

Gliding Australia Training Manual

Pilot Guide



Unit 13W Launch & Release Winch

Unit 13W - Launch & Release Winch

WHAT THIS UNIT IS ABOUT

To develop and demonstrate the skills and knowledge required to safely fly a winch launch, from the initial climb stage through to release.

WHAT ARE THE PRE-REQUISITES FOR THIS UNIT?

- GPC 7 – Straight Flight various Speeds & Trim
- GPC 8 - Sustained turns, all controls
- GPC 10 – Use of Ancillary Controls
- GPC 12 – Slow flight & Stalling

COMPLEMENTARY UNITS

- Nil

KEY MESSAGES

- Winch stages occur quickly – pilot must remain ahead of the aircraft.
- Always remain in the safe winch speed range for the aircraft.
- Use the too-fast signal prior to the speed exceeding the upper limit.
- Winch upper limit may be exceeded by up to 10% in the initial climb stage only.
- Learn to use speed signals and know when to abort a launch.
- Conduct launch work cycle continuously through the launch.
- Always abort the launch if the speed is unsafe (fast or slow).
- Release should be performed manually with as little cable tension as possible.
- Never allow the winch launch to continue outside Visual Meteorological Conditions (VMC).

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PILOT GUIDE FOR THIS UNIT

A winch launch consists of 5 stages – ground run, separation, initial climb, full climb and release. This unit covers the last three stages.

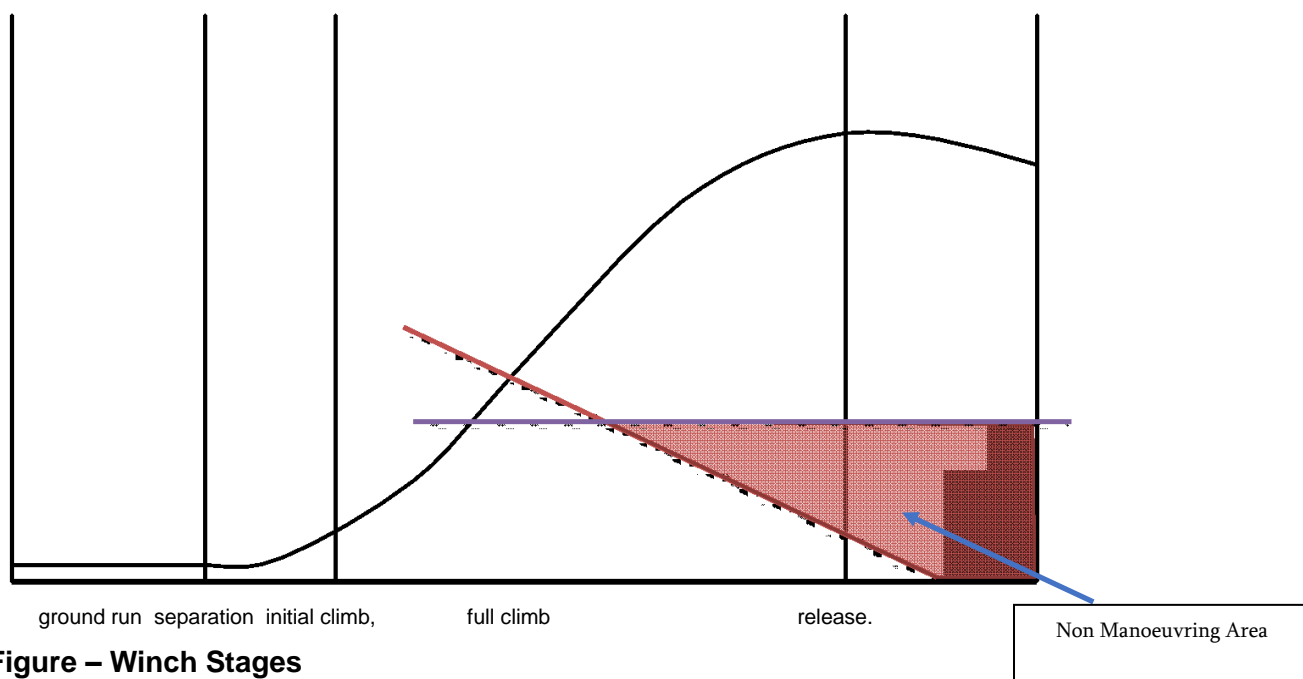
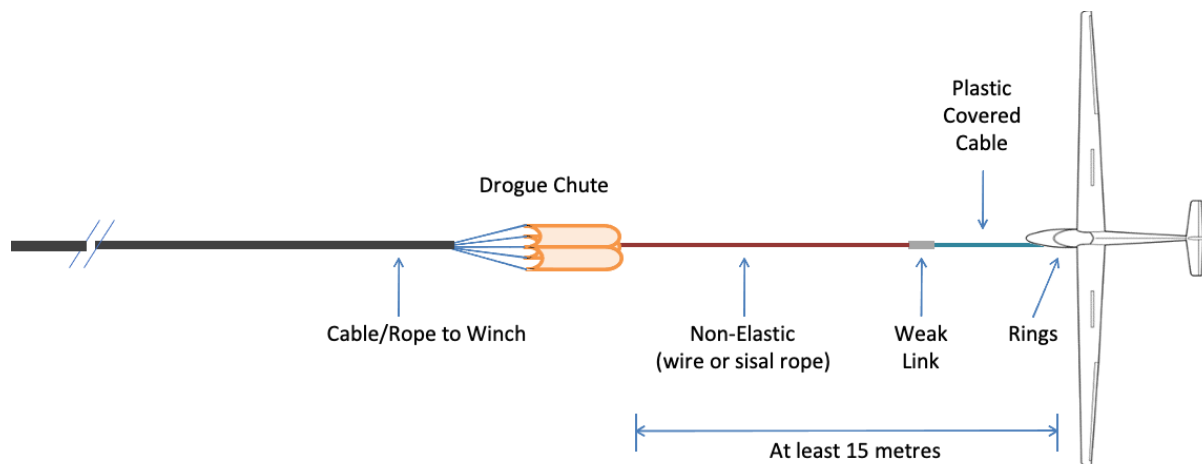


Figure – Winch Stages

- A winch is a static device, consisting of a powerful engine driving a large steel drum on which is wound about 1500 metres of wire. Modern winches may use a number of different cables – single strand wire, multi-stranded cable and Dyneema® rope.
- The gliders are launched by being attached to the end of the 1500 metres of wire, appropriate signals then being given to the winch-driver by the crew at the glider launch point.
- In the full climb the gliders climb steeply, at about 45 degrees nose-up, and reach a typical height of 1500ft in under a minute. As a rough guide, the height gained on a winch-launch in a light wind will be about one-third of the length of the cable at the start.
- A weak link is in place between the cable and the glider release to ensure that the load from the cable does not exceed the weak link rated value. It is critical that the right weak link is used for the aircraft being launched. A drogue chute is often used further down the cable to reduce the speed at which the cable falls back to the ground.

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- After the cable is released, the wire is wound back into the winch.

The advantages of winch-launching are:

- A reasonable cost per launch;
- it is easier to train winch-drivers than it is to train tug-pilots;
- it gives a reasonable launch-height very quickly in comparison with aerotowing; and
- winches are much cheaper to build and maintain than tug aircraft.

The disadvantages of winch launching are:

- Winches are fairly complicated, and reliability is not as good as with aerotowing.
- The launch cable breaks more frequently than aerotow ropes do; and
- Calm conditions reduces the launch height.

Initial Climb Stage

- This is the stage following separation from the ground where the attitude of the glider is gently and smoothly graduated from the separation attitude to the full climb attitude. Before doing this, the pilot will check that the speed has risen to the minimum permitted value for commencing the climb and is still rising.
- The lower third of the launch places less aerodynamic load on the wings and is the only part of the launch where the maximum winch speed (VW) can be exceeded by a small amount and never more than 10%. Once beyond this point the upper airspeed limit must be strictly enforced.
- You should always refer to the winch speed information provided for the aircraft in the Aircraft Flight Manual.
- The minimum permitted speed is 1.3 times the stalling speed - 1.3Vs. If the speed is falling towards the minimum safe speed of 1.3Vs at this stage of the launch, you need to treat it as a launch failure and release the cable.

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- It is dangerous to climb steeply near the ground, even if the speed appears to be adequate, as it may be impossible to lower the nose to a safe attitude in the available time if a failure occurs.
- It is also dangerous to rotate from initial to full climb too quickly, particularly with a powerful winch as this may induce a high-speed stall as the wings exceed the critical angle of attack.
- Pulling back aggressively in the initial climb may cause the cable to break or create a more dangerous situation where one or both wings stall due to a high angle of attack. This latter situation can rapidly result in the aircraft being out of control and cartwheeling into the ground.

Full Climb Stage

- Before entering Full Climb, the airspeed must be between the minimum of 1.3VS and the maximum (VW) as displayed on the cockpit placard. This defines the "working speed band" which differs from type to type and must be known for each glider you fly.
- The exact degree of steepness of the Full Climb stage depends on the airspeed; if the speed tends toward the low end of the band, ease off the climb angle, if it is toward the high end, it is safe to maintain a steeper angle. Climb angle is determined by glancing out at one wingtip. Never exceed a climb angle of approximately 45 degrees.
- During the full climb stage, the pilot has a 'work cycle' of things to continually manage, these are:
 - Airspeed: is the airspeed within the winch speed band, or approaching a limit?
 - Angle: is the angle of the horizon against the wingtip correct, or too steep/shallow?
 - Drift: is a crosswind drifting the aircraft to a point where a correction is required, left or right?
- A typical full climb is steep, about 40-45 degrees nose up.
- The full climb stage of the launch however is characterised by a very high climb rate, typically in excess of 2,000 ft/min (20 knots). Height is obviously gained very rapidly, and it is quite safe to climb steeply during this phase, provided that the speed is safely within the working band.
- The maximum placarded winch/auto launch speed must not be exceeded when in full climb.
- Due to the nose angle of the aircraft there is no forward view of the ground, but direction may be maintained by glancing outside down each side of the instrument panel.
- The wings are kept level, or at an appropriate bank angle in a crosswind, by glancing to each wingtip in turn.
- The pilot will notice that they need to keep easing back on the control column in order to maintain the climb angle due to the increasing down force exerted by the cable as the launch proceeds. The force on the column will be significantly more than normal flight loads.
- If the winch launch will take the aircraft outside Visual Meteorological Conditions (e.g. into cloud) you must release the launch whilst the aircraft is still in VMC.

Release Stage

- The correct time to release is usually signified by the winch or car driver positively closing the throttle.
- The loss of power at the top of the launch is easily discerned by the pilot. At that point, lower the nose just below the horizon. LOCATE-IDENTIFY-OPERATE the cable release twice.

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- Hold the glider straight and level for a few moments to allow the speed to settle at the value you want, and re-trim.
- The cable back-release mechanism may activate prior to the pilot operating the release. In this case still operate the release to be certain that the cable has been released.
- The **non-manoeuving area** is the area of sky on a winch/auto launch in which, if a launch failure occurred, a glider is too low to carry out a circuit but too high to land ahead in the remaining strip length. See the red shaded area on the diagram above. You will note that there are no absolute height values mentioned in the description of the non-manoeuving area.

Signals to the Winch Driver

- The pilot can advise the winch driver if the speed is approaching the upper end of the working band.
- The “too fast” signal is provided by yawing the aircraft left and right, until the signal is recognized, and the speed reduced by the winch driver. The signal needs to be visible to the winch driver.
- If the airspeed reaches or exceeds the top of the working speed band the launch you must release.
- There is no signal for when speed approaches the lower end of the working band, in this case the pilot lowers the aircraft nose to remain within the speed band. The winch driver may notice this and increase speed as a result.
- If the airspeed reaches or drops below the bottom of the working band the launch must be aborted.

FLIGHT EXERCISES FOR THIS UNIT

- In these flight exercises the instructor will assume responsibility for handling any launch failures or emergencies that occur. Your responsibility is to fly a ‘normal’ launch profile.
- Initial training in this unit will focus on the full climb and release stages. As your training and skills develop your instructor will progressively hand more launch responsibility over to you. Ensure that you always have a thorough pre-flight briefing on expectations and effective transfer of control in flight (my aircraft – your aircraft).
- Your instructor may take you off to a safe position on the ground to observe a winch launch from the side and identify the different stages.
- Initial flying will concentrate on the top part of the full climb stage and recognising the drop in power at the top of launch and the subsequent process of releasing the cable. You will need to practice the launch work cycle and maintain control of the aircraft on the cable.
- As you become proficient the instructor will give you control of the aircraft at the lower part of full climb stage. Once you can manage that well you will be given control of the aircraft from just after Separation Stage of the launch.
- The instructor will also show you how to perform the ‘too fast’ speed signal (yawing) at height when not attached to the cable. You will then need to perform this signal as required on subsequent launches.
- When you are competent in this unit of training you will be assuming responsibility for conducting the winch launch from just after separation to the point where the cable is released.

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THINGS YOU MIGHT HAVE DIFFICULTY WITH

COMMON PROBLEMS	
Problem	Solutions
<ul style="list-style-type: none"> Failing to ease back to maintain a correct launch angle in full climb. 	<p>Ensure that you monitor the angle the wingtip makes with the horizon and use this to determine whether you need to adjust the pressure on the control column during the launch.</p>
<ul style="list-style-type: none"> Pulling back too much in the transition from initial climb to full climb. 	<p>Ensure that you have allowed the aircraft to climb approx. 50 feet above ground prior to commencing the transition to full climb.</p> <p>Allow for a period of a few seconds to go from the initial climb to full climb attitude.</p> <p>Ask your instructor for guidance and a demonstration if you still need assistance.</p>
<ul style="list-style-type: none"> Failing to practice the winch launch work cycle. 	<p>Ensure that you don't focus continually on one aspect, you need to scan continuously to ensure that Airspeed, Angle and Drift are all within acceptable limits.</p>

HOW DO YOU DEMONSTRATE COMPETENCE?

- The conduct of a winch launch from just after Separation Stage through the Initial Climb and Full Climb Stages in a variety of wind conditions using an appropriate climb angle.
- A normal release of the winch launch cable and post-release actions.
- Your reaction to airspeed changes during the Launch with the appropriate actions and signals.
- You can describe the threats present during a winch launch

RESOURCES & REFERENCES

- Aircraft placard for winch speeds
- GFA Winch Manual (OPS 0007).
- Australian Gliding Knowledge
- Video – Winch launch, normal flight profile.
- BGA Winch Videos – what can go wrong.

SELF-CHECK QUESTIONS

- What are the three last stages of a normal winch launch?
- What is different about the maximum speed limitation in the lower third of the launch?
- What is the work cycle that needs to be conducted during a winch launch?

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- How do you know when to commence the release stage of the launch?
- How do you release the launch cable from the glider?
- How do you know what the min and max winch launch speeds are?
- What actions do you take if the airspeed on launch is moving towards the min or max?
- What actions are needed when launching in a cross wind?
- What are the dangers of pulling back aggressively at the initial climb stage?
- What is the back-release mechanism and how does it operate?