FLYING THE WINCH LAUNCH

The BGA Safety Team explains some of the techniques that mitigate winch launch hazards

The BGA Safe Winch Launching initiative in 2005 [1] greatly reduced the number of winch launch fatalities and injuries by offering guidance on how to fly the launch and how to deal with launch failures. This advice has now been constant for 20 years, and is a key component of flight training. Yet winch launch accidents have not been fully eradicated, misconceptions persist, and unsafe practices continue to be observed.

This article reviews how the different stages of a winch launch should be flown and the reasons why.

LINE UP

Winch launches are trickier and more risky if there's a crosswind or sideways pull from the cable, for these create an imbalance during the initial stages and a dynamic situation as the glider straightens up. To avoid this, the glider should be lined up with the winch and pointed into wind. Avoid bow in the cable, especially if using steel cable which will settle into the turf. If a crosswind can't be avoided, assess carefully whether it is acceptable.

STOP THE DROP!

The first hazard of winch launching is the cartwheel that can quickly develop if a glider pivots around a wingtip in contact with the ground. It takes a force to make a wing drop from the level position, so the wing runner should stop the launch if a significant up or down force is felt at the wing tip [2]. This calls for experience and courage, so wing running is not a job for newcomers; proper training, covering the hazards involved, is essential. Cartwheels are rare but commonly fatal: our records show that in 50 years of UK gliding, 19 pilots have been injured following wing-drops, with seven fatalities or serious injuries.

GROUND RUN

With a powerful winch, cartwheels develop quickly: there is little time to release once they start, and the cable tension and geometry may make it difficult to do so. With the wings held level and the cable attached, the pilot's initial attention should therefore be upon avoiding wing drop and releasing the cable immediately if the wings cannot be kept well clear of the ground.

Pilots do not always spot when a wingtip is low, especially if the wings are low set or hard to see with peripheral vision. There's nothing wrong with a brief glance at the wingtip: for the first part of the ground run, the forward view is of limited consequence.

The launch crew must be ready to stop the launch if the pilot cannot keep the wingtip clear of the ground. The signaller, who again needs to have received proper training, must have direct sight of the glider and a means of signalling STOP to the winch without the delays inherent with flashing lights and signal bats. Energy ceases to be supplied to the cartwheel as soon as the winch power is cut.

SHALLOW CLIMB

As the glider leaves the ground, the pilot should maintain the normal take-off attitude. Depending upon the glider geometry and trim position, this may occur naturally, or a deliberate stick input may be needed: in all cases, the glider needs to be actively flown. As the airspeed increases with the glider held at this attitude, it will gain height in a shallow climb. Should winch power be lost at this stage, the glider will require only minimal control inputs to achieve a speed-maintaining glide or to intercept the round-out.

TRANSITION TO FULL CLIMB

Recovery from launch failure at a steeper attitude is aerodynamically more demanding. Airspeed will be lost in the pushover and, while the stall speed will be lower with the reduced wing-loading, sufficient speed is required for control authority to fly the manoeuvre. The pushover must be started promptly and the recovery attitude adopted and maintained until a safe manoeuvring speed has been regained – often at a lower height than the failure. The pull-out from the recovery attitude will demand extra lift from the wings, raising the stall speed above that in steady flight.

Just as the pull out from a dive demands more lift from the wings, so does transition to the full climb, and the stall speed is similarly increased. As the glider is pitched up, a part of the cable tension must be balanced by further lift, again raising the stall speed. With the tension from the winch cable accelerating the glider, a stall in this phase of the launch can become a violent flick-roll that since 1974 has killed or badly injured 20 UK pilots.

For these reasons, the transition to full climb should not be started until the airspeed and height are sufficient to recover without stalling the glider or hitting the ground, and the speed is adequate for the lift required. With the height gained during the shallow initial climb, and an airspeed of at least 1.5 times the 'normal' stall speed, a progressive transition to the full climb can begin, provided

that the airspeed continues to rise [3]. It's vital that the change of attitude be gentle and steady, lasting at least five seconds. Again this transition needs to be actively flown.

A higher speed may be appropriate in turbulence or to ensure recovery in a wind gradient [4]; a good rule of thumb is to use the minimum approach speed for the day.

FULL CLIMB

The pilot's aim once the full climb has been established is to maintain an appropriate combination of attitude and airspeed, while of course keeping the glider pointing in the right direction. The principal objectives are to ensure that safe recovery is possible should the launch fail; to avoid stalling the glider [5], breaking the weak link or overstressing the airframe; and, only if safely possible, to achieve a decent launch height.

The full climb will typically find the glider pitched up by 35-40deg and climbing through the airmass a few degrees shallower, with an airspeed a few knots below the placarded maximum winch speed *Vw*. A prompt push-over at reduced G allows the recovery attitude and manoeuvring airspeed to be readily achieved should the launch fail.

The pilot needs to have in mind the acceptable range of speeds and attitudes, to monitor both, and to manage the combination as the launch proceeds. If the speed is adequate, an attitude towards the steeper end of the range may be appropriate. If the airspeed falls, the nose should be lowered so that, as the speed approaches the minimum safe manoeuvring speed, the glider is near the normal gliding attitude. If the winch power is not restored at this point, the cable can be released and little recovery is required.

Only in the full climb can the winch driver judge how the launch is proceeding. Lowering the glider's nose will be taken as a sign to increase the winch power; a steep climb will conversely indicate that it may need to be reduced. The best winch launches are a partnership between the glider pilot and the winch driver – if it feels more like a battle, discuss it before the next launch.

TOO FAST, TOO SLOW

An understandable mistake is to worry more about exceeding the maximum winch launch speed *Vw* than maintaining adequate speed for safe recovery and stall avoidance – after all, the manufacturer has gone to the trouble of specifying *Vw* on the limitations placard. Sadly, many pilots have died or been badly injured from insufficient airspeed, whereas our records reveal no injuries or damage from excessive speed of an airworthy glider during a winch launch.

' *VW* IS BEST REGARDED, LIKE *VA*, NOT AS A RIGID LIMIT BUT AS A SPEED THAT SHOULD ONLY BE EXCEEDED WITH CARE '

Above the maximum winch launch speed *Vw* it is possible to overstress the glider through some combination of cable tension, control deflections and gusts [6], just as it is above the maximum manoeuvring speed *Va* in normal flight. Like *Va*, *Vw* is best regarded not as a rigid limit but as a speed that should only be exceeded with care. Excessive speed will only break the glider if accompanied by a high 'downward' cable load, normally only achieved by pulling hard towards the top of the launch, or by large deflections of the rudder or elevator.

When winches were weaker, it was sometimes possible for the pilot to moderate the winch speed by pulling back to increase the cable tension. With today's winches and transmission systems, raising the nose can have the opposite effect until the winch driver corrects it. If the cable breaks in this situation, only prompt action can prevent the nose rising still further and a rather exciting recovery that risks meeting the parachute on the way down. In any case, pulling back at the top of the launch, or vigorously signalling 'too fast' by yawing the glider left and right, creates exactly the loads for which *Vw* was calculated.

If the speed is excessive in the upper parts of the launch, it may be better to relax the back pressure and, when at a safe height, release the cable under modest tension to ensure separation from the strop. The 'too fast' signal should be made clearly but gently and is best reserved for modest over-speeds in mid-launch when loads are moderate and there is plenty of height for recovery.

Tim Freegarde and the BGA safety team

■ **Winch launching has long been a topic for discussion. While there's some great insight in early articles [5,6], the hazards of pitching up too quickly and recovery requirements were not correctly understood until work leading to the 2005 BGA Safe Winch Launch initiative [1,7]. Refs [8,9] give useful details.**

[1] BGA, Safe winch launching
https://tinyurl.com/flyright2546

[2] Stop the Drop, *S&G* (Feb/Mar 2020)
https://tinyurl.com/flyright2547

[3] Safe rotation, S&G (Oct/Nov 2020)
https://tinyurl.com/flyright2548

[4] The effects of wind gradient, *S&G* (Oct/Nov 2019)
https://tinyurl.com/flyright2549

[5] B Scull, Accidental spins off winch launches, *S&G* pp302-3 (Dec 91/Jan 92)
https://tinyurl.com/flyright2550

[6] J Gibson, Understanding the winch launch, S&G pp28-31 (Feb/Mar 1987)
https://tinyurl.com/flyright2551

[7] H Browning, Boundaries of Safe Winch Launching, *Technical Soaring* 31 (4), 95 (2007)
https:// tinyurl.com/flyright2552

[8] BGA Instructor Manual section 16 (2011)
https://tinyurl.com/flyright2553

[9] GFA, Winch launching manual (2021)
https://tinyurl.com/flyright2554

■ All previous 'Fly Right' articles are available from the *S&G* website.
See: *www.sailplaneandgliding.co.uk/safety-articles* which may be accessed using the QR link right.