WINCH NUANCES

The BGA Safety Team discusses some details of safe winch launching

Before the BGA's Safe Winch Launch initiative of 2006, the UK averaged over three fatalities or serious injuries each year from winch launch accidents. A painstaking analysis of the details revealed clear categories of accidents associated with different phases of the launch, as listed in Table 1. Each of these failure modes was then addressed, including a new understanding of the dynamics of steepening the climb angle, and the resulting advice was passed to pilots and instructors. As a result, the rate of serious winch accidents fell by a factor of 4. Wing drops proved persistent, but the other classes of winch accident were almost completely eradicated.

Recently, winch launch accidents seem to have begun to reappear.

There are several possible explanations. New pilots, who were unaware of the situation 20 years ago, might not appreciate its severity. Older pilots may have forgotten and drifted into bad habits. Supervision could have become less diligent. Rumours and competing advice could have crept in, especially if the original advice left room for interpretation.

This article therefore addresses some nuances in the Safe Winch Launching advice [1].

WING DROPS

Wing drops do not occur instantaneously. They require an imbalance of forces and time to develop. It should therefore be possible [2] to stop them by:

- Ensuring no force is required at the wingtip before launching, by holding the wings level and positioning to launch into wind.
- Maximising the ground clearance by keeping grass short and starting with the wings level.
- Minimising changes in force balance during flight, by launching into wind and avoiding cable bow.
- Abandoning the launch if the wings cannot be kept level, by releasing the cable or stopping the winch.

It's the pilot's responsibility to check that all is well and abandon the launch if the wingtip holder reports a tip force or the wings can't be kept level. If a down-going wing can't be quickly controlled, the pilot must release immediately. The launch crew's role is, however, crucial in setting up the launch, halting the launch to alert the pilot to any wingtip force, and stopping the winch if a wing subsequently drops. The launch crew and launch marshal/signaller must therefore be trained and on the ball, with good sight of each other and in audible range. These aren't jobs for beginners.

To maximise wingtip clearance, it is common to accommodate a slight sideways slope by starting with the wings parallel to the ground rather than level with the horizon. However, this will itself cause the wingtip holder to feel a tip force, and will result in drift and require prompt correction once airborne. It's a trade-off that can't be codified, and requires more experience both within and outside the cockpit. Any major change is a step into the unknown: maybe the site or conditions that day are unsuitable.

It isn't always clear from the cockpit that the wings aren't level. It may help to check how different angles look beforehand, and to think consciously whether the picture looks right during the ground run. On dual flights, the second pilot can be briefed to monitor the tip clearance and release if needs be.

Abandoning or stopping the launch requires prompt reactions. Pilots need a hand on the release, and ground crews must have a swift and reliable way to signal 'stop' to the winch. The crucial thing is to depower the launch before the cartwheel develops. If the glider gets airborne and a low-level recovery is required, it is likely to be less hazardous than a fully-developed cartwheel.

ROTATION RATE

Rotation refers to the smooth, progressive transition from roughly level flight to the full launch climb. It must only be commenced when the speed and height are sufficient for a recovery to normal flight should a launch failure occur. It follows that, once flying, the glider must perform a shallow climb until

PHASE	CAUSE	CONSEQUENCE
ground run	wing drop	groundloop / cartwheel
rotation	pitch change too rapid	accelerated stall /wing drop / spin
low launch failure	turn attempted	spin / cartwheel
launch failure in climb	failure to recover flying speed	stall
launch failure in climb	failure to achieve manoeuvring speed	spin

Table 1: Winch launch accident causes and consequences

this has been achieved. Crucially, however, rotation itself may demand a still higher airspeed because the wings must supply a centripetal force as the glider's path curves upwards, as well as take an increased fraction of the winch cable tension. It is these extra loads that cause an accelerated stall and spin if the rotation is too rapid. Ensuring that the progressive change of pitch is spread over at least five seconds will limit the additional acceleration to below 0.5g and allow the glider to climb and accelerate. This limits snatch forces and provides useful height in the event of a cable break. The recommended technique [3] is therefore:

- Maintain a shallow climb until the airspeed is sufficient to recover from the climb attitude; check that the glider is still accelerating.
- Smoothly raise the nose so that the transition to the full climb takes at least five seconds.
- Monitor the airspeed and attitude to avoid a stall and ensure that safe recovery is always possible.

Depending upon the glider and trim setting, the nose may have a tendency to raise itself and require a stick force to check it. Regardless, it is important that the rate of rotation is actively controlled by the pilot.

The shallow climb should be achieved by maintaining a typical take-off attitude as the glider accelerates, not by raising the nose. This allows modest height gain while only a small attitude correction will be required in the event of a launch failure.

An adequate airspeed is considered to be at least 1.5 times the stall speed – though more may be required if recovery from a launch failure would mean descending through a wind gradient [4].

With a powerful winch, the airspeed can increase rapidly during the transition to the full climb, and can easily reach the placarded maximum winch speed. This limit is determined by the loads that could be experienced at the top of the launch or under extreme control inputs (including vigorous yawing to signal 'too fast'). During at least the first third of the launch it may safely be exceeded if excessive control inputs and steep climb angles are avoided. We have no record of an airworthy glider being damaged by over-speeding during a winch launch.

It's therefore important that the pilot's focus remains upon controlling the rotation rate and maintaining an adequate airspeed, rather than worrying about over-speeding. A good winch driver will, in any case, adjust the winch power as soon as the full climb is established. If the speed remains excessive, the pilot should continue the launch with moderate control inputs, until it can be abandoned or waved off at a safe height.

LAUNCH FAILURE

Part of the solution to winch accidents was a focus, in training and refresher flights, upon actions in the event of a launch failure [5]. Provided the height is sufficient, these are to:

- Lower the nose to an appropriate recovery attitude.
- Wait until adequate manoeuvring speed has been attained.
- Land ahead if it is safe to do so.
- Plan landing options for possible failure scenarios before launch.

Calculations showed the importance of a prompt initial response if the glider is to be recovered without undue loss of height. This prompt reaction needs to be followed by patience while the attitude is attained and then airspeed is restored. The switch from responding urgently to waiting patiently can be testing, particularly after the shock of the launch failure.

Having restored the glider to a normal attitude and airspeed, landing options can be considered. If there is not clearly room to land ahead, the height will be adequate for a considered decision once the attitude and speed have stabilised, and if a turn is necessary the height will be adequate for unrushed manoeuvring. As it is difficult to see the landing area from overhead, scenarios are best considered before the launch.

The recovery attitude and target airspeed vary somewhat with conditions: the airspeed should be enough to manoeuvre and penetrate any wind gradient [4], and the attitude should allow this to be attained relatively promptly.

If the launch failure occurs very low down, the height may be insufficient for complete recovery, and it may instead be necessary to intercept the round-out or hold-off with whatever airspeed is available. This demanding manoeuvre – similar to recovery from a bounced landing – can be demonstrated by an instructor and flown in a simulator or practised as part of an instructed approach and landing.

There's a wealth of information about safe winch launching on the BGA website [6]. Please make sure that you and your student pilots are familiar with it, and help us ensure that winch launching accidents don't make a come-back.

Tim Freegarde and the BGA safety team

■ Clubs can obtain printed copies of the Safe Winch Launching booklet [1] and other safety briefings from the BGA Office.

[1] BGA, Safe Winch Launching (2021) *https://tinyurl.com/flyright2320*
[2] *Stop the Drop, S&G* (Feb/Mar 2020) *https://tinyurl.com/flyright2321*
[3] *Safe Rotation, S&G* (Oct/Nov 2020) *https://tinyurl.com/flyright2322*
[4] *Wind Gradients, S&G* (Oct/Nov 2019) *https://tinyurl.com/flyright2323*
[5] *Act When the Launch Fails, S&G* (Dec 2021/Jan 2022) *https://tinyurl.com/flyright2324*
[6] BGA, Safe Winch Launching *https://tinyurl.com/flyright2325*

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