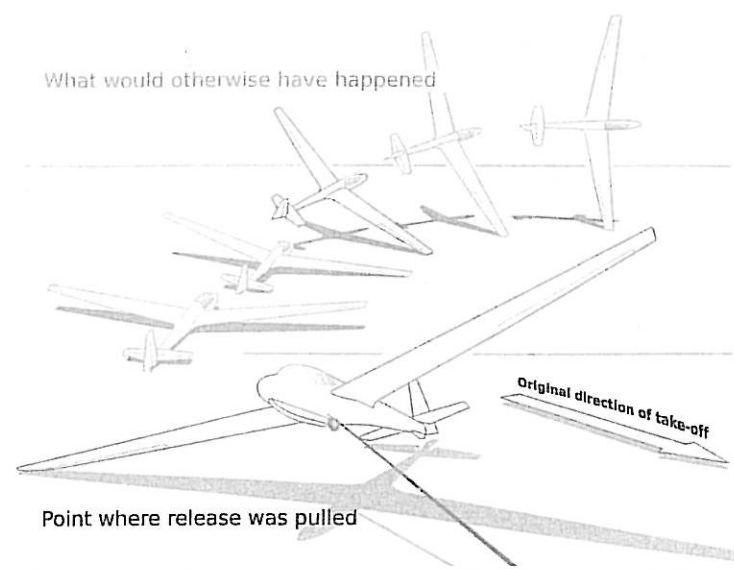


Figure 3: And when the misalignment is increased, the lateral C of G is correspondingly increased

Figure 5: if the glider is allowed to climb only half a wingspan, just a matter of seconds, it will probably cartwheel. Now is not a good time to be fumbling for the cable release knob



Diagrams:
Steve Longland

Key factors

A number of factors can contribute to this unhappy situation developing:

1. Crosswind – encourages a turn to initiate.
 2. Wing held back by wingtip holder – encourages a turn to initiate.
 3. Cable out of line (or offset hook) – encourages a turn to initiate.
 4. Wet or slippery ground – assists the rolling moment.
 5. Rough surface – can encourage turn when wing is on the ground.
 6. Cable snatch, with misalignment – increases the lateral C of G couple, making the wing drop more severe.
- The result is a take-off with yaw – which encourages a turn. Don't take off with yaw!

What can you do?

Your hand must be on the release, and you must release if you cannot keep the wings level.

What you can't do

If the C of G couple has forced your wing down, you will not recover.

It is so fast you will not have time to work it out.

It is so fast you do not have time to reach for the release knob.

The release knob is in front of the stick (in some gliders); if you have moved the stick in a failed attempt to raise the wing,

you may be unable to reach the release unless your hand is already on it.

The golden rules are to ensure that you start straight and that you stay straight:

1. Keep the glider in line with the winch and the cable; this will reduce the risk of a nose swing.
2. Ensure the cable is straight in front of the glider. If it is not, it will encourage a turn.
3. Ensure the wingtip holder is properly trained and does not hold the wing back. Holding the wing back will induce a turn.
4. Be even more vigilant if the surface is slippery. The lateral C of G couple is far more effective on slippery surfaces.
5. On rough ground, realise a dropped wing will snag on tussocks, or long grass.
6. Do not allow the glider to weathercock in a crosswind.
7. Ensure that the winch driver is trained to deliver power smoothly and progressively.
8. Always have your hand on the release: the first four seconds from "all out" are critical.

Anatomy of an incident

Date: March 9, 2005

Wind: 10kt steady crosswind from the right (cockpit view)

Surface: top surface thaw on frozen clay (worn grass), on a gentle slope with slightly higher ground to the right

Launch type: Winch (cable straight in front of glider)

Left wingtip: held by experienced ground handler

P2: on the controls, ab initio 70 per cent trained towards solo

P1: Instructor, full time and current

P1 account:

Eventualities were discussed in the normal way. P2 was reminded to have his hand on or near the release. "If a wing goes down despite the application of aileron, you will pull the release and abort the launch". The launch was absolutely routine. I had no reason to suspect that trouble was around the corner.

I placed my hand on the release. Not something I was particularly good at remembering – thankfully this time I did. P2 had the cable attached and then the launch procedure was initiated. Immediately after "all out", I became aware that the glider was turning right and the right wing had touched the ground. Because my hand was on the release, I was able to pull it immediately. By the time the cable was detached, the glider had turned 40° to the right, the wheel was 4ft above the surface (according to external witnesses) and the right wing was pressed firmly on the ground. In the meantime P2 had applied full left aileron to no effect.

This process took less than three seconds. In my estimation one more second was needed for the right wing to lose contact with the ground and "tuck under". There would not have been time to locate and pull the release.

After the release was pulled, I took control rolled the wings level and landed at 90° to the take-off run. At no time did the ASI read more than 40kt.

Summary:

The event had such a profound effect on me that I was prompted to review it many times before writing this short article. I just cannot think what I would have changed if I could take that launch again.

There are many occasions when a wing might be picked back up with no serious implications. Most pilots have seen it, and might wonder what all the fuss is about. However, when circumstances change, just slightly, then dire situations follow – alarmingly fast. Please keep your hand on the release, and use it if you need to.

ACCORDING to BGA Safety Initiative figures, one of seven fatal winch rotation accidents between 1987 and 2004 and two of eight serious injury accidents followed a wing drop on to the ground. This article, although not part of the BGA Safety Initiative's Safe Winch Launching project (see December 2005-January 2006, pp26-29, reinforces just two of its key points: start the launch with your hand on the release and if you cannot keep the wings level, release immediately. The winch launching work of the Safety Initiative (a multi-disciplinary team of BGA experts) is now being rolled out to clubs via CFIs and instructors. The team can be reached at safetyinitiative@gliding.co.uk

