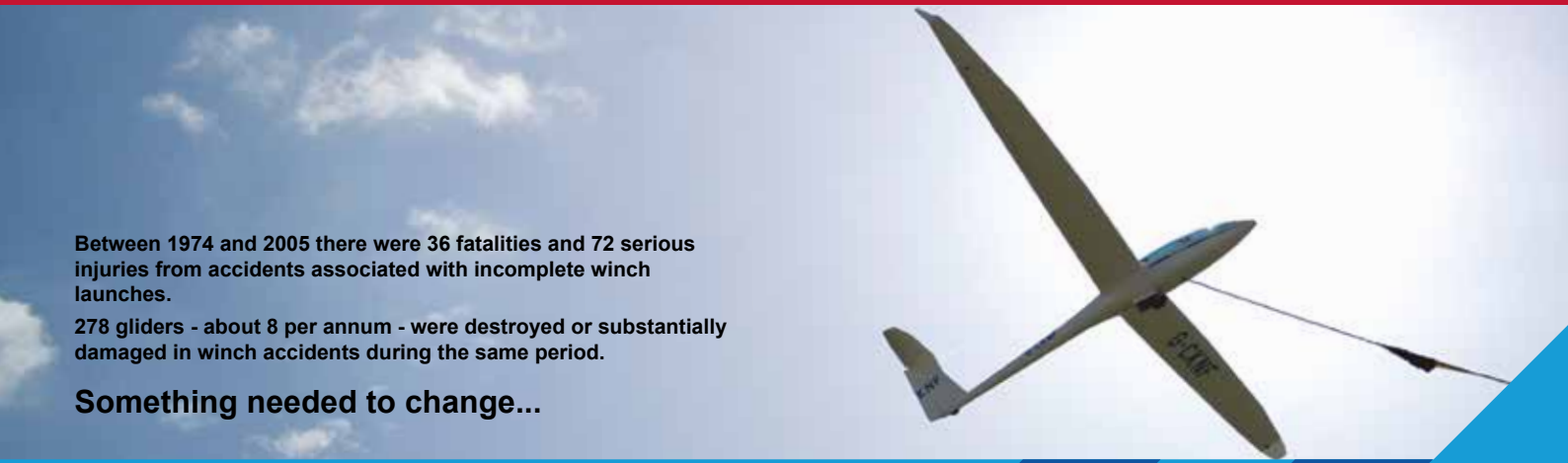
Safety Briefing



Between 1974 and 2005 there were 36 fatalities and 72 serious injuries from accidents associated with incomplete winch launches.

278 gliders - about 8 per annum - were destroyed or substantially damaged in winch accidents during the same period.

Something needed to change...

Safe Winch Launching

This guidance has been developed from the BGA's Safety Initiative winch launch accident study. It also draws upon Chapter 16 of the BGA Instructor Manual.

The advice contained in this booklet highlights the key risk areas in winch launching and offers simple but effective guidance on how to minimise these risks.

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Safe Winch Launching

Introduction

A winch accident is an accident resulting from a winch launch which for any reason does not proceed to the usual height. Many winch accidents arise as a result of power loss at the glider. This can be for any reason, including winch fault, cable break, cable snarl-up, and cable release by the pilot or instructor.

BGA records show that there were 36 fatal and 72 serious injuries from accidents associated with incomplete winch launches between 1974 and 2005. 278 gliders, about 8 per year, were destroyed or substantially damaged in winch accidents in the same period.

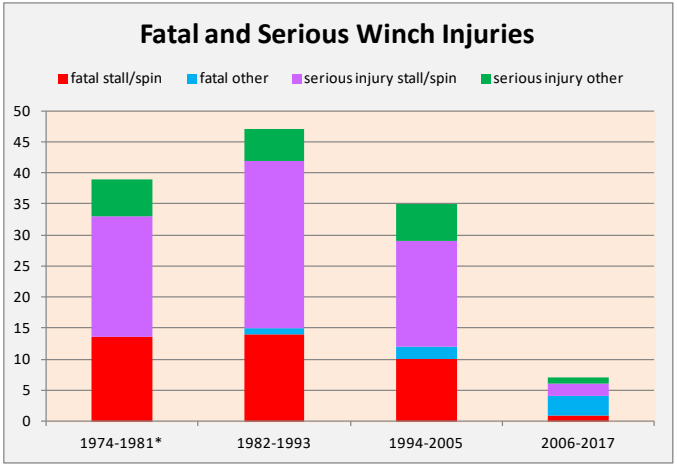
The main sources of fatal injury were a stall during rotation and a spin after power loss in mid launch. The main sources of serious injuries were these two groups and also a stall after power loss below 100ft.

The overwhelming majority of winch accidents resulted from a very few circumstances:

- Wing drop on the ground followed by groundloop or cartwheel.
- A stall during rotation followed by wing drop or a flick roll to inverted flight.
- Power loss below 100 feet followed by a stall or a dive into the ground.
- Power loss in mid launch followed by a stall and spin.
- Power loss in mid launch followed by a recovery to controlled flight and then an overshoot, undershoot, or a collision during landing after a demanding circuit.
- Catching a cable on the ground, or hitting it in flight.

Following an analysis of winch accidents and new studies of the mechanics of winch launching it seemed likely that accidents could be reduced if pilots and instructors were offered additional guidelines on the hazards of winch launching and how to manage or avoid these hazards.

The BGA safe winch launch initiative began in October 2005, 12 years ago. In those 12 years there have been 7 fatal or serious injuries from winch launches compared with the previous 12-year average of 40. The number of fatal or serious injuries that involved a stall or a spin declined from a 12-year average of 34 to 3.



The fatal and serious injury winch accident rate in the last 12 years is a vast improvement on the previous rate but we need to continue to work hard at safe winch launching if the current accident rate is to be maintained and driven even lower.

This booklet contains advice for keeping safe at each stage of a winch launch. Please study it carefully.

*Detailed statistics are not available prior to 1974. The injury totals for the 8 years from 1974 to 1981 have been extrapolated on a straight line basis to provide 12 year totals for comparison purposes.

The most critical elements for staying safe are:

- If you have difficulty in keeping the wings level before takeoff, release before the wing touches the ground.
- After take-off, maintain a shallow climb until adequate speed is seen with continued acceleration. Then allow the glider to rotate at a controlled pace. If power is lost near the ground, immediately lower the nose to the appropriate recovery attitude.
- After power loss in mid-launch, adopt the recovery attitude, wait until the glider regains a safe approach speed, and land ahead if it is safe to do so.

A downloadable copy of this booklet together with a quiz and videos of simulated winch accidents are available on the BGA website.

A DVD containing presentations on safe winch launching with a voiceover was sent to all instructors in 2013. The contents of this DVD are also available on the BGA website to all glider pilots.

www.gliding.co.uk/safewinchlaunching

In the space available this booklet cannot cover all aspects of safe winch launching. Site specific factors (for example, a winch with low cable speed or low power) may call for a modified technique. If you have any questions please consult an instructor.

Safe Winch Launching

1. On The Ground

HAZARD

Wing drop followed by groundloop or cartwheel.

If the wing drops on the ground the glider may rotate about the wing tip and cartwheel. After the wing has dropped the cartwheel can be so rapid that no recovery by releasing or other means is possible. You need to anticipate and pre-empt this hazard by conducting the launch with your hand on the release. Release immediately and before the wing touches the ground if it is not possible to keep the wings level.

You can see a video simulation of a wing drop and cartwheel on the BGA web site at:
www.gliding.co.uk/safewinchlaunching

Advice:

- Start the launch with your hand on the release.
- If you cannot keep the wings level, release immediately.

EVERYONE involved in a winch launch can contribute to a wings level take-off.

Please view the Stop the Drop presentation available on the safe winch launch DVD and on the BGA web site at:
www.gliding.co.uk/safewinchlaunching

PRACTICAL CONSIDERATIONS

The essential with every winch launch before take-off is to keep the wings level.

A wing drop may result from yaw at the very beginning of the launch. Reducing the potential for yaw should therefore reduce the chance of a wing drop. The magnitude and the direction of yaw can be anticipated by considering any crosswind, the position of the cable on the ground, whether the hook is offset to one side, and which wing tip is held. Moderate temporary yaw at the beginning of the ground run can be accepted. In most cases the cable will pull the glider straight.

The wing tip holder should STOP THE LAUNCH if there is an up or download at the wing tip of the stationary glider.

Wing drops usually occur when the wing tip holder lets go. If you are the signaller, send a stop signal to the winch IMMEDIATELY. Do not wait for one or two seconds to see if the pilot picks the wing up.

The wingtip holder should run with the tip while holding the wings level. This is especially important for large span and/or low wing gliders in light winds and in cross winds. In a cross wind it is usually advisable to hold the downwind wing.

In some wing drop accidents the pilot had not realised that the wing has dropped. Be aware of the importance of monitoring whether the wings are level.

If you need to release you must be able to do that instantly. That means being strapped in tightly, with any cushions being energy-absorbent, and with your hand firmly on the release.

It is important to understand that “if you cannot keep the wings level, release immediately” means release BEFORE the wing touches the ground.

The acceleration on many winches is so rapid that there is often no time to adjust the pitch attitude precisely. This can be accepted if you keep the glider in an approximately level attitude and allow the glider to take off when it is ready.

10% of fatal and serious injury winch accidents are first flight on type. Even if you are an experienced pilot, ensure your first winch launch on a type is made after reading the Flight Manual, a thorough briefing, and in benign weather conditions.

2. Rotation

HAZARDS

1. A stall during rotation followed by wing drop or a flick roll to inverted flight.

2. Power loss below 100 feet followed by a stall or a dive into the ground.

1. STALL DURING ROTATION

Accidents from a stall during rotation are very rare but often fatal.

During the transition from level flight at take off to the full climb the wing must generate a force sufficient to accelerate the vertical speed of the glider from zero to about 40 knots.

If a stall occurs during rotation it will be a dynamic or high speed stall after which the glider may flick roll. The glider is spinning while attached to the cable. The rolling of the flick roll is the autorotation of a spin. In some cases the glider hits the ground inverted with the cable still attached. Once the glider has stalled, recovery is probably impossible.

You must anticipate and pre-empt this hazard.

A stall during rotation results from a low airspeed combined with a rapid rotation rate.

A glider with a 1g stalling speed of 34 knots will stall at about 50 knots during rotation on a winch launch if the rotation rate is 20° per second. The stall speed will be about 45 knots if the rotation rate is 15° per second.

A low airspeed and a high rotation rate can arise from a too rapid rotation at low airspeed, or from a rotation with an airspeed that was initially adequate but which reduces during the latter part of the rotation.

You can see a video simulation of a stall and flick roll on the BGA web site at:
www.gliding.co.uk/safewinchlaunching

Advice to avoid a stall during rotation:

- Avoid taking-off with a significant amount of yaw present.
- Maintain a shallow climb until adequate speed is seen, with continuing acceleration.
- Ensure that the transition from level flight at take off to the full climb (typically 35°) is controlled, progressive, and lasts at least 5 seconds.

PRACTICAL CONSIDERATIONS

Ensure you are adequately strapped in and that there is no chance of you inadvertently pulling the stick back during rotation because you are sliding up the seat to the rear. This is possible on some types, including the Cirrus.

Resist the temptation to pull the glider off the ground when taking off over bumpy ground in a light wind or with a tail wind.

Maintain the glider in a shallow climb (10 to 15 degrees) until you achieve the predetermined minimum safe airspeed on the ASI (typically 1.5 times the stalling speed) and you feel continued acceleration. This may require a substantial push on the stick, especially if you are a light pilot, flying with a C of G towards the rear, and/or the acceleration is rapid, or you are flying a glider with the hook well below the C of G (eg a K8).

Having achieved the minimum safe speed, typically 50% above the stalling speed, allow the glider to rotate into the full climb at a controlled pace.

Continue to monitor the airspeed. If it starts decreasing, reduce the rate of rotation.

Be aware that with competent winch driving many gliders will take off and rotate into the climb in a safe manner of their own accord. You may think you are controlling the winch launch profile but this may not be the case. This is one reason that many simulated launch failures are essential before solo.

There is not enough time on a winch launch to adjust the flap setting. Carry out the whole launch with the flap setting recommended in the flight manual.

Safe Winch Launching

2. POWER LOSS BELOW 100 ft

Accidents resulting from power loss below 100ft used to be common. The serious accidents often led to compressed vertebrae. Usually the glider landed in a stalled state but in 20% of the accidents the glider hit the ground nose first, unstalled. 40% of these power loss accidents were during instructional flights usually when simulating a cable break.

A glider with an L/D of 25 that suffers power loss in a 25° climb at 55 knots might not appear to be vulnerable if the pilot lowers the nose at 0g to a 10° recovery dive but delay in lowering the nose may result in a stall. If there is no delay the airspeed at the beginning of the recovery dive when the 1g stalling speed is restored is a healthy 49 knots. With a 2 second delay the airspeed will be 34 knots and the glider will probably crash.

After power loss below about 70ft a single mistake of lowering the nose too little or too much, or being one second too late in lowering the nose, can make a crash inevitable. This is what happened in many of the instructing accidents. The student made a mistake and the instructor did not take over in time to initiate a recovery.

Typical combinations of airspeed and height which should provide sufficient energy for a safe recovery after power loss in a K13 are 55 knots at 20ft or 50 knots at 50ft. In a turbo or water ballasted glider the desirable minimum energy after power loss is probably about 60kt at 50ft.

Advice to recover after power loss below 100 ft:

- If the launch fails, immediately lower the nose to the appropriate recovery attitude. Minimising the reaction time is crucial.
- Do not use the airbrakes unless the glider has attained an appropriate attitude combined with a safe speed.
- Instructors: simulated power loss with less than 50ft and 55kt must be by instructor demonstration only.

PRACTICAL CONSIDERATIONS

Avoid ever being too low, slow, and steep. This can be achieved by following the same launch profile guidelines as those on page 7.

In a cross wind, wait until you have climbed to about 300ft before correcting for drift.

If power is lost, the imperative is to lower the nose immediately to the correct recovery attitude. Every half second counts. You need to anticipate power loss on every launch and be ready to lower the nose without delay.

After power loss very near the ground it may not be possible to achieve the approach speed. Be aware that previous habits might lead you to open the airbrakes at an unacceptably low airspeed. If the airspeed is very low you will need to make a brakeless landing. If the airspeed is a little higher it may be safe to crack the brakes. Do not release the cable unless you have time to spare. It will safely back release.

EXCESS SPEED NEAR NEAR THE GROUND

Do not be overly concerned about exceeding the placarded maximum winch launch speed during the early part of the winch launch. The relatively low placarded maximum winch launch speed of many gliders is to protect the glider from undue stress near the top of the launch where the lift opposes a large tension in the cable, there is no bending relief as there would be in a high g manoeuvre in free flight, and the stress from a gust is greater than in free flight. During the first third of the launch the stresses on the structure are moderate and the placarded maximum launch speed may be temporarily exceeded with care.

Advice:

If the speed is excessive near the ground, climb gently to several hundred feet and release, or signal if the excess speed is now moderate. Releasing below 100ft could be hazardous, not least from hitting the cable. Signalling could overstress the tail. Pulling back to control the excessive speed may break the weak link leading to a difficult recovery.

PRACTICAL CONSIDERATIONS

If you find yourself in a shallow climb near the ground with excessive speed just maintain the shallow climb until you are at several hundred feet. If you release at this height the glider and cable should separate safely. If the excess speed is now moderate, you may wish to signal.

3. Main Climb

HAZARDS

1. Power loss followed by a stall and spin.

2. Power loss followed by a recovery to controlled flight and then an overshoot, undershoot, or a collision during landing after a demanding circuit.

1. POWER LOSS AND STALL/SPIN

After power loss in a steep climb at several hundred feet, the attitude of the glider at the beginning of the recovery dive may look satisfactory but the airspeed may be at or below the stalling speed. It is essential to maintain the recovery dive until the approach speed is restored. If the glider is manoeuvred before this acceleration has taken place it may stall and spin.

Sudden power loss usually produces an unmistakable sensation but a reduction in winch power, or surges in winch power, may have a less obvious impact on the airspeed. It is important to monitor the airspeed and to be aware of these modes of failure.

You can see a video simulation of power loss folowed by a stall and spin on the BGA web site at:
www.gliding.co.uk/safewinchlaunching

Advice:

- Adopt the recovery attitude; do not turn or use the brakes until the approach speed is attained. Beware of a turn into potential sink from strong winds or wave.
- Land ahead if it is safe to do so.

PRACTICAL CONSIDERATIONS

When faced with a reduction in airspeed in the full climb, unload the wing by relaxing the back pressure. If the airspeed falls to your predetermined minimum the best course of action is usually to release and to follow cable break procedure.

After a power failure and a push over to a recovery dive it can typically take 5 seconds to restore the approach speed. That can seem a long time. When you have achieved the approach speed land ahead if it is safe to do so. If not, turn in the direction you decided before take-off. Release the cable when time permits.

2. POWER LOSS, RECOVERY, CIRCUIT

Many accidents occur after a successful recovery to controlled flight following power failure in mid launch. The ensuing circuit may be difficult, with the glider at a few hundred feet at the upwind end of the field.

Advice:

Plan provisional circuit options before taking off.

PRACTICAL CONSIDERATIONS

Think about the circuit options before every take-off. At some sites the best option might be an off field landing. **If you are an instructor and the circuit planning by P2 is not correct, take over early.**

4. Fouling the Cable

HAZARD

Catching a cable on the ground or flying into the launching cable.

Since 1974 over 120 launching gliders have encountered a winch cable. One accident was fatal and 4 led to serious injury.

PRACTICAL CONSIDERATIONS

Release immediately if your glider overruns. Stop the launch if you see an overrun.

Be aware that, after a release near the ground, the cable parachute will open and you may fly into the cable. For this reason it is advisable to climb to a few hundred feet before release if the speed is excessive in a shallow climb near the ground.

If practising simulated launch failures below 200ft, do this by arranging for the winch driver to reduce power.

If you are simulating a launch failure by releasing the cable at 200ft or higher, release under tension to ensure the glider and cable separate. Do not lower the nose before release.

If you are driving the winch and see the cable detach from the glider in the early part of the launch, close the throttle and brake hard. Only wind the cable in when you are sure it is safe to do so.

5. Winch Operations

Safe winch launches may not be possible if the glider is accelerated too quickly. The glider should be provided with the ideal accelerations and airspeeds at each stage of the launch. This is where the winch driver can contribute to safety.

A too rapid initial acceleration might cause the glider to rotate too rapidly in spite of efforts by the pilot to contain that rate of rotation. Over-rotation is more likely with a powerful winch, rapid throttle movement, excessive initial power setting, light synthetic cable, stretchy cable (eg rope), a light glider, a high and aft C of G position, and a low and aft hook position.

Particularly with modern powerful winches, always ensure you use the correct throttle setting on each launch for the glider type and conditions. Advance the throttle smoothly taking a minimum of 2-3 seconds (3-4 seconds with a powerful winch and synthetic cable/rope). If the circumstances indicate possible over-rotation consider taking longer to advance the throttle. Seek feedback from the pilots you launch to determine whether your accelerations and speeds are ideal.

It is desirable for clubs to appoint a winchmaster who can ensure the equipment is fit for purpose and drivers are correctly trained.

All winch drivers, whether pilots or not, should be familiar with the advice in the whole of this booklet. In particular they should read this section and the last paragraph of page 11.

6. BGA Safe Winch Launching Website

Study the video clips and answer the quiz questions.

There are 7 video clips on the BGA web site. Even if you have already seen some of these it's worth studying them again to remind you how and when things can go wrong:
www.gliding.co.uk/safewinchlaunching

When you've seen the videos try doing the interactive quiz to reinforce the messages in this booklet:
www.gliding.co.uk/winchquiz

Summary of Guidelines

Truncated advice, shown on pages 14/15 is necessarily simplified.

Site-specific factors may require many other considerations; however, the key points listed, if rigorously applied, should help to prevent many sad and unnecessary winch launch accidents.

Pilots should consider the hazards shown on page 14 before every winch launch.

	HAZARD	AVOIDANCE
GROUND RUN	Wing touches the ground, glider cartwheels or ground loops violently.	• Start the launch with your hand on the release. • If you cannot keep the wings level, release immediately.
ROTATION	Stall/spin during rotation.	• Avoid taking-off with a significant amount of yaw present. • Maintain a shallow climb until adequate speed is seen with continuing acceleration. • Ensure the transition from level flight at take off to the full climb (typically 35°) is controlled, progressive, and lasts at least 5 seconds.
	Stall or heavy landing after launch failure below 100 ft.	• If the launch fails, immediately lower the nose to the appropriate recovery attitude. **Minimising the reaction time is crucial.** • Do not use the airbrakes until the glider has attained an appropriate attitude combined with a safe speed. • **Instructors: simulated power loss with less than 50ft and 55kt by instructor demonstration only.**
CLIMB	Stall or spin, after launch failure.	• Adopt the recovery attitude; do not turn or use the brakes until the approach speed is attained. Beware of a turn into potential sink from strong winds or wave. • Land ahead if it is safe to do so.
	Controlled flight achieved after launch failure but subsequent stall, undershoot, overshoot, heavy landing, or collision.	• Plan provisional circuit options before taking off.

	PRACTICALITIES
GROUND RUN	• Strap in tightly. • Be aware of the second cable. Release if the glider swings too close to it during the ground run. • Anticipate yaw. • Hold correct wing; stop launch if up or downforce at tip; run with tip. • Monitor wings level. • If wing drops, release before the wing touches the ground. • Signaller: stop launch immediately if wing drops. • First flight on type in benign conditions
ROTATION	• Do not pull back to reduce ground run over rough ground or with tail wind. • Be prepared to use whatever forward stick may be necessary to maintain a shallow climb until speed is adequate. • Monitor the airspeed; reduce rate of rotation if appropriate.
	• No cross wind correction below 300ft. • If speed is excessive do not release; maintain shallow climb to a few hundred feet and then release or signal. • Beware habitual opening of airbrake; use airbrakes with care or not at all after launch failure. • Do not release the cable; allow it to back release.
CLIMB	• If airspeed reduces, unload the wing; consider releasing if airspeed approaches 1.5 times stalling speed. • It typically takes 5 seconds in the recovery dive to accelerate to the approach speed.
	• If instructing, and P2 makes a mistake, take over early.

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