Winch Manual

glidingmatamata.co.nz

Piako Gliding Club

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Contents

1 Introduction

This manual is adapted from the GNZ winch operators' training syllabus but is based on procedures and equipment commonly used at Matamata. It covers operation of the winch and retrieve tractor, but not the procedures for flying a winch launch.

A winch driver is responsible for all aspects of winch operation, from driving the winch out of the garage in the morning to backing it in again at night. A full winch driver rating cannot be given until all aspects of winch operation have been learned and demonstrated.

In addition, the winch driver is responsible all activities at the winch end of the airfield, including vehicle movements, crowd control, cable retrieving and general care of the winch.

Winch drivers must be trained and have completed the training syllabus, which is to be filed in club records. An approved winch driver shall not undertake solo launches unless they have completed at least 3 launches in the preceding 6 months.

Winch launching procedures at Matamata airfield are covered by CAA Rule Part 93 Subpart F-Matamata Aerodrome, the AIP charts for NZMA and PGC club procedures (How We Do Things).

2 Recommended Reading

Glider End Cable Equipment Explained, Skylaunch Limited, December 2023, 9 pages, skylaunch.com/wp-content/uploads/Strop-trace-advice-Dec-2023.pdf

How We Do Things, Piako Gliding Club, October 2022, Section 6 Winching Procedures, pp 38-44, glidingmatamata.co.nz/members/procedures/standard_operating_procedures/

Manual of Approved Procedures, Gliding New Zealand, December 2022, pp 64 and 80, gliding.co.nz/pilots/moap/

NZMA Aerodrome Charts, AIP New Zealand, August 2021, NZMA AD2-51.1, 51.2, 55.1, www.aip.net.nz/assets/AIP/Aerodrome-Charts/Matamata-NZMA/NZMA_51.1_51.2.pdf, www.aip.net.nz/assets/AIP/Aerodrome-Charts/Matamata-NZMA/NZMA_55.1.pdf

Special Aerodrome Traffic Rules and Noise Abatement Procedures, Civil Aviation Authority of New Zealand, September 2015, CAA Rules Part 93 – Subpart F – Matamata Aerodrome, pp 13-14, www.aviation.govt.nz/assets/rules/consolidations/Part_093_Consolidation.pdf

Winch & Auto Launch Cable Configuration, Gliding New Zealand, April 2020, Advisory Circular AC 3-04, gliding.co.nz/wp-content/uploads/currentdoc/AC3-04.pdf

Winch Driver Training, Gliding New Zealand, October 2020, training.gliding.co.nz/pluginfile.php/4807/mod_resource/content/1/Course%20Winch%20Driver.pdf

Winch Launching Manual, Gliding Federation of Australia Inc, November 2015, 56 pages, training.gliding.co.nz/pluginfile.php/3008/mod_resource/content/6/GFA%20Winch%20Launch%20Manual%202015.pdf

Winch Operators Manual, British Gliding Association, October 2002, 22 pages, members.gliding.co.uk/wp-content/uploads/sites/3/2015/04/1430311907_winchops.pdf

3 Preparation

3.1 Three Glider Flights by Winch

Three Glider Flights by Winch A winch driver needs to appreciate what the glider pilot is experiencing at the other end of the cable. Things to notice are the initial rate of acceleration, the control of the glider attitude with a gradual climb until about 150 feet, the gradual transition to a full climb which is about 45°, the reduction in power at the top of the launch, and the smooth release with almost no tension in the cable.

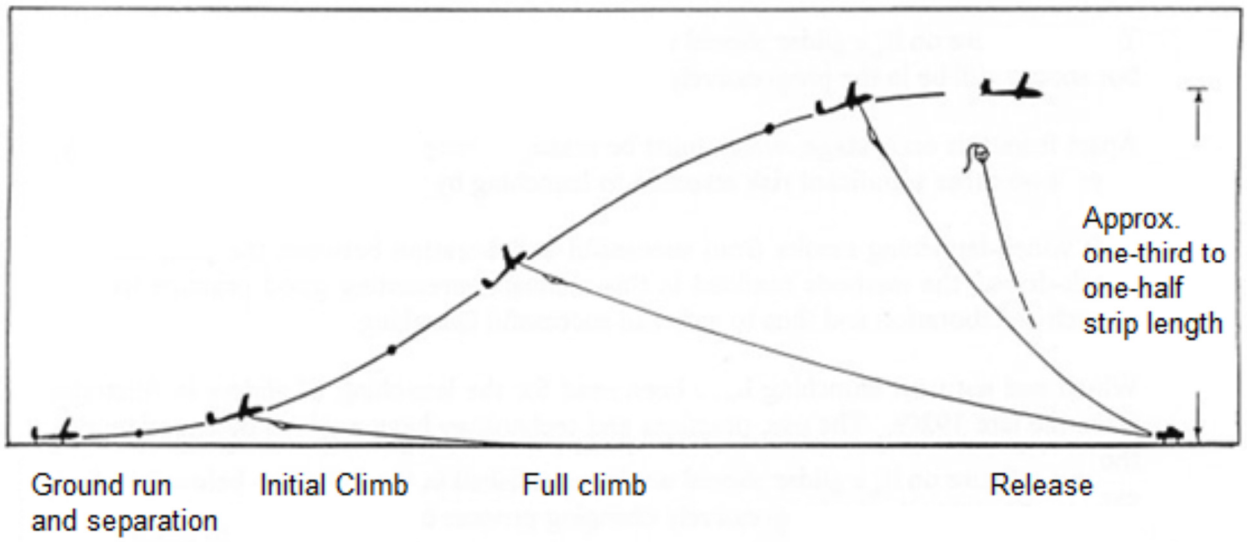
Pass: Three winch launches, at least two of these going to the full height.

3.2 Basic Theory of Winch Launching

The basic principle of a winch launch is simple. The glider is attached to a cable which is wound back into the winch at such a speed that it provides the glider with flying speed. Most winches are fitted with powerful V8 petrol engines and automatic transmissions. Although popular in Europe, diesel winches are rare in Australia, as are manual transmissions in this application.

As the winch accelerates the glider toward its safe launching speed, the glider is flown in such a way that it follows a gradually steepening flight path, gaining height rapidly until it is almost overhead the winch, whereupon the cable is released, and the glider goes on its way.

This is simplified description, but it will suffice for a starting point. For those to whom a picture is worth a hundred words, the following diagram may help.



The key requirement in a winch launch is to maintain the correct speed of the glider at all phases of the launch.

Pass: Demonstrates a basic understanding of a winch launch. This includes the normal flight profile, how the power is regulated at different stages during the launch, how different gliders need a different power setting, and effect of headwind/tailwind. Consequences of too much power, or power applied too quickly at start of launch.

3.3 Read Winch Operating Manual

A modern winch will come with a comprehensive manual. Our's does not.

Pass: Shows a reasonable understanding of the key points in the Operating Manual.

3.4 Safety Precautions with Cables

A stationary cable is harmless, even if it is still falling to the ground. However, a moving cable on the ground - or draped over an obstacle - can inflict serious damage or injury, even moving very slowly. For this reason, a winch cable must be always treated as “live”. Cables should not be picked up without proper training, which includes the safe way to grasp them, and should never be wrapped around a hand or arm. They should not be driven over, as they can be damaged in this way. The area beside and in front of the winch must be kept clear of people and vehicles (except for the tractor).

TREAT ALL CABLES AS “LIVE” WIRES (in case the wrong cable is pulled in or both at once). There should be no aircraft or vehicles on the winch side of the airfield in front of the glider to be launched. The only person who should be in front of the glider is the person attaching the cable to the glider. ALL OTHER PEOPLE MUST STAND AWAY FROM AND BEHIND THE GLIDER TO BE LAUNCHED.

Pass: demonstrates a strong awareness of the safety precautions required around cables.

3.5 Daily Inspection, Review Logbook

Before towing the winch onto the airfield, it is prudent to perform a series of checks. In particular, check that the engine runs before towing out the cables, because winding them in by hand is not pleasant. Do not add engine oil if the level on the dipstick is already above the minimum - it is too easy to overfill. The transmission fluid should be checked by the winch engineer, not the driver.

The winch and tractor must have a Daily Inspection before setting up each day:

- Re-connect the wiring to the negative terminal of the tractor battery.
- Check engine oil on both winch and tractor.
- Check gear box oil.
- Check water on both winch and tractor.
- Inspect ropes, rings (for elongation), parachutes, weak links, towing out links – for signs of wear.
- Check that the guillotines are armed and ready for use.
- Check that the drum locking sleeve and locking clip are present.
- Check that the Dyneema repair kit is in the winch.
- Check tyres.
- Check for oil leaks; report to winch master if any found.
- Check that the radio is working.
- Check the amber flashing lights on the winch and tractor are working properly.
- Check and, if necessary, top-up the winch and tractor with fuel

A winch log is to be kept for all launches. This is to show how many launches drivers have completed and is also used for winch maintenance and costing purposes.

Pass: Performs a daily inspection prior to towing to position, using the check list specific to the winch. Identifies any remaining issues. Makes a correct entry in logbook.

3.6 Towing Winch Behind Tractor

Take no short cuts and drive slowly when towing the winch. Drive along the edges of the runway. Cross active runways only at the ends, and after checking for aircraft traffic.

Pass: Hooks up winch to tractor, tows winch onto airfield, uncouples, aligns winch with launch direction.

4 Daily Setup

4.1 Winch Setup on Field

The winch is always operated on the Kaimai side of runway 10/28. Tow the winch to the upwind end of the runway in use, disconnect it from the tractor, fit the wheel chocks and place the fire extinguisher on the grass near to the winch. Erect the VHF Antenna.

White cone or bucket markers shall be placed at regular intervals down the centreline of runway 10/28 to separate all general air traffic from winching operations.

Make sure that the bucket markers are placed at no more than 50m intervals along the centreline and that there are sufficient markers (approximately 22 No) for the full length of the runway.

There must be a white “W” displayed on the threshold of the active vector when the winch is in use. In addition, there will be 3 white markers, 3.5 x 0.5 metres in size, placed at 20 metre intervals from the threshold of the runway in use, in line with the cone markers.

The threshold of RWY 28 is 130 metres from the boundary fence and cars involved in glider operations may be parked in the designated parking areas. When RWY10 is used for winching, it is convenient to park cars on RWY04 near the intersection of the runways. Cars are required to give way to aircraft traffic and to remain adjacent to the southern boundary of the runway (Clubhouse side).

Powered aircraft operations are restricted to the southern side of RWY 10/28, and winch launching operations are restricted to the northern side.

Winch launching may not commence at any time when it could result in conflict with other traffic or when parachutes are in descent.

Gliders may land on the southern side of the runway but must be moved clear immediately upon completion of the landing roll.

> *Pass: Sets up winch as per the check list. The list can be referred to, and does not need to be memorised, but every item must be fully attended to.*

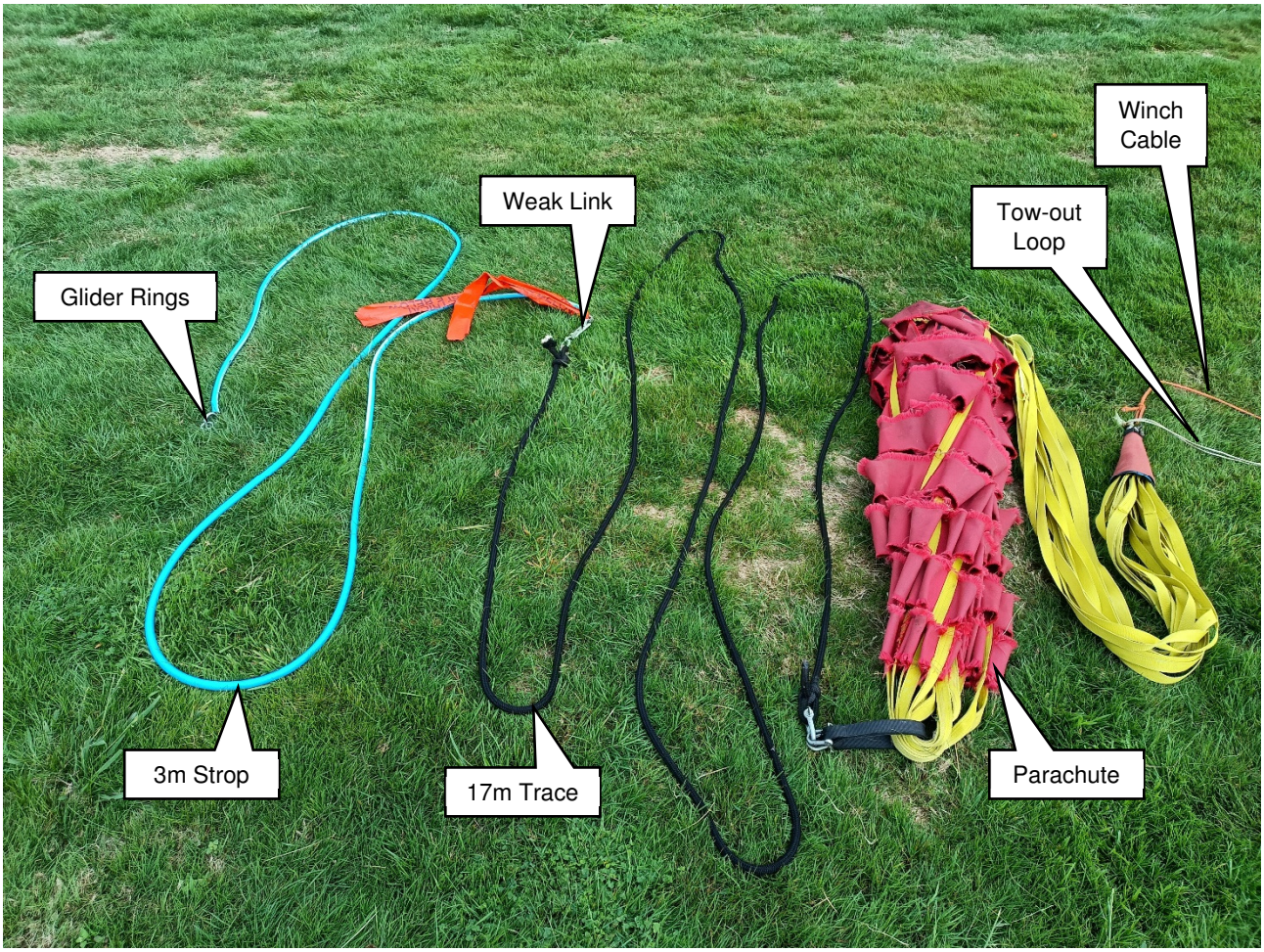
4.2 Glider-end Cable Equipment

The strop length is 3m; long enough to clear the front of the longest glider nose, but short enough that it will not reach the elevator, rudder, or ailerons if a weak link breaks. It can be stainless steel wire rope, 8mm Dyneema, 14mm double braided polyester, or 16 mm laid polyester. The strop should be enclosed in a hose to prevent damage or hang-ups around the glider.

Tow cable weak links are Tost metal linkages with different colours indicating different breaking strains. Weak links are in a box in the caravan. Tables of weak link colours for many gliders are posted in the caravan and appended to this document. The pilot should make sure that the correct weak link is fitted for the glider being launched. If launching a glider which is not listed, check with the Glider flight manual for the correct weak link to use.

The weak link can be connected to the tether by a “Quick Release Ring/Hook” so that it can be easily swapped for a strop with a different weak link to suit different gliders.

The items at the "glider end" of the cable all need to be inspected prior to towing out. These components are subject to extreme wear, so examine carefully for damage and replace defective components (or ask for help).



Pass: Identifies and checks each component on the "glider end" of the cable. Note that some items may be disconnected for tow-out.

4.3 Towing Out Cables

Make sure that both drums are disengaged from the differential by pulling out both hubs. FAILURE TO DO THIS WILL WRECK THE GEARBOX.

Hand brakes must be set to exert a small amount of brake on each drum.

The parachutes and strops need to be bundled and carefully placed on the tractor tray. The winch cables are connected by a light rope or binding twine tow-out loop to hooks at the rear of the tractor. The tractor driver should slowly take up slack on the cables only after receiving a signal from the winch driver indicating he is ready for the tow-out. When the slack is taken up in both cables, the tractor driver should smoothly accelerate to a constant speed for the retrieve.

The tractor driver must start from centre of winch and drive in a straight line from the winch to the launch point, accelerating/decelerating smoothly. The driver must keep a lookout for aircraft and stop if a glider is on final approach. Otherwise avoid stopping, until cables are towed past the launch point. A careful watch is required in the winch when the tractor reaches the far end to avoid the drums spinning and overriding the cables. Any overrides must be cleared by the winch driver before the next launch.

While cables are being towed out, a continuous watch should be kept on the bow of the cables in front of the winch and if they go slack, apply light back pressure on the appropriate hand brake(s).

The tractor should be brought to a gradual stop when approaching the expected launch position of the most downwind glider. The tractor will need to reverse a short distance to relieve the tension

on the cable and to allow the rope towing links to be removed from the hooks at the back of the tractor. Make sure that any helpers who approach the tractor to remove the end gear from the tray are well clear before reversing the tractor.

There will be two used tyres on the tray at the rear of the tractor for the first tow out for the day. These tyres can be left at the caravan for use at the end of the day.

Pass: checks that the tractor is going to be reliable for the day's flying, and that the towing attachment points are serviceable. Confirms radio communication, or reviews other means of signalling.

4.4 Tractor Driver Briefing

The tractor driver may be new to the job on the day, and have had no training, so check whether a full briefing is needed. The procedures for taking up slack and accelerating to normal tow-out speed need to be clearly understood. No sudden speed changes, as these can lead to loops on the cable drums and damage to cables.

If more than one cable is being towed out the line must be absolutely straight, or if curved then only in one direction and the inside cable always used first. Under no circumstances should cables be allowed to become crossed.

If the driver sees that a glider will be landing about the same time as the tractor will arrive at the launch point, he should gradually slow down (or stop) to give the glider a chance to land before the tractor gets to the launch point. After the glider has landed, the tractor may slowly accelerate to complete the tow out.

An experienced tractor driver or helper may assist the winch driver by changing the hubs on the drums and by gathering up the parachute, tether, strop etc ready to put on the back of the tractor for towing out to the launch point. Do not approach the winch or cable equipment while the winch engine is running.

After dropping the cable and equipment at the launch point, the tractor driver should go around the end of the runway and return to the winch along the clubhouse edge of RWY 10/28. The tractor should park slightly behind the winch so that a falling winch cable will not be draped over it.

Pass: Gives an acceptable briefing to a new tractor driver.

5 Authority and Responsibilities

5.1 Clear Area Around Winch

The winch driver is responsible for the safety of personnel around the area of the winch and should not commence a launch if there are any persons near the winch due to risk of injury in the event of a cable break.

Pass: Demonstrates an awareness of people in the vicinity of the winch, and ensures they move to a safe position. Having extra people inside the cab is not an acceptable solution for a driver-in-training.

5.2 Liaison With Launch

All calls between the winch and the launch point must be on Matamata MBZ frequency, 122.25 MHz. Winch driver and glider PIC must maintain a listening watch on 122.25 and a visual scan for all other traffic joining or taxying.

Pass: performs the communication checks between winch/launch point and understands (and is alert for) the emergency STOP signal.

5.3 No Passengers in Cab

A winch driver in training should only have the instructor in the cab. When the driver has been trained sufficiently to operate the winch without the instructor present then it is very important not to allow any observer or guest in the cab for the first 40-50 solo launches.

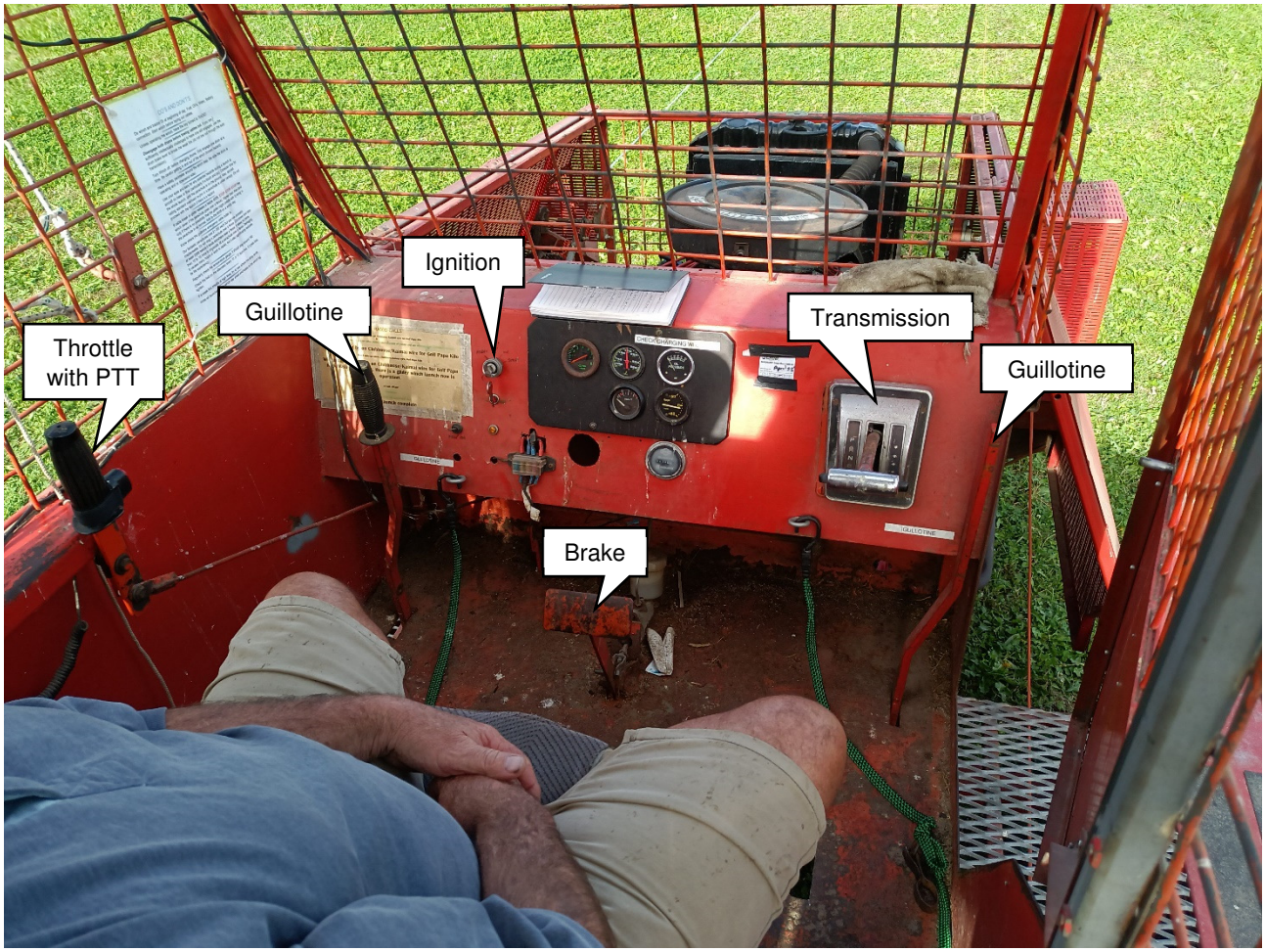
Winch driving requires serious concentration and practice, and all distractions must be eliminated. It is up to the winch driver-in-training to enforce this rule if a friend or curious onlooker drops by. This is akin to the 'sterile field' that is needed when a pilot is doing preflight checks.

Pass: Demonstrates the ability to decline requests from others to join them in the cab to observe a launch.

6 Winch Driving

6.1 Winch Controls, Hand Locations

This is a very important aspect and must be done the same way whether the driver is left-handed or right-handed. There are several key functions.



Pass: Develops the habit of always using the correct hand positions for the winch controls. There should never be any need to 'change hands' or cross over the hands.

6.2 Use of Throttle

After the 'all-out' signal is received the throttle is opened at a steady rate so that the preset power setting is reached after 4-5 seconds. This setting is then held for the first half of the launch. The only exception would be if the glider calls for 'more power' or 'slow down'.

> *Pass: Able to receive instructions from launch point, set the throttle guide correctly for the aircraft type and headwind, and demonstrate a steady opening of the throttle up to the guide position. It may be a Club requirement to read back the throttle guide settings to the launch point to prevent errors.*

6.3 Radio Phraseology

It is strongly recommended that you adhere to a standard set of phrases when operating the winch. Except for the launch sequence (take-up slack, all-out, stop), avoid using any phrases which could be misinterpreted by a pilot operating at the same or a nearby airfield.

For example, never tell the tractor driver to "take-up-slack" - use a different phrase. It is good practice to preface a radio call with the station being called if there is any possibility of confusion.

When requesting a launching glider to offset against a crosswind, do not use the terms left or right, as this depends on your viewpoint and some people are confused by these terms anyway. It is better to refer to dominant landmarks, such as "Clubhouse side" or "Kaimai side". When transmitting during a launch you will need to use your 'outside voice' to be heard above the engine noise.

All winch launches are arranged from radio calls between the glider pilot and winch driver. The glider pilot specifies whether it is “Kaimai” wire or “Clubhouse” wire. The down-wind cable is used first. When one of the cables is retracted, then the active cable is referred to as “Remaining” wire.

Radio instructions from the launch point should be made by the glider PIC.

> *Pass: Consistently uses the agreed terminology correctly at all phases of the operation, including cable tow out and retrieve, normal launch, directing the glider pilot to offset against a crosswind.*

6.4 Glider Signals

Lights at the launch point are not used to control the launch at Matamata. A voice link is needed to communicate the type of glider to be launched, and the headwind at the launch point.

A winch driver also needs to know the visual signals from the glider. A deliberate yawing of the glider is the signal for "slow down". If the nose is lowered this is a request for "more power". The old signal of rocking the wings for more power is no longer used - too dangerous.

Where radio is used, the suggested terminology for use by the glider pilot is: "more power, more power" for increased speed, and "slow down, slow down" for a decrease in power. Note that the winch driver cannot directly control the speed of either the cable or the glider - the single control regulates the power delivered by the engine.

The winch has a rotating yellow beacon that indicates that the winch is operating.

> *Pass: Correctly describes all the signals as above. From memory. Where launch signal lights are in use, conducts a launch while paying attention to these.*

6.5 Engine Temperature Management

The engine needs to be warmed up before the launch and allowed to cool down a little afterwards. Use the temperature gauge to determine how much pre-running and post-running is needed. If the winch engine is still cold when the "take up slack" signal is given advise the launch point there will be a short delay.

Regularly check the temperature gauge, it should stay around 180°. On very hot days, where it is calm and heavy gliders are being launched in rapid succession, the winch coolant temperature can increase and stay high.

> *Pass: Consistently applies the warm-up and cool-down procedures for the winch and shows an awareness of the engine temperature.*

6.6 Normal Launch Procedure

Start motor well in advance of first launch and ensure it is running smoothly. After a warm-up period, the first launch may be started.

Before every launch check the circuit and approach for any traffic. A launch must not proceed if there is a possibility that it could cause conflict with any other traffic.

A winch launch must not proceed if there are any people, cars, or the tractor on the winch side of the airfield, between the glider and the winch. The responsibility rests with all those involved with the launch: the winch driver, pilot, and wing-runner.

Before each launch ensure the correct drum is selected and the locking sleeve and pin are in place.

The normal launch is procedure is as follows:

- Glider pilot radios: **"*Winch standby on Kaimai (****or Clubhouse, or Remaining****) wire for Glider Papa Charlie*".**
- Winch driver responds: ***"Winch is standing by on Kaimai wire for Glider Papa Charlie*".**
- Start the motor with the with transmission in Park, and the foot brake engaged.
- Glider pilot radios: "***Winch Take Up Slack, Take up Slack".***
- Winch driver radios: ***"Winch taking up slack. Matamata Traffic, be aware there is a glider winch launch now in progress".***
- Depress the foot brake. Select "D" on the transmission lever.
- Release the foot brake and take up slack with the motor at idle.
- As the cable tightens and the glider begins to move, the glider pilot radios: "***All Out, All Out, All Out"***.
- It is important to expect sudden ***Stop*** commands at this stage; be ready to STOP IMMEDIATELY
- Open hand throttle smoothly, watching as the glider rotates into the full climb. Listen for radio calls and watch for signals from the glider.
- When the glider reaches the full climb position, maintain this speed and throttle setting.
- Watch and try to maintain a constant climb rate for the glider.
- If the glider signals "too fast" by either calling the speeds over the radio, or by yawing the tail of the glider from side to side, slow down by reducing the throttle.
- As the launch progresses, gradually reduce throttle setting. Listen to the engine note and watch the sag in the cable to gauge how much to reduce the power. Cut throttle completely if glider goes beyond 80 degrees above winch.

- Then, when the launch is complete cut the throttle completely - right back to the stop. When the parachute opens, increase the engine speed again to reel in the cable with sufficient speed to prevent a loop in the drum and to keep the cable off the ground.
- Watch the fall of the drogue chute, cut power completely if it looks likely to fall over any obstacle, such as fences.
- As the parachute approaches the ground, cut the throttle to zero and allow time for the drum to slow down of its own accord. The drum should be stationary by the time the cable lands. This is an important safety habit in case the cable lands where it can cause damage or injury.
- The parachute can be reeled along the ground for a short distance at a slow speed. Stop it 20 metres from the winch - that's close enough. If you accidentally pull the parachute through the rollers, you will break the cable and/or you could damage the rollers!
- When the drogue chute has landed, the winch driver announces on radio: ***"Matamata Traffic, glider winch launch complete"***.
- When launch is completed, take the drum out of gear, make sure that the hand brake is on, and that the chute and ropes are clear of the other cable.
- Record each launch in the book provided in the winch.

Pass: Follows the correct launch procedure for three launches without prompting or correcting from the instructor.

6.7 Cable Stopped Before Landing

A stationary or freely falling cable normally does no damage at all. A running cable is potentially lethal - even when running at extremely low speeds!

Develop the habit of a stationary drum BEFORE the cable contacts the ground. That way you will avoid pulling out fences or damaging vehicles or people.

This stopped-cable condition can be recognised by the cable being 'wrinkled' rather than straight in the few moments before it finally falls onto the ground. A further clue is that the parachute collapses onto the ground without bouncing or being dragged.

This is an art - it means anticipating the inertia of the drum and cable, and closing the throttle several seconds earlier than you might expect to. A small amount of brake can be applied after the drum has slowed right down. If you need to brake firmly then you have left closing the throttle too late and need to close it earlier next time.

Pass: Consistently brings the drum and cable to a complete stop before the cable contacts the ground or any obstacle - like trees or fences. If Dyneema is used, there will be a wriggly line out to the parachute, and the parachute will not move towards the winch after touching the ground.

6.8 Review of Emergency Stop

The Emergency Stop involves bringing the drum to rest as quickly as possible. The left hand releases the throttle lever, and the foot moves directly to the brake pedal. The right hand moves to disengage the transmission.

Due to inertia the cable will keep travelling into the winch and will probably entangle itself around the drum or collect underneath the winch. After every emergency stop the winch engine must be turned off (after cooling down) and the affected drum checked thoroughly for tangles. Any tangle needs to be manually unravelled. This does take time.

After any kind of launch failure, always bring the drum to a complete stop and disconnect the drive from the engine. Do not start spooling the cable in until cleared to do so by someone who has physically checked that it is all clear.

> *Pass: Demonstrates a correct emergency stop. This may be required during a mid-level launch failure initiated by the glider instructor, or a weak link failure. It can also occur when a STOP signal is transmitted by lights, radio, or any other means.*

6.9 Rehearse Use of Guillotine

The guillotine must be activated if the cable fails to release from the glider after a reasonable time. A second situation would be where the cable accidentally falls over live power lines - cutting the cable will isolate the winch from high-voltage hazard.

In a normal launch the power is cut completely to zero when the glider is about 70° above the horizontal, and the glider should have released by 80°. If this does not happen check that the safety latch on the guillotine lever is undone.

As soon as the glider passes directly overhead the winch (or is otherwise wildly out of position and obviously in trouble) with the cable still attached then activate the guillotine. Pull the lever firmly and fully towards you. Switch off the engine, notify the launch point of the emergency, and remain in the cab until the cable is all on the ground and the all-clear is given.

After activating the guillotine do not push the lever back into position as this could damage the trigger pins. Leave everything for the authorised winch engineer to sort out. There will be no more launching for a couple of hours, or possibly the rest of the day.

> *Pass: Recites the above process from memory. If you need to use the guillotine there will only be a few seconds to make the decision.*

6.10 Solo in Cab

Solo in Cab Congratulations! Your instructor has left you alone in the cab to perform a launch or two.

You are now about half-way towards being a competent winch driver. Keep up your practice and continue to work through the remainder of the training program. Do not hesitate to ask for help if you don't understand anything, or if something puzzling happens.

And remember that sterile field. Even a silent observer in the cab will take away some of your attention. No Passengers in the cab until cleared to do so.

7 Launch Point Procedures

IF RADIO COMMS BETWEEN THE GLIDER AND WINCH IS NOT WORKING CLEARLY, LAUNCHING MUST NOT TAKE PLACE UNTIL THE PROBLEM IS FIXED.

Radio calls are to be made from the launch glider PIC, not from the caravan radios or from bystanders with handheld radios.

Gliders must be positioned for launching by the launch point caravan.

Once the cables have been laid out near the gliders, they should not be touched other than to change weak links, or to hook onto the glider. The spare cable must not be touched until the previous launch has been completed. TREAT ALL CABLES AS “LIVE” WIRES.

No person may act as a wing runner for winch launches unless they have been fully trained and demonstrated their competence under supervision. The wing runner makes a final check that the

weak link being used is correct for the glider being launched. After completing the pre-flight checks, the PIC will command the wing runner to hook on the cable by calling out “belly hook open”. Make sure the cable is attached to the ***BELLY HOOK***.

For first flight of the day for each glider, check the 3 release positions: cable releases forward, that it releases from a straight drop and from a backwards release.

The wing runner must check that all is clear above and behind and call out to the PIC ***“all clear above and behind”.***

The tractor must not drive down the runway beside the winching area when a launch is in progress. The tractor can return along the edge of the runway on the Clubhouse side of airfield to avoid delays in bringing wires back to launch point.

Keep the winch driver informed - let them know if there are no more winches or there are going to be delays.

Do student pilot briefings in advance of strapping in, to avoid unnecessary hold-ups. Rate of launches is higher if the second glider on a pair of cables can launch before the first glider returns to land. This way, gliders may be re-positioned for the next launches while the cables are being towed out to the launch point. Otherwise, there is often a delay to the second of a pair of launches to push the first glider out of the way. When busy, it pays to hold back the launch of the first cable until the second glider is also ready (or nearly ready) to go.

8 Handling Non-Normal Situations

8.1 Launching in Tail Wind

In general, this is not recommended, as it increases the risk of a wing drop during the ground roll. However, if the wind is 'light and variable' then there can be frequent shifts in wind direction. If the tailwind component is less than 5 knots then use the same settings, perhaps opening the throttle slightly faster (4 seconds instead of 5 seconds). Or just a normal calm air launch.

The second consideration is that at top of launch the cable might get blown over the top of the winch and be impossible to retrieve normally. To prevent this the launch must be stopped a little sooner.

> *Pass: Demonstrates a satisfactory launch with a slight tailwind at the launch point.*

8.2 Launching in Cross Wind

This requires a special technique at the launch end. Where possible change to an into-wind vector.

A second consideration is keeping the cable inside the fence on a narrow strip. To some degree this can be compensated by having the glider offset into wind during the climb, so the parachute is comfortably upwind at point of release.

If the cable cannot be landed safely due to cross winds, then the winch driver needs to call a halt to further launches.

> *Pass: Shows an ability to manage a cross-wind launch. Makes radio call (if available) to glider to offset into wind. Lands the cable safely despite the crosswind. Driver is willing to stop further launching if 'not happy'.*

8.3 Failed Launch

Once the winch has started to accelerate and the power is cut for any reason, never re-accelerate.

If there is a cable or weak link break below 400', CUT POWER IMMEDIATELY AND STOP.

If it occurs above 500ft, consider towing the cable back to winch. But cut the power if there is any likelihood that the glider could conflict with the parachute after circling.

If the parachute is likely to go over the fence, ensure the power is cut by the time the parachute gets to 100ft. It is easy to lift the parachute and cable over the fence by hand, but very time consuming and costly to repair a damaged parachute or cable.

IF THE GLIDER CANNOT RELEASE the cable at the top of the launch – allow the glider to fly just beyond the winch, so there is a bow in the cable behind the glider. If at that point the cable fails to back release from the glider, CUT THE CABLE IMMEDIATELY with the guillotine lever. It is imperative to weigh up this situation and act quickly.

STOP IF ANYTHING APPEARS WRONG DURING THE LAUNCH, such as: obstruction near cable, parachute caught on glider skid, glider not climbing, powered aircraft and glider too close, etc.

Launching must not be carried out on the other drum until the first cable has been cleared from any obstruction and wound in.

8.4 Cable Retrieve After Failed Launch

This is another area where the winch driver is responsible, although help is usually available in difficult situations. On confirmation of a break from the launch point, the winch driver traces the break from the winch end.

There are two types of launch failure: either the glider releases, or the winch driver chops the throttle and gently applies the brake. If the glider releases, then the parachute will open and the winch engine will rev strongly, so cut the power and brake gently.

If there is only one cable in use and it lands on the runway then it can be towed back to the launch point. With a 2-drum winch there must be no chance of the cables overlapping, so it is best to retrieve the cables completely back to the winch and tow them out straight.

If the cable is hopelessly entangled in willow trees or a tall maize crop (for example) then disconnect the parachute at the end of the cable, remove the cable end buffer and draw the cable slowly back into the winch.

> *Pass: Successfully manages a variety of non-normal cable retrieves where the cable is lying on the ground, perhaps off the runway or over obstacles.*

8.5 Cable Loops, Check after Braking

Every time the brake is used the cable can keep moving towards the drum and form a loop or other tangle. The drum must be checked for this after every use of the brake, and any loop removed before further damage occurs to the cable.

A loop can also occur after a cable break, where the cable momentarily recoils towards the winch faster than the drum can wind it in.

> *Pass: Demonstrate that you can recognise a loop, and that you know what to look for. Also show you are aware of how a loop is formed, and that you remember to check for it on these occasions. Demonstrate or describe correctly how to remove a loop on the drum. Winch Power Failure: Sim or Real*

8.6 Winch Power Failure: Simulated or Real

Sometimes the glider instructor will ask the winch driver to cut the power in the early stage of the launch to test the reactions of the trainee pilot. This could be a gradual or sudden power failure and must be conducted at a safe height (say 200 feet).

It is important that as soon as the parachute is seen to open the winch power is immediately cut and the brake applied firmly. Otherwise, the parachute can continue to "fly" upwards, and the glider could become entangled with it in flight.

In more advanced training the winch driver might be asked to gradually reduce power shortly after launch (say at the start of transition into full climb), to simulate a partial loss of power. This is to test whether the glider pilot gets the nose down and maintains a safe speed.

On the other hand, if the winch itself falters or seems sluggish during a launch it is safest to abandon the launch completely and solve the problem. The glider pilot is more likely to react promptly to a sudden loss of power than a gradual one.

> *Pass: Performs a simulated winch failure while under supervision from a winch instructor. The main thing is to ensure that the glider reaches a sensible height for recovery before cutting the power.*

8.7 Cable Hang-up Procedure

The glider will normally release when the pilot feels the drop in power from the winch. Either the pilot will release manually, or the belly hook will back-release automatically. A cable hang-up is when the cable does not release from the glider as expected. This can be a hook malfunction or the cable tangles with some part of the glider.

First step is to ensure that the throttle is completely closed. If there is any tension on the cable it can require more effort to release from the hook.

Second stage would be to put the transmission into neutral and gently apply the brake - right hand on transmission and foot on brake. After that, let the brake go so that the cable can be pulled out by the glider to ease the tension.

Third stage would be to use the guillotine to cut the cable at the winch end. See notes on "Use of Guillotine". This would only be required if the previous two measures had failed.

> *Pass: Demonstrates a clear awareness of the factors which contribute to a hang-up and describes the actions to be taken - from memory! There will be no time to read the manual if it happens.*

9 Other Procedures

9.1 Cables Not Towed Out Straight

With a multi-drum winch the cables must be towed very straight. If one cable slides over another during the launch the friction can easily cause the stationary cable to be sliced through, or a section of the stationary cable to be lifted into the air and tangle.

If the winch driver is not satisfied that the cables have been towed out straight, then they must be retracted while being watched and towed out again.

> *Pass: Winch driver is insistent that the cables are towed out straight and stops any action which does not achieve this (e.g. the tractor deviates from a straight path for any reason).*

9.2 Cable Retrieve from Mid Field

When a cable lands part-way down the strip, the accepted practice is to wind it all the way in then tow it out straight for the next launch. With winch operations it is always best to follow established and predictable processes rather than improvise.

If only a single cable is on the ground and lies very near the cable track, then it may be towed back to the launch point. However, if a second cable is on the ground already then, the first cable must be wound in completely.

When winding in cables from a significant distance, the cable end assembly should be removed and replaced with a tyre for the retrieve.

Pass: Follows above procedure when presented with a cable that has landed in mid-field.

9.3 Closing at End of Day

One of the main actions is to de-tension the cable on the drums. This is because the cable drums come under tremendous stress from multiple turns of tightly wound cable. The procedure is to tow out the cables as normal, and then continue a moderate distance beyond the launch point, say up to 100 metres if available. This will remove all tightly wound cable from the drum. Then substitute an old car tyre for the parachute (to save wear) and wind the cables in slowly, one at a time, with little tension on them.

Use the radio in the caravan to let the winch driver know when the cables are attached to the tyres and ready to be wound in. Do not remove the buckets and release the Kaimai side of the runway to normal use until the tyres arrive back at the winch. Remind people around the launch point and those towing gliders back to the hangars that the tyres and cables are **STILL LIVE** until they are wound back to the winch.

Retract the VHF antenna, retrieve the chocks and the fire extinguisher, couple up the winch to the tractor and tow it back to the hanger. Disconnect the negative battery terminal on the tractor when finished for the day.

Pass: Takes charge of the cable de-tensioning exercise, then packs up the winch while adhering to the end-of-day check list.

9.4 Reporting Winch Defects

There needs to be a place where minor defects are recorded. A glider DI book can be used for this purpose. Major defects should be reported to an authorised winch engineer as soon as possible.

Pass: Identifies a minor defect and makes an appropriate entry in the log.

9.5 Winch Refuelling

Always use fresh fuel in the winch, and preferably fill it up at the end of every day. This helps prevent condensation in the fuel tank. On a busy launching day check the fuel level in the mid-afternoon to ensure that the winch will not run out of fuel during a launch.

Old fuel will give reduced power, which will produce less than optimal launches. Where possible refuel the winch outside the garage so fuel vapour does not accumulate. Take extra care on hot, dry days as there is a risk of a spark from static discharge starting a fire.

Pass: Demonstrate that you can follow the standard Club procedure for procuring and storing fuel and refuelling the winch.

10 Maintenance and Repair

10.1 Cable Splice Cable Splice - Loop and In-Line

There are two types of splices required on a winch: in-line for joining two sections of cable, and an eye splice for making a loop at the end of the cable. Splicing is similar for both cases. You will need Dyneema scissors (most scissors or knives won't cut Dyneema), and a hollow needle (fid) to draw the end of the cable down through the core.

Follow the instructions given. You can be as basic or as fussy as you like with the tapering of the working end.

Pass: Performs both an in-line splice and a cable end splice that are good enough to put into service.

10.2 Change Broken Weak Link

If a weak link has failed, the cable should be winched in so that replacement of the weak link can take place at the winch where spares and tools are kept. In general, the new link should be fitted in the same way as the old one.

The slotted end of any weak link holder should face towards the glider so that the weak link holder isn't fired back at the glider when the weak link breaks. It also leaves the holder attached to the trace, so less likely to be lost.

The bolts should be done up only to a sliding fit, so the load is entirely carried by the link, and not partly by the holder. Note that when a weak link fails the cable flicks back and could put a loop onto the drum, so check the drum too!

Pass: Using the tools and spare links in the winch tool kit, replace a weak link correctly as above.

10.3 Change Strops and Traces

One easy way to manage weak links (so they don't get lost) is to attach the weak link to the strop (the 3m rope with rings at one end). The entire strop can then be colour coded, and a quick-connector used to change the strop when a different weak length is called for.

When connecting ensure that the quick-connector is fully engaged, as they can be damaged if loaded up when partly connected.

There is no flexibility in the cable-end configuration. Every component has a purpose. The 3m length of strop is to get the weak link out in front of a nose wheel or skid but not long enough to flick back and hit the tailplane if a weak link breaks.

The "trace" cable running from the weak link to the parachute should be 17m in length to give a total of 20m distance from the glider rings to the parachute. This should be enough to eliminate any possibility of the glider flying into the parachute during real or simulated launch failures.

Pass: Demonstrates the ability to inspect the cable-end components for condition and to replace any that are found to be defective or excessively worn.

11 Weak Links

Glider Type	Tost Weak Link	Max Speed Kt
Arcus all models	Black	80
ASG 29	Red	65
ASH 25	Brown	70
ASH 26	Red	70
ASH 31 Mi	Brown	70
ASK 21	Black	81
Astir/Grob single	Blue	65
Astir/Grob twin	Brown	65
ASW 15	White	59
ASW 17	Blue	65
ASW 19B	Blue	67
ASW 20	Blue	65
ASW 27	Blue	70
ASW 28	Blue	75
ASW 28-18	Red	75
Bocian Black	Black	54
Cirrus (Open)	Brown	59
Cirrus (Standard)	Blue	65
Cobra	Red	59
Dart 15 & 17	Blue	71
DG 100/200/300	Blue	70
DG 1000	Black	81
DG 400/600/800	Blue	81
DG 500/505	Black	75
Discus & Discus 2	Blue	81
Duo Discus	Brown	81
Hornet	Blue	75
Jantar Standard 2	Blue	67
Janus a & b	Red	65
Janus c	Brown	81
Ka 6BR & CR	Blue	60

Glider Type	Tost Weak Link	Max Speed Kt
Ka 13	Brown	65
Ka 6E	Blue	56
Ka 7	Black	66
Ka 8	Blue	60
Kestrel 17/19	Blue	70
LAK 12	Blue	75
LAK 17	Blue	75
Libelle all models	Blue	65
LS 1f	Blue	65
LS 3	Blue	70
LS 6	Red	75
Mini Nimbus	Blue	81
Mosquito	Blue	81
Nimbus 2	Blue	65
Nimbus 3D	Black	81
Olympia 463	White	66
Phoebus C	Red	65
PIK 20	Blue	67
Pirat	Blue	64
Puchacz	Red	59
Puchatek	Black	67
PW 5	Blue	65
PW 6	Black	65
Rhonlerche (Ka 4)	Brown	49
SHK	Blue	56
Skylark 2B	Blue	61
Skylark 3F	Blue	71
Skylark 4	Blue	76
T 53	Red	70
Vega	Blue	70
Ventus & Ventus 2	Blue	81

From GNZ AC3-04 April 2020

12 Do's and Don'ts

- Do winch and tractor DI at beginning of day. Fuel, Oil's, Water, Battery connection.
- Start winch before laying out cables.
- Unless operating the winch, have the key turned to 'RADIO'.
- Disengage both drums before towing cables out. If you are sufficiently intellectually challenged to have one still engaged, use the drum brake lever to break the weak link (do not tow out through the auto transmission).
- Turn Winch off before changing drums. Only engage one drum at a time. Be careful getting in and out of the winch (known hazard).
- Have a safety perimeter around the winch (esp. the side the drum is operating and/or downwind side).
- Use your eyes and ears for any potential hazards during a launch i.e. aircraft on base to final (particularly if a touch and go). Consider time for the whole launch; until the parachute is on the ground. Also, aircraft calling standard overhead re-join or a parachute is under canopy. Do not proceed with the launch if there is a hazard.
- If cable break or glider release is below 600 ft, **STOP STOP STOP** the winch (even if the parachute goes over a fence). Higher than that (and only if there is no possibility that the glider might collide with it) bring in the parachute in as normal. Add to the 600 ft on a windy day.
- Know where the guillotine emergency cable cutter is.
- Our fantastic parachutes cost $1000 each but are now probably irreplaceable. Do not drag a parachute over a fence. Cut power and stop at least 200 ft before it lands anywhere near a fence. It takes no more than 10 to 16 mins to physically lift a parachute over a fence. Damaging it causes many hours of work to repair, but it also significantly reduces its life expectancy.
- Regularly check the temperature gauge, it should stay around 180.
- Check the belt on the alternator every 10 or 15 launches. If it gets lose, tighten.
- If a weak link breaks at high level, try to see where the strop lands.
- Write all launches in the winch day sheet and totals in the winch log.
-

13 Splicing

Splicing Dyneema is simple providing you take it a step at a time.

All the tools you need are shown in the picture above. Working from the top we have a sharp pair of scissors, or you can use a sharp knife (it's surprisingly tough to cut), a large darning needle (this was the prototype, and we now use a shorter one), a "fid" – a pointy tubular tool for threading one rope through another, and some ordinary electrician's tape.

To cut Dyneema rope, first take a piece of tape long enough to go round the rope at least twice. Wrap it around the point where you wish to cut the rope, and then make the cut in the middle of the tape. This will leave you with two ends that will not fray.

A couple of definitions: -

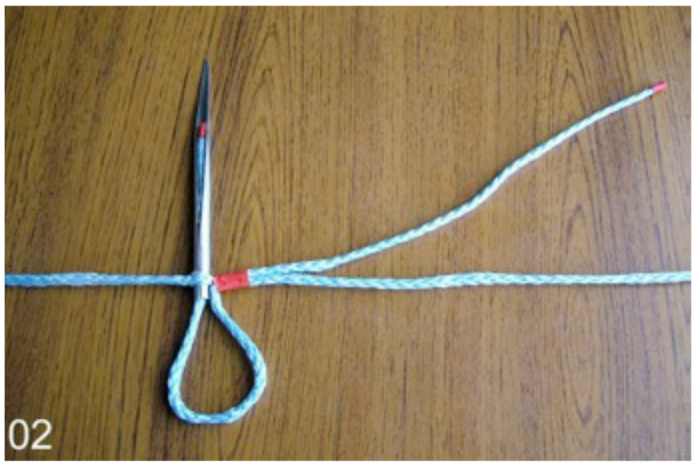
The main body of rope you are trying to splice into is called the "standing part".

The tail, which you are usually trying to splice in, is called the "working part", or "working end".

13.1 The Long Splice

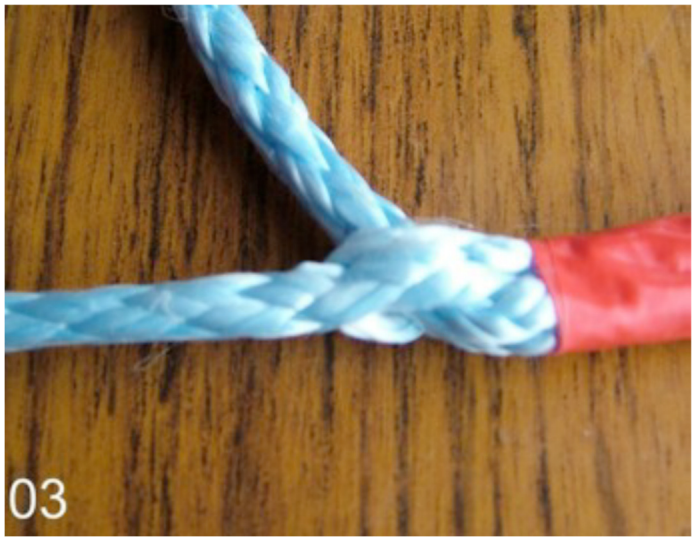
You can see that we have two standing parts, and two working parts.

Cut the ends of the standing parts as described above, to sort out any frayed ends. Lay the two standing parts overlapping in such a way that you can tape them together with the two working ends each of length 25cm to 30cm (10" to12"), or about the length of this A4 page. It is not critical, but if you are uncertain, it is better for them to be longer than shorter (by mischance the darning needles are just over 23cm long, it would have been nice if they had been made exactly the right length as a gauge!).



To use the fid, always open up the rope by compressing it gently along its axis, and insert the fid between the strands, adjacent to the tape, and not through the strands. Admittedly, this is the fiddliest thing you have to do, but it makes a much better job from a neatness and strength point of view. If you have done it properly, the fid requires very little force.

Next thread the respective working end into the tubular fid, and then pull the fid fully through the standing part. This will leave the loop of the working part neatly threaded through the standing part.



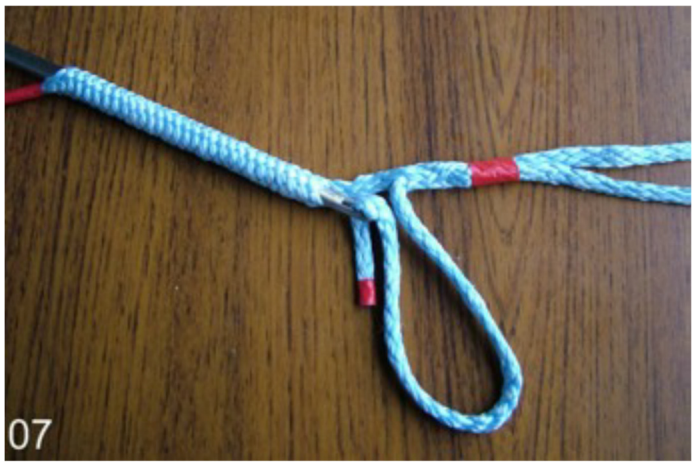
Now pull the working end until the loop has disappeared, and the first tuck of the splice is complete.

The next step is a fiddly one. When you open up the rope by pushing along its axis you can see little holes where the strands open up. Skip two holes, from the exit point of the first tuck, and push

the fid into the third hole at an angle of about 45 degrees, as in the picture. This means that it should come out at the fourth hole on the underside. That's the fiddly bit.

Now insert the working end in the fid,

and proceed as in the previous tuck.

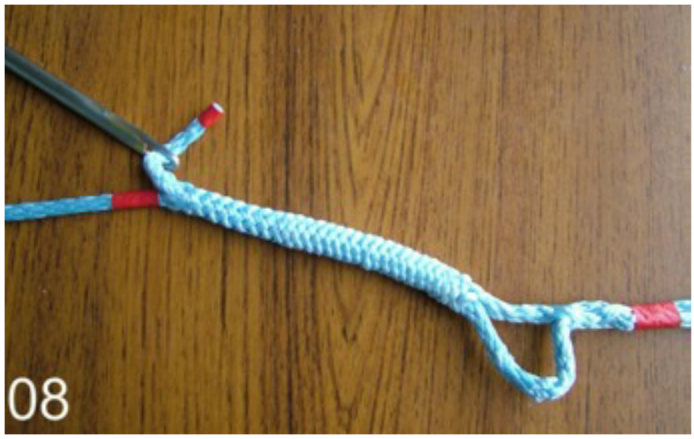


To complete the splice, you need to bury the working end completely inside the tubular braid of which the rope is made. To do this take the darning needle and open up the strands as you did with the fid, but instead of coming out of the other side of the rope, you push it up inside the rope.

Start where the last tuck came out and skip four holes between strands and go into the fifth hole at an angle so that the point of the needle is facing along the standing part away from the last tuck. You can now gently thread the braid onto the needle, if you think you have snagged a thread or slipped out of the side, stop, withdraw the needle until you are clear, and then proceed until you have buried about three quarters of its length inside the rope.

Push the needle out through the nearest hole in the braid. Thread the working end through the eye of the needle. With a bit of a struggle at the start, draw the needle and working end through the braid.

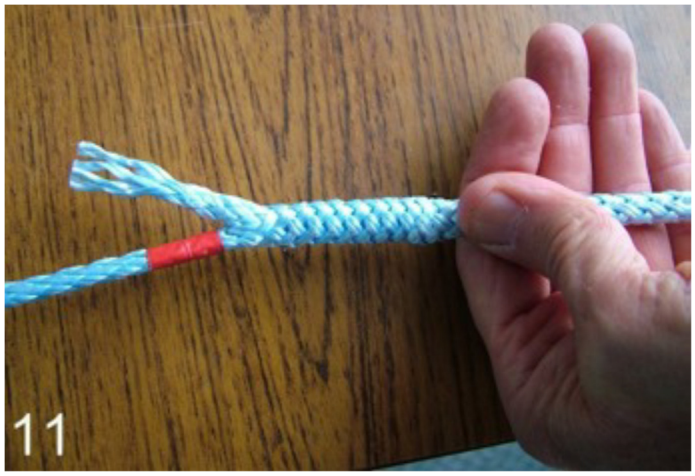
The tape dimly visible in the top left of the picture was a misleading attempt to show where to bring the point of the needle out. There is no need for it!



Remove the working end from the needle, and do not let it disappear inside the braid. Carefully pull through the braid to remove the loop visible in the lower right of the picture, but do not smooth out the expanded braid. As before, ignore the misleading piece of tape at the left of the picture.

Remove the tape from the working end. Now taper the working end over a distance of a couple of inches, (5cm) by pulling out strands at differing lengths,

and cutting them off.

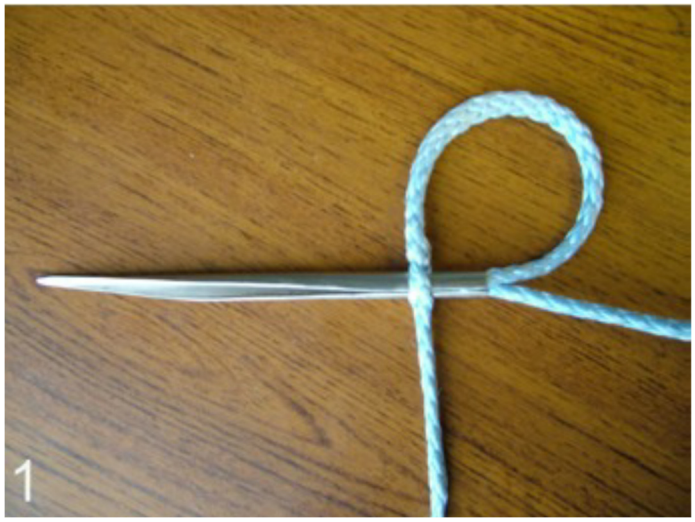


Now ease the braid smooth over the working end, which should disappear into the inside of the tube. Again, ignore the misleading piece of tape.

You have completed half of the splice, now do the other end, starting all over again from picture 02.

The lower spliced rope shows the effect of not tapering the working end prior to burying it inside the rope. There is a sharp change in diameter, which can weaken the splice. This is absent from the top rope, which has been tapered properly. These ropes and splices are exactly the same diameter, but the apparent difference is down to the camera angle. A well-made and tapered splice has a strength of between 95% and 100% of the full strength of the rope, so it is well worth the effort to do it nicely.

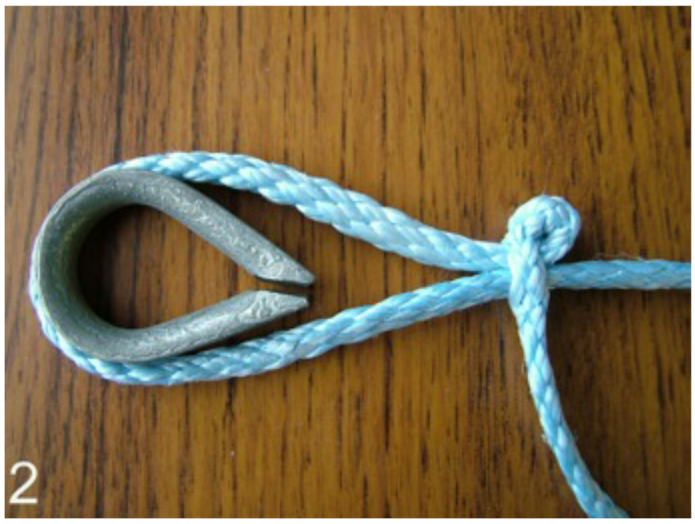
13.2 The Eye Splice



The eye splice is started in a different way to the long splice, but the finishing off is identical.

Insert the fid at a point to give a working end of length 25cm to 30cm (10” to12”), or about the length of this A4 page. It is not critical, but if you are uncertain, it is better for them to be longer than shorter (by mischance the darning needles are just over 23cm long, it would have been nice if they had been made exactly the right length as a gauge!).

Take hold of the standing part about 15cm (6”) from the insertion point of the fid. Fold it back on itself, and after a bit of squeezing and moulding it in your fingers, insert the fold into the end of the fid.

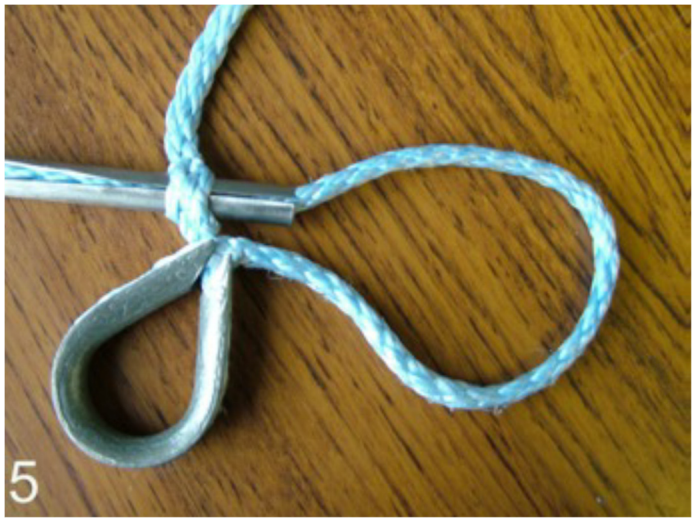


Pull the fid, and the folded bit of the standing part through the hole in the working end. It looks a little odd, but if you pull through, you will create an eye, into which you may or may not decide to put an eyelet, depending on the application.

The remaining kink can now be smoothed out, by pulling the working end, and its continuation in the eye. Smooth the kink out, with your fingers, until it looks like a normal splicing hole. You will now have a simple eye with a normal looking standing part and working part.

Tighten the eye around the eyelet or adjust the size of the eye to your requirements.

This picture shows the standing part at the top, and the working part at the bottom. The benefit of this technique of creating an eye, is that it will tend to tighten under load, but the conventional method of inserting a working part into the standing part will tend to undo under load.



You should now insert the fid as in picture 4 of the long splice, i.e. skip two holes and enter the third, and with the fid at approximately 45 degrees to the standing part, exit at the fourth hole along. You end up with this picture 5 matching the state of play in picture 5 of the long splice.

Proceed from here exactly as in the long splice instructions, until you have finished.