

NEW ZEALAND
HANG GLIDING AND
PARAGLIDING ASSOCIATION
INCORPORATED

HANG GLIDER TOW MANUAL

Issue No.1 January 1994

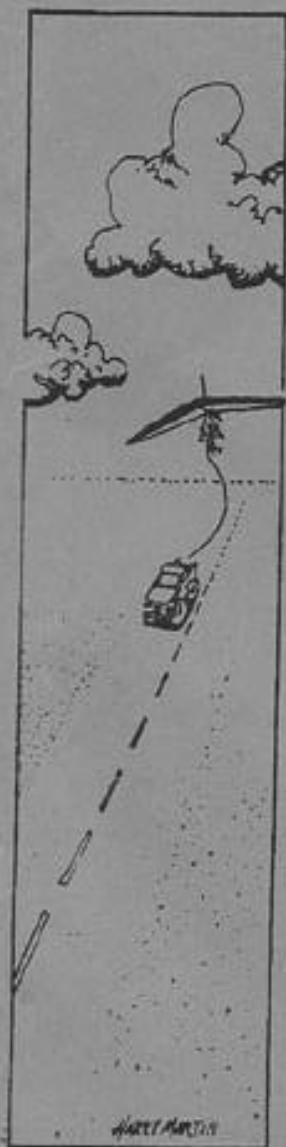


Table of Contents

Section 1. Introduction

Section 2. Towing Systems

- 2.1. Static Tow Line
- 2.2. Pay Out Winch And Platform Launch
- 2.3. Pull In Winch
- 2.4. Aero Tow
- 2.5. Variations

Section 3. Criteria

- 3.1. Constant Direction
- 3.2. Constant Tension
- 3.3. Reliable Tensiometer
- 3.4. Centre-Mass Attachment
- 3.5. Gradual Transitions
- 3.6. Reliable Releases
- 3.7. Weak Link
- 3.8. Safe Learning Method
- 3.9. Adequate Power
- 3.10. Capable Crew
- 3.11. Communication
- 3.12. Suitable Environment

Section 4. Personnel

4.1. The Tow Instructor

- 4.1.1. Qualifications
- 4.1.2. Duties
- 4.1.3. Restrictions

4.2. Launch Marshall

- 4.2.1. Qualifications
- 4.2.2. Duties

4.3. Signaller/Observer

- 4.3.1. Qualifications
- 4.3.2. Duties
- 4.3.3. Restrictions

4.4. Driver

- 4.4.1. Qualifications
- 4.4.2. Duties
- 4.4.3. Restrictions

4.5. Pilot

- 4.5.1. Entry Qualification

Section 5. Towing Equipment

5.1. General

5.2. Releases

5.2.1. Pilot End Release

5.2.2. Winch/Vehicle End Releases

5.3. Tow Bridle

5.3.1. Bridle Construction

5.3.1.1. Standards

5.3.1.2. Car Tow Or Winch Bridle

5.3.2. Attachment Points

5.4. Weak Links

5.4.1. Reasons For A Weak Link

5.4.2. Weak Link Specifications

5.5. Rope Systems

5.5.1. Rope

5.5.2. Rope Rings

5.5.3. Rope Swivels

5.6. Tension Gauge

5.6.1. Reasons For A Tension Gauge

5.6.2. Gauge Types

5.7. Launch Platform

5.8. Power Source

Section 6. Communications

6.1. Visual Methods

6.2. Radio Equipment

6.3. Radio Operation

6.4. Spoken Commands

6.4.1. Initiating Tow

6.4.1.1. Minimal Command Calls.

6.4.1.2. Including Optional Command Calls.

6.4.2. During Tow [If Needed]

6.4.3. At Release

6.4.4. After Release

6.4.5. In Emergency

Section 7. Tow Procedures

7.1. Airstrip Etiquette

7.1.1. Reasons For Etiquette.

7.1.2. Ground Operations.

7.1.3. Ground Movements.

7.1.4. Landing Circuits.

7.2. Launching

7.3. Under Tow

7.4. Releasing**7.5. Foot Launch Towing Procedures - Pilot's Aspect****7.6. Static Car Tow System - Driver's Aspect****7.7. Static Winch Systems - Driver's Aspect**

7.7.1. Reflex Winch

7.7.2. Pull-In Winch

7.7.3. All Winches

7.8. Platform Launch**Section 8. Emergency Procedures****8.1. Weak Link Break**

8.1.1. Low Level - Weak Link Break

8.1.2. High Level - Weak Link Break

8.1.3. Weak Link Break Scenarios

8.2. Line Breaks

8.2.1. Low Level - Line Break

8.2.2. High Level - Line Break

8.3. Release Failure**8.4. Loss Of Power****8.5. Lockouts**

8.5.1. Lockout Causes

8.5.2. The Lockout Scenario

8.5.3. Recommended Actions

8.6. Communication Failure**8.7. Landing****Section 9. Weather Conditions****9.1. Wind Conditions****9.2. Strong Wind Launch****9.3. Cross Wind Launch****Section 10. Training Procedures****10.1. Introduction****10.2. Training Programme Guidelines****10.3. Example Programme For Beginners**

10.3.1. Conditions

10.3.2. Towing Sites

10.3.3. Programme Synopsis

10.4. Exemptions For Experienced Pilots**Appendix Quick Reference Card For Pilots****Appendix Quick Reference Card For Drivers****Appendix Tow Rating Application Form**

Diagrams

- 5.1 Three Ring Circus Release**
- 5.2 Horse Panic Snap**
- 5.3 In-Line Spinnaker Snap Shackle**
- 5.4 Three String Release**
- 5.5 Two-Stage Chest Release**
- 5.6 Hewett Bridle**
- 5.7 Keel Attachment**
- 5.8 Alternate Leg Strap Harness Attachment**
- 5.9 Chest Release Harness Attachment**
- 5.10 Two-Stage Chest Release Harness Attachment**
- 5. 11 Weak Link Knot**
- 5.12 Non-Release Failure**
- 5.13 Example Rope And Leader**

CAUTION

This manual has been produced as a guide only, and is primarily based on the H.G.F.A. [Hang-gliding Federation of Australia] manual and experience gained from HGFA, USHGA and NZHGPA member pilots. The information in this manual is intended as a beginning only and may well become outdated quite quickly as techniques improve, so it will need regular updating.

It is intended that this manual be a basis for towing in NZ. Therefore any submissions for changes to any part of it are welcome. In particular the information on platform launch and aerotow are in need of expansion as we have the least experience in these forms of launching.

Although towing is not new in NZ. it is not yet wide-spread and therefore there are many different factions, ideas and methods so the idea of this manual is to bring a uniformity to the discipline.

To get uniformity invariably will involve everyone making some changes to their system and being the stubborn people we are we won't want to change our methods.

What we are asking then is that you keep an open mind and for the good of all initially accept the methods in this manual as it is and as time goes on it can be refined through submissions.

Under no circumstances should the reader use this manual as a sole reference to base their operation of towing without first obtaining instruction in the techniques of towing and without teaming with experienced tow pilots.

AJ & Bruce have compiled this information in good faith; but disclaim any responsibility directly or implied.

Written by Bruce Williams & AJ Murray, AHGC

Produced using Lotus AmiPro 3.0 and printed on an BP DeskJet With thanks to No. 1 Software of Newmarket, Auckland suppliers of Lotus products and Logitech scanners.

January 1994

Section 1**Introduction**

Towing has been around for as long as hang gliding and paragliding itself and although it is a more complex method of launching, with professional instruction and the correct equipment, it is a safe and efficient method of launching. Towing has shown a definite re-emergence, this is particularly evident by the growing number of pilots attending such competitions as the the Australian Flatlands Challenge each year.

Due to the extra complexity of towing, great care must be taken at all times. Crew and pilot rely heavily on the integrity of radios and the towing system. It is therefore much more team orientated. Responsibility must not be taken lightly. Not to adhere to the guidelines in this manual is foolish, and may result in destroyed equipment, pilot injury or death.

Virtually every accident in towing is the result of rules or procedures not being adhered to, so the message is clear.

ADHERE TO THE RULES

All forms of towing require:

- **AIRMANSHIP** - safe procedures through all operations must be adhered to. This diminishes ambiguity and delegates responsibilities.
- **KNOWLEDGE** - the transition from hill/foot launch to tow launching involves quite different methods. For the first time tow pilot, information gathering is important, not only for knowledge learnt, but also questions raised.
- **EXPERIENCE** - It is strongly advised that beginners glean as much knowledge as possible from a variety of experienced tow instructors and pilots, especially by watching and helping.

Aspects related to the ground crews responsibilities are to be understood thoroughly, with emergency procedures practiced and in place at all times.

Minimum Pilot requirements

Novice Rating is the basic requirement for a pilot to undertake tow training. These students may then complete the tow rating.

ANY pilot without a tow rating should not attempt ANY towing activities other than under the supervision of an experienced tow rated pilot.

The NZHGPA welcomes any advice, information or assistance from members, to ensure programmes are established, that promote and maintain a high level of instruction and safety throughout our membership.

Section 2**Towing Systems**

There are basically four types of towing systems and some minor variations:

2.1 Static Tow Line

The Static Tow Line system consists of a length of rope [usually poly propylene] attached via a tensiometer and quick release [optional but recommended] to the rear of a vehicle. The rope is laid out, then attached to the pilot's harness via a reliable hand operated release system. Because poly rope is so elastic a zero stretch bridle is attached between the pilot and tow rope. This is to prevent the bridle from whipping back and hitting the pilot in the event of a rope break or release under load. Preferable strip length 800M+. Line length approx one third strip length.

2.2 Pay Out Winch And Platform Launch

This system comprises of a brake drum and wheel mounted on a trailer or utility truck. The glider and pilot lift off the back of the moving vehicle so wind direction is less important than some other systems. This system uses the brake drum to regulate the towing tension, i.e. rate of climb. Once the load rises above the set limit, the drum pays out. This is a good safety feature. There is also a guillotine built into the system, operated from the vehicle.

2.3 Pull In Winch

This type of winch is usually mounted in a trailer and is fitted with one or two steel wheels containing steel cable. Most have a brake system as well as a clutch system for smooth take-offs. Some systems use automatic transmissions, while others rely on a hydraulic system,

2.4 Aero Tow

The hang glider is towed up behind a trike or microlight.

This is not covered extensively in this manual but basically the same type of procedures apply.

For further information, regulations and procedures refer to HGFA Powered Hang Gliding Operations Manual Section 6.8.

2.5 Variations

Reflex Static Line - Pulley at upwind end of paddock with car pulling downwind towards glider.

Reflex Pull-In Winch - This is the same as the reflex static line system, with the exception that a cable pulley is secured at the other end of the field. This allows the winch driver to watch the take off and flight from close to the pilot.

Section 3**Criteria**

Criteria for safe and efficient towing (also known as Skyting Criteria)

3.1 Constant Direction

The direction of the towing force must remain constant throughout every phase of the towed flight.

3.2 Constant Tension

The tension of the tow line must remain essentially constant throughout every phase of the towed flight.

3.3 Reliable Tensiometer

The system must have a reliable load sensor to detect any changes happening to the hang glider in flight whilst under tow.

3.4 Centre-Mass Attachment

The towing forces applied through the tow line/bridle must be attached as closely as possible to the effective centre of mass of the system, i.e. harness.

3.5 Gradual Transitions

The graduation to, and from tow, as well as any variations while on tow must be of a gradual nature.

3.6 Reliable Releases

The release devices and their methods must be sturdy, rapid and reliable preferably with a release on the vehicle.

3.7 Weak Link

The system must include a weak link which will infallibly and automatically release the glider from tow, whenever the tow line tension exceeds the limits for safe operation.

3.8 Safe Learning Method

The system must include a safe method for learning, and gradually advance the student from one level of experience to the next.

3.9 Adequate Power

The system must have a source of power adequate to maintain a safe mode of flight whilst under tow.

3.10 Capable Crew

The system must be operated by a crew which is adequate in number, and competent in ability to see that the system functions properly.

3.11 Communication

A reliable method of communication, bats, lights or ideally FM radio must exist between all crew.

3.12 Suitable Environment

The system must be operated only within the environment, and under the conditions, for which it is designed.

Section 4**Personnel**

Recommended personnel for fully crewed tow operation. Note that fewer personnel may be present when all participants are experienced in all aspects of tow operations.

4.1 The Tow Instructor

There must be a person in charge of all towing teaching operations. In the club environment they are known as the "Tow Instructor" and are qualified in all aspects of towing.

4.1.1 Qualifications

- Hang gliding instructor
- Tow Driver
- Pilot with Tow rating
- Experienced signaller
- Current First Aid Certificate
- Minimum age 18
- Total 50 personal towed flights
- Driver for a total of at least 50 launches

4.1.2 Duties

- Responsible to the NZHGPA for the group's safe towing and its following of procedures.
- Instructing new Pilots
- Responsible for the location and tow direction of towing operations on the day.
- Teach driver
- Teach signaller
- Teach Pilots

4.1.3 Restrictions

- Can only operate within NZHGPA guidelines/procedures.
- Responsible to the Launch Marshal

4.2 Launch Marshall

4.2.1 Qualifications

- Good knowledge of all aspects of tow operations
- Knowledge of airspace restrictions in area
- Knowledge of GA procedures if operating on airfield

4.2.2 Duties

- Overall control of operations on towstrip on the day..
- Designates areas of field for TO, LZ, TO corridor etc

- Appoints operational positions - signaller, driver, instructor, other assistants

- organizes launch order
- co-ordinates tow operations with other air traffic e.g. arranges use of strip with other operators
- ensures pilots in launch order are ready for TO
- assists pilots with safety checks
- has the authority to cease all operations
- has the authority to refuse the use of tow equipment they consider unsafe
- has the authority to refuse to allow a pilot to be towed

4.3 Signaller/Observer

4.3.1 Qualifications

- Responsible person over 16 years of age
- Good eye sight
- Thorough knowledge of all signals and commands including emergency procedures.

4.3.2 Duties

- Relays pilot commands to the winch operator/driver by visual and/or audio signals
- May accompany a driver and observe pilot during tow.

4.3.3 Restrictions

- Follows NZHGPA approved procedures only

4.4 Driver

4.4.1 Qualifications

- Age 18 years minimum
- Good eye sight
- Has received training by Tow Instructor

4.4.2 Duties

- Launching pilots and trainee pilots.
- May only launch trainee pilots under direction of a Tow instructor or Launch Marshall
- Teaches signaller
- Must obey instructions given to them from the pilot, Tow Instructor, Launch Marshall and/or Signaller.

4.4.3 Restrictions

- Follows NZHGPA approved procedures only
- Cannot teach new drivers.
- Cannot teach pilots to tow launch
- Must only operate tow systems of the type they are experienced on.

4.5 Pilot

4.5.1 Entry Qualification

The minimum recommended level of experience required before a pilot may undertake tow training is:

- a) 75 logged takeoffs and landing on hang gliders
- b) 5 hours logged soaring time on hang gliders

The above experience must have been gained on 4th or 5th generation gliders. It is imperative that the Tow Instructor checks that the pilot has valid NZHGPA flying membership.

Section 5

Towing Equipment

5.1 General

The construction and maintenance of the equipment used in any towing is critical to the overall level of safety of that operation. Equipment failures in towing have proven to be the major cause of serious accident and injury. Use only approved bridles and releases as many accidents have resulted from home built releases and unconventional bridle arrangements. The tow instructor will have available for inspection the equipment approved for the particular form of towing being used. Be aware that different bridle set-ups are required for the different forms of towing.

The pilot should never learn to tow on a borrowed glider or harness and should never attempt prone tow unless fully experienced in prone prior to the course. As platform launch towing requires prone position from start, extra training of novice pilots will possibly be required to bring them up to a safe standard before attempting platform launch.

5.2 Releases

5.2.1 Pilot End Release

All releases **MUST** release at any angle, and at any load. Any weak links built into a bridle must allow for release 100% of the time. All releases must be infallible and must only release upon pilot activation. or when glider and tow line are dangerously out of alignment.

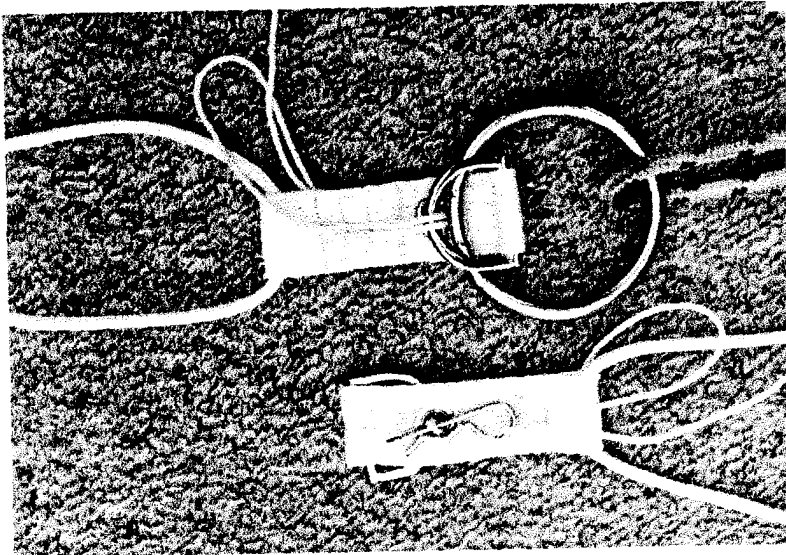


Diagram 5.1 Three Ring Circus release

There are several variations on this design. Shown here is a two-ring version. It is preferable that round rings be used (not D-rings).

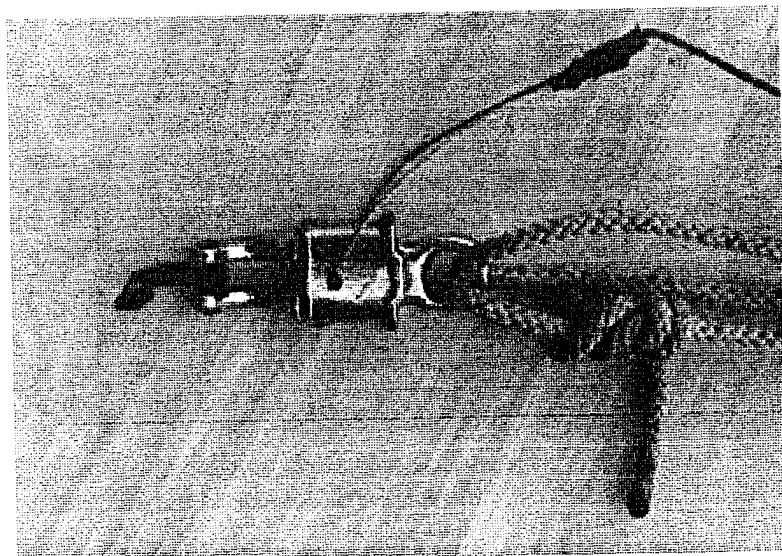


Diagram 5.2 Horse panic snap

Diagram 5.3 In-line spinnaker snap shackle

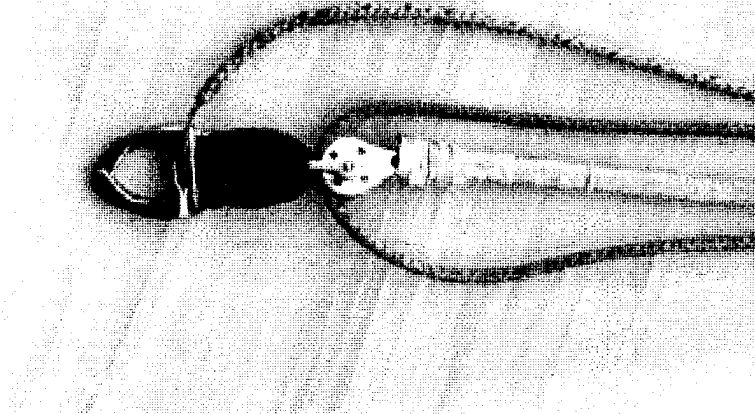


Diagram 5.4 Three string release

This is an example only of how they look as no real string releases were available. The diameter of the string used is critical for safe operation.

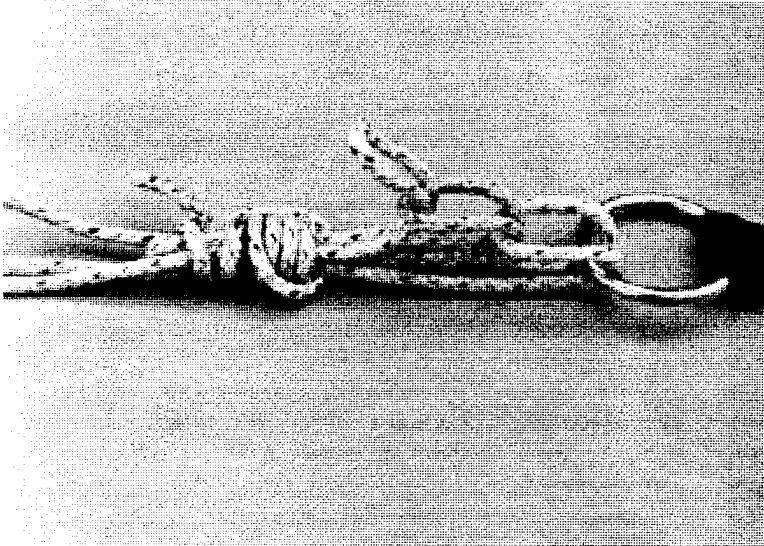
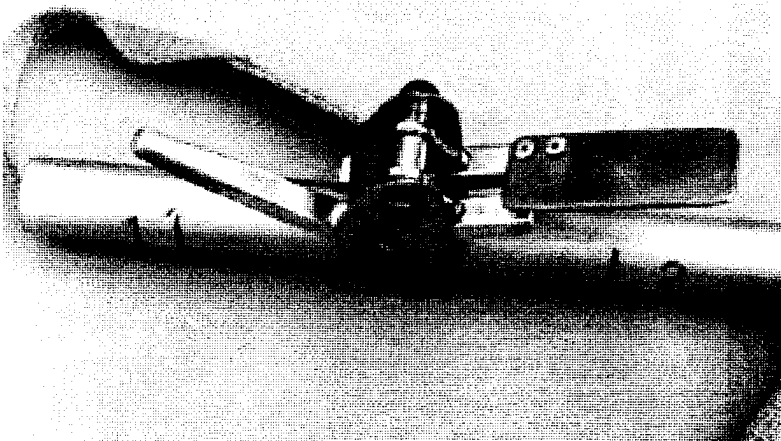


Diagram 5.5 Two-stage chest release

These are commonly used in Britain and Europe.



5.2.2 Winch/Vehicle End Releases

These are recommended and should be releasable at any tension. A "hook knife" or wire cutters/guillotine must be a standard feature at this end of tow line.

Either a sailplane, ski boat release or pilot-end type release can be used in this application.

5.3 Tow Bridle

5.3.1 Bridle Construction

5.3.1.1 STANDARDS

The following list of specifications for each particular application should be adhered to stringently.

Only equipment approved for that particular application to be used. (Do not mix equipment i.e. Aero-tow bridle ... aero-tow only; Platform bridle ... platform tow only.)

5.3.1.2 CAR TOW OR WINCH BRIDLE

You will require at least 10 metres of NON STRETCH [not pre stretch] rope. 4mm Kevlar is ideal because it is quite stiff and won't tangle as easily as others but Spectra-line or similar will do. 2M of 2 or 3 mm day-glo cord for a release line.

Two seamless metal rings (best is stainless steel). Or better still two small blocks Ronstan RF666 or RF571 or similar.

A release. An inline releasing snap shackle of some description is the best, the most robust and reliable is a WD2673 from Wichard [French]. Expensive but you have to pay for the best [1993 retail \$70-90]

A NZ and a British one are also available [\$50] but are not as good.

Australians sometimes use a panic snap clip as often used on horse leaders [\$15] but they require some small modifications and are not as robust as the Wichard type.



Diagram 5.6 Hewett Bridle

Note that two lines are attached to the harness and go under the base bar One line is attached to the keel and goes through the A-frame.

The release line is attached to the centre of the base bar.

5.3.2 Attachment Points

The harness must have professionally sewn tow loops at the required positions, and glider/bridle attachment point should be positioned as indicated.

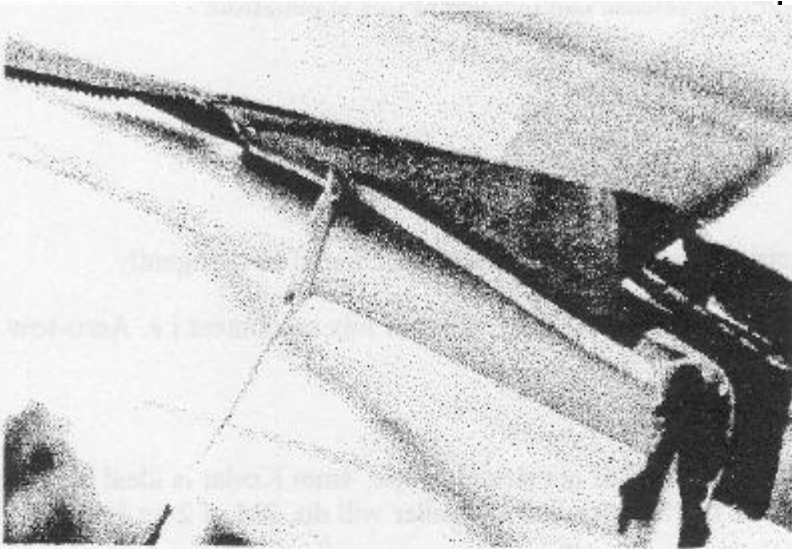


Diagram 5.7 Keel attachment

The line should be securely fastened round the top of the A-frame or king-post and run along the keel to connect to the bridle approximately 20-30cms in front of the hang point. This distance is critical as it controls the angle of attack of the glider at trim position during tow.

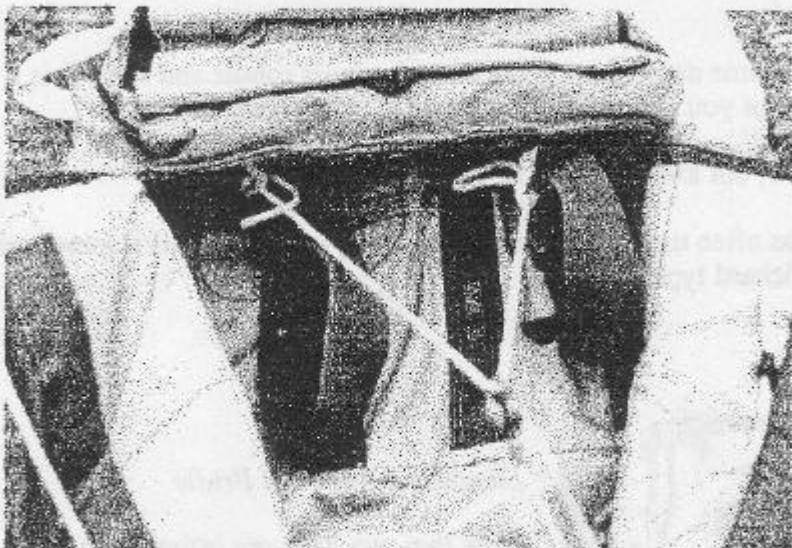


Diagram 5.8 Alternate harness attachment to leg straps

If no tow loops are sewn on the harness then the bridle may be attached to the leg loops close to the harness.



Diagram 5.9 Harness attachment for string chest release

If no tow loops are sewn on the harness at the shoulder the release may be tied directly round the shoulder straps.

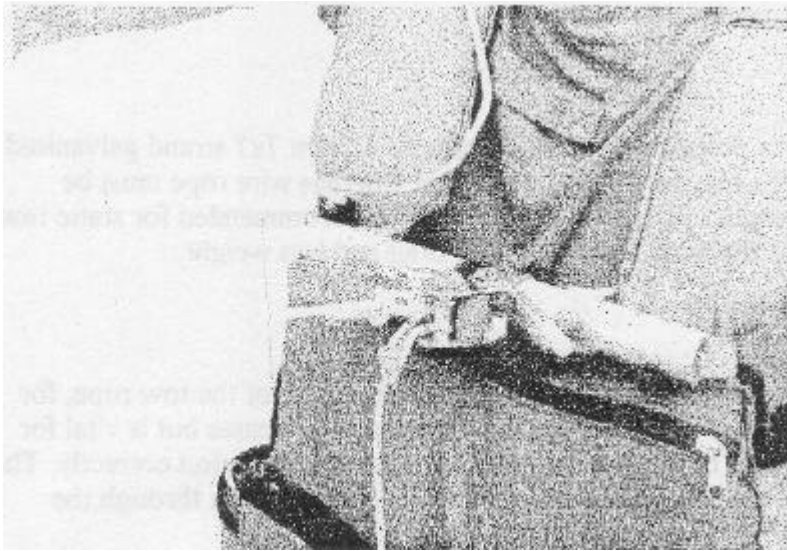


Diagram 5.10 Harness attachment for two-stage chest release

5.4 Weak Links

5.4.1 Reasons For A Weak Link

The use of a weak link in the tow line is mandatory in all tow systems. It prevents overloading of all tow elements including the pilot and is designed to break before forces on the glider become excessive.

5.4.2 Weak Link Specifications

Recommended is 1g breaking load (equals weight of glider plus pilot and gear). EG. Glider of 30kgs plus pilot and gear of 75kgs should have a weak link of 105kgs breaking strain.

Weak links should conform to the following material and design standard they must be infallible.

Marlow Kenwal nylon builders line No. 8 is suitable, or any similar line which breaks consistently at a predictable load.

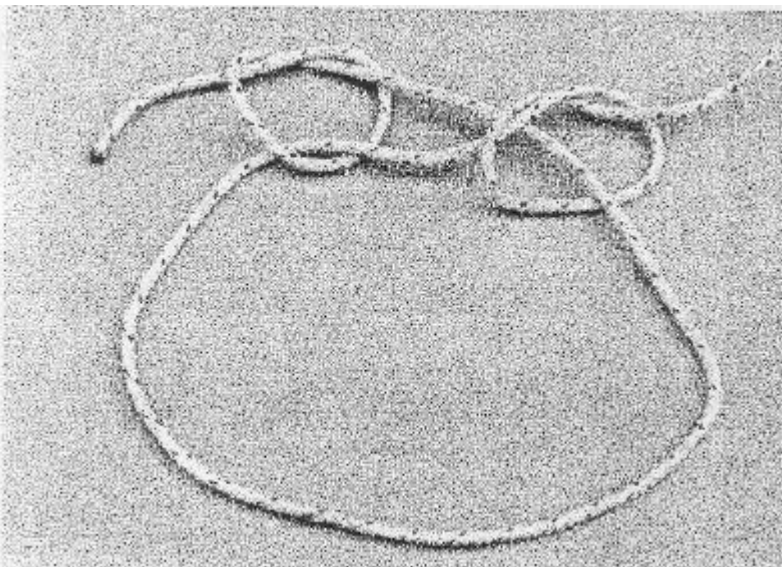


Diagram 5.11 Recommended knot for weak link string.

Note that knotting reduces line strength. This must be taken into consideration when choosing a weak link line.

5.5 Rope Systems

5.5.1 Rope

For general towing use 4-5mm polypropylene or polyester rope. Wire rope of 1.5mm 7x7 strand galvanised or stainless steel can also be used. Synthetic rope may be knotted or spliced whereas wire rope must be swaged to join. A line length of one third the length of the available tow strip is recommended for static tow systems. The smaller diameter the rope, the less the wind resistance, less drag and less weight.

5.5.2 Rope Rings

Depending on the release type used, a suitably sized ring must be attached at each end of the tow rope, for connection to the release and tow gauge. The size is not important for snap shackle releases but is vital for Three-Ring releases, where the tow rope ring must be large enough for the release to function correctly. The smaller the size of ring able to be used, the less the drag when the tow rope is dragged back through the grass to the start position.

ALWAYS USE RINGS AT ALL ROPE ENDS

Rings must always be used when connecting the release to the tow rope, never connect the tow rope directly to the release, or weak link to the release. This is because the smaller diameter of the weak link cord makes it possible to twist to the point where it could bind up the release and prevent separation from the tow rope. String releases are particularly vulnerable to this problem.

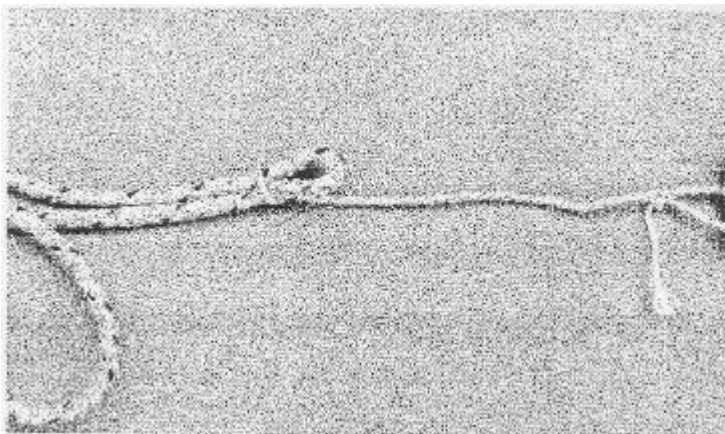


Diagram 5.12 Non-release failure

All tow lines seem to twist, even wire rope. This is what can happen if rings are not used at the release end.

5.5.3 Rope Swivels

If twisted or laid synthetic rope is used, then swivels incorporated in the tow rope length will alleviate problems with excessive stored rope twist after repeated use. Twists in the rope cause wear and make it susceptible to breakages.

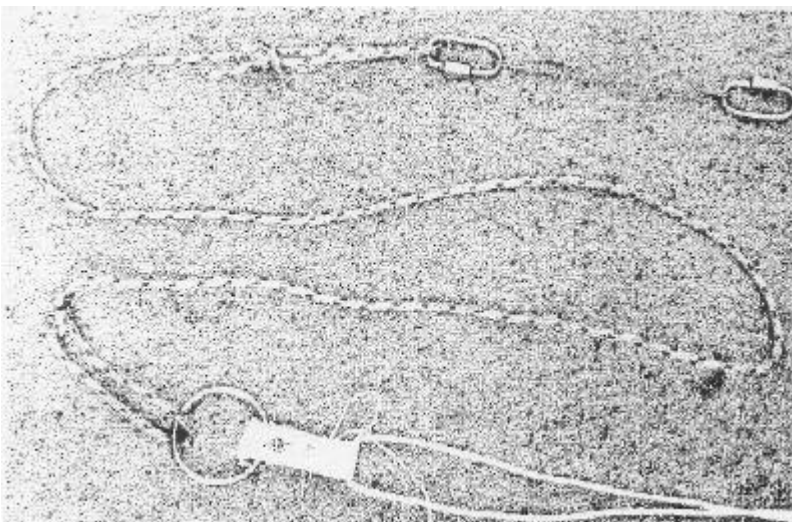


Diagram 5.13 Example rope and leader set-up

Quick links at the weak link simplify changing the link.

5.6 Tension Gauge

5.6.1 Reasons For A Tension Gauge

The use of a reliable and accurate tension gauge is **mandatory** in **all** tow systems. This is so that the driver or observer is able to control the tow force on the glider being towed and provide a constant tension on the line. They must be able to compensate for variations in tow pressure caused by thermic or turbulent conditions, or to tailor the tow to the pilots ability.

The line tension should go up to no more than 20 kgs when tension is being taken up to remove line slack before the tow starts.

- The average line tension during tow is usually between 75 and 90 kgs.
- Only use higher tensions with higher altitude.
- Remember - low altitude, low tension; high altitude, higher tension.
- Maximum line tension should not exceed 1g.

5.6.2 Gauge Types

Tension devices may be electronic, hydraulic or mechanical.

Guages are mounted either in-line with the tow rope (as with static tow lines) or as part of the reel and brake control mechanism.

Static car tow systems use a separate tension gauge (mounted on the drivers dashboard) which does not directly control the tension.. The driver varies the speed of the vehicle to control the tension. Payout and pull-in winches have the tension gauge built into the mechanism and the tension is automatically regulated. This type of system usually also requires a governor to dampen the on-off effect on the line. Platform launch systems may have the tension regulation built into the reel or a manual brake on the reel operated by an observer.

5.7 Launch Platform

Base bar mounts (approximately 1,500mm apart) support the glider when sitting on the trailer. They should not allow the glider to bounce out or fall from the vehicle, but **MUST** allow the glider to release from launch smoothly and fully when desired. A smooth tow strip will help avoid this problem.

Glider angle of attack should be slightly positive (approximately 5 degrees above horizontal) and held by rope and ring to a nose-platform release. The nose rope must attach to the keel and not interfere with glider front wire catch or attachments. The nose release is activated by the pilot and should be 100% reliable. The release must be close to the pilot's hand whilst in prone ready for lift-off. For initial training this should be releasable by instructor as well. (The nose rope will need to be of min 300kg rating).

An AIR SPEED INDICATOR should be mounted so that it is easily seen by **BOTH** driver and pilot and marked to indicate predetermined launch speed (30-35mph).

If a drogue chute is used on winch line it must not be capable of tangling around glider, bridle or release mechanisms.

The pilot must be experienced in prone flight in the glider to be used.

VB ropes must be tied clear of platform and supports.

5.8 Power Source

Static tow systems use a car. The tow line is connected to the car tow bar or chassis.

Static winches use a vehicle engine mounted on a trailer. The tow line is mounted on a reel which is controlled by the motor.

Platform launch systems use a car with the launch platform located on the car top, ute tray or trailer. The towline reel must have the ability to "free wheel".

Section 6

Communications

6.1 Visual Methods

Because the key to towing is team-work and good communication, it is virtually a waste of time to attempt to tow without using radios. When winch and static line towing, the tow vehicle may well be out of sight of the pilot behind a rise in the ground or simply too far away to be seen clearly and therefore relying on visual signals may be impossible. However it is advisable for tow crew to know the visual commands, some of which can be used when training or when a pilot without a radio is being towed.

A large bright coloured bat or flag is required to enable the signal to be seen as far away as the length of the tow line, a fluorescent colour is recommended. The signaller may need to stand on a fence post or vehicle to maintain line of sight with the tow vehicle. It may also be necessary to have an assistant part way down the strip relaying the signal.

Signals from the observer at the pilot end:

Take up tension	Swing the flag from 3 o'clock through 6 to 9 o'clock and back repeatedly, big arc with straight arm in front of knees
All out, all out, all out	Swing the flag from 3 o'clock through 12 to 9 o'clock and back repeatedly, big arc with straight arm over head
Stop, stop, stop	Hold the flag at 12 o'clock and stationary, straight arm over head

Signals from the pilot on tow:

Faster, faster, faster	Running motions with legs
Slower, slower, slower	Move straight legs apart and together laterally repeatedly

(A signal for stop is not required as this is usually obvious from the glider attitude and pilot exclamations!)

Signals from aero-tug pilot to pilot on tow:

You are too high, fly down	Arm extended to side to be seen round engine and hand pointing down
You are too low, fly up	Hand pointing up

Signal from pilot on tow to aero-tug pilot prior to launch:

All out, all out, all out	Straight leg swung out laterally and back a couple of times
--	---

6.2 Radio Equipment

At the moment the best by a country mile is the 2 metre FM [These require an Amateur Radio or Ham license to operate.]

A headset and finger mounted Push To Talk (PTT) switch is the ideal setup for both pilot and driver.

Other options for transmission switches are:

1. Bungee cord on harness shoulder strap-mounted radio. Grab the tail of the bungee cord and slide the knot onto the transmit button during tow, slide it off after release. [Forgetting to can piss off a lot of fellow pilots in a very short time].
2. Vox. (Voice activated transmission). This is definitely not recommended as the pilot never knows with certainty whether they are transmitting or not. Experience has proven this to be an unworkable option.
3. Constant transmit switch. Next best alternative to finger PTT switch.

Be sure to unclip your microphone (mike) after the tow, and be wary of mikes being clipped on accidentally during set up/pre-flighting/ground handling.

An option would be for every tow operation to be assisted by a safety person with a base/car radio poised, so should you become speechless in the event of an accident about to happen or someone on constant transmit the safety person can transmit over the top. Thus it is important that the safety person use a radio of higher power than that of the pilot's portable unit.

6.3 Radio Operation

Be extra careful not to transmit over the top of a tow in progress, and do not chat unnecessarily on the radio when towing is in progress. Arranging an alternate chat channel would help avoid congestion on the airwaves.

It is also imperative that you identify your driver by name or call sign prior to each command when towing in the vicinity of other tow groups. If you are about to start a tow and a nearby team is also about to go or on tow ensure that different frequencies are used to avoid confusion by your driver responding to their pilots commands or vice versa.

If you cannot raise anyone on the radio there is a good chance you are on "constant".

A BLOCKED FREQUENCY SOMETIMES MEANS TOWING OPERATIONS MUST CEASE.

It is a good idea to prearrange an alternate frequency everyone can use if the primary frequency is blocked.

In any instance of confusion or the driver not understanding a command then the driver **MUST NOT PROCEED** with tow.

- Speak clearly.
- The word "NO" should NEVER be used
- Negative for No.
- Affirmative for Yes.
- The call "No, No, No" could be interpreted as "GO, GO, GO".
- Always use positive commands, eg say 'take up tension' not 'take up slack'. Then if only some of the words are heard clearly it is obvious what is wanted, in this case tension.

NOTE: The driver should get into the habit of only reacting to commands that are heard at least twice, this makes sure they have been heard correctly. For the driver to hear the command twice the pilot should repeat it 3 times because so often the first command is said at the same time as the transmit button is pushed and therefore is lost.

6.4 Spoken Commands

The calls are defined as: (See Appendix for Quick Reference Cards)

6.4.1 Initiating Tow

6.4.1.1 MINIMAL COMMAND CALLS.

1	Driver	Tow Car [or winch] ready	When line is laid out and ready for next tow
2	Pilot.....	Standby	If pilot is not ready
3	Pilot.....	Pilot ready, Take up tension	
4	Driver	Taking up tension	Acknowledgment that the command was heard
5	Driver	Tension On	This is said after applying 20kg of tension
6	Pilot	All Out, All Out, All Out.	To start tow

6.4.1.2 INCLUDING OPTIONAL COMMAND CALLS.

1	Driver.....	Tow Car [or winch] ready	
2	Pilot	Pilot ready	If the pilot is not ready still acknowledge the call by saying 'Stand by'
3	Pilot	Take up tension	
4	Driver	<i>Are You Hooked In?</i>	
5	Pilot	<i>Affirmative Hooked In</i>	
6	Driver	Taking up tension	
7	Driver	Tension On	This is said after applying 20kg of tension
8	Pilot	<i>All Clear Above And Behind?</i>	<i>If observer/signaller or other pilots are close by to check Sailplane pilots use this command and expect other glider pilots to also do so.</i>
9	Driver	<i>Hang Glider Launching, Matamata, Runway 21</i>	<i>[Mandatory] if operating on an airfield with other GA users, transmit on airband local circuit frequency.</i>
10	Pilot	<i>Clipping On (mic)</i>	<i>The pilot will now clip on transmission switch on microphone</i>
11	Pilot	<i>Wind Strength ??</i>	<i>Indicates the actual wind so the driver knows how hard to begin tow at take-off, also warns driver to be ready</i>
12	Pilot	All Out, All Out, All Out.	To start tow

6.4.2 During Tow [If Needed]

Pilot "Faster Faster Faster"

Or

Pilot "Slower Slower Slower"

6.4.3 At Release

Pilot "Releasing Releasing Releasing"

The car can slow down to take weight off the line.

6.4.4 After Release

Pilot "Thank You Driver, release height 150ft, release time please"

Driver "Release time 2:14" This is to remind pilot to unclip microphone after release. i.e. if this is not heard chances are the pilot is still transmitting.

The driver then writes down the pilots name and release time for later use.

6.4.5 In Emergency

Pilot "**STOP STOP STOP**"

Section 7**Tow Procedures**

7.1 Airstrip Etiquette**7.1.1 Reasons For Etiquette.**

Hang glider pilots are undisciplined in airspace behaviour in comparison to GA traffic due to the nature of our form of aviation. Since tow operations require a greater degree of organisation within our own activities, and co-operation where we contact other air traffic (especially when operating from an aerodrome), it is necessary to lay down some guidelines to introduce some degree of predictability to our movements both on the ground and in the airspace in the immediate vicinity of a tow group.

7.1.2 Ground Operations.

Certain areas on the tow strip are designated as:

Car park area - along the edge of the tow strip furthest away from the circuit pattern. Keeps cars away from harm in case of a miscalculated approach.

Rigup area - away from the circuit pattern again. Keeps ground obstacles together to aid landing.

Take off area - pilots with gliders line up here when they are ready for launch. Makes it easy for the Launch Marshall to see who is next to go.

Landing area - off to one side of the tow strip itself to enable launching to continue even if gliders are landing. Should be adjacent to and behind the Take off area and not require crossing of the tow line.

Some aerodromes require a line of cones down the strip to designate one side for tow operations and the other for powered aircraft. Check with the airfield CFI or Duty pilot.

7.1.3 Ground Movements.

For all ground movements of people, cars and gliders the following rules should be observed.

- Don't cross the tow line. Towing may commence at any time.
- Drive around the boundary of the tow strip. You may not always be able to see when an aircraft is landing or taking off. Also reduces damage to the tow strip surface.
- Drive slowly anywhere on the strip.
- If you have landed up the strip from the Take off, carry the glider back to Take off away from the tow line so that it is free for the next pilot to launch.

7.1.4 Landing Circuits.

Hang glider circuit landing patterns will be inside the GA circuit (due to our slower speed) but we should still obey the circuit procedure designated by the airfield CFI or Duty Pilot (if there is one). Otherwise the Launch Marshall will specify the circuit direction for the day.

This is so that any other aircraft approaching the airstrip will know what to expect from aircraft already within the circuit airspace. IE which direction they are likely to be turning and what they may be about to do.

- Don't cross the airstrip below a set minimum height (eg. 1,500ft). Leaves the airspace free for other towed craft.
- Don't thermal over the tow path and circuit pattern.
- Be familiar with the relevant VTC when flying from aerodromes.

7.2 Launching

The towing procedures for the static tow line and pay out/pull-in winch systems are identical for foot launch operations. The use of vehicle/platform launch systems requires special considerations. Please refer to 7.7.

Prior to being attached to the tow it is essential that you are ready to launch; i.e. all equipment is serviceable - radio check, release check, [physically do a test release] glider pre-flight check and harness/hang check. It is preferable not to have instruments on the base bar as they can interfere with the bridle lines.

NOTE: When car towing do not attach the pilot to the tow line as the car is returning to the car-end of the line in case the car fouls the line on the way.

When attaching to the tow line, test the release, check ropes for knots and tangles and make sure the harness is clipped into the glider. [It is preferable to leave your harness clipped into the glider all the time]

Any problems on the launch area causes delays for all. If you cannot solve any problem immediately, move off the launch area and give the next pilot an opportunity to launch. [There should always be at least one and preferably more pilots ready in line all the time.]

All launches are to be treated in exactly the same manner as if you were launching from a hill. Go only if you are satisfied ALL is right - equipment, glider and conditions. Fortunately towing gives a greater tolerance to cross wind and tail wind launches. Remember that you are, the pilot in command, and it is your decision only, to go or not! If you are not satisfied with any aspect, e.g. if the conditions are not favourable to you, let somebody else have a go if they think they can handle it and are ready to launch.

Remember, you are being towed, so take-off run need not be so aggressive. The tow will pull you and the glider, so you are primarily concerned with maintaining wings level.

During launch you should offer a slight amount of resistance to the tow at the beginning, ie hold back briefly as the tension increases. Launch into the wind, but wait for good wind direction, strength and smoothness before initiating the launch. (ie down tow strip).

Once off the ground remain in hang, cross your ankles and maintain a stable body position allowing the bridle to set the rate of climb.

7.3 Under Tow

Under tow, you must have your hands on the uprights allowing the glider to trim. The correctly set up tow bridle will make the glider adopt the correct attitude all you need to do is maintain the heading.

Only if you have much experience in prone should you, after establishing a stable climb, move one hand at a time to the base bar and without pitch, roll or yaw input bring your legs up into the harness and adopt full prone position. Do not attempt to close the harness.

However there are several reasons why it is advisable to keep your hands on the uprights and remain in hang position.

(a) If you have a weak link or line break near the ground then your body and hand positions are ready for immediate response and flare.

(b) If you get gusted or turned away from the tow line you must steer back on line, however the centre of mass bridle system does provide some tracking assistance so apply the roll correction steadily.

This will require a little more effort than normal due to the higher angle of attack related to the towing forces. It is important not to over control or to pull in dramatically whilst attempting to get back on line. This will either initiate yaw oscillations in the case of over control, or will create fine slack as the glider stops climbing and flies forward. The resulting loss of line tension often causes the driver to respond by accelerating to increase tow tension.

(c) The more upright position keeps your head out of the way of the rope at the top of the tow.

Concentrate on directional control and airspeed at low altitude. Once sufficient height has been gained, if there is a cross wind some directional input may be required in order to be able to drop the tow line onto the strip after releasing. The pilot should 'crab' upwind to allow for wind drift of the line.

Basically the tow should require "finger tip" flying. Keep most responses minimal. Assist with control but keep input to a minimum unless absolutely necessary. Many control problems are pilot induced, so relax and keep the glider going basically straight.

If the glider is yawing significantly, it is usually because the pilot is over correcting or holding in too much. Ask driver to "slow down".

To dampen out oscillations (return to an upright position if in prone) remain central in the frame, keep input to a minimum and allow the glider to fly at trimdo not hold in on the bar.

Wait for the oscillations to stop. If they continue a slight amount of push out may be needed. Once stable ask driver to resume normal tow.

If the situation continues or worsens stop the tow by releasing.

Remember, it is your tow. If at anytime you are not satisfied with the way the tow is going, stop the tow and release.

7.4 Releasing

Once the pilot has sufficient altitude or the vehicle has reached the end of the tow strip, the pilot must tell the driver "Releasing Releasing Releasing".

The pilot should only activate the release when the tow rope starts to go slack. This is done to eliminate the problem of "pitch up" associated with release under load. The best procedure is to reduce angle of attack slightly to provide some line slack.

After release inform the driver of your release, say "Thank you" and unclip the mike.

7.5 Foot Launch Towing Procedures - Pilot's Aspect

The pilot has checked the glider and performed a harness hang check. Connect the tow release and tow rope to the harness or bridle attachment without exiting harness or unclipping from glider.

After pre-flight release check, the pilot will contact driver identifying both driver and pilot clearly and may inform the driver of the conditions at the take off area. Once clear communication with driver is established and the pilot is ready they inform the driver to "Take up tension". This is done to take up the slack and elasticity out of the poly rope. This tension is usually about 15-20 kgs depending on pilot weight. If there is too much tension inform the driver or maybe take a step forward.

The driver will then radio that they have taken up tension. If pilot does not have tension then there must be snag and the procedure must be aborted. The pilot will respond that they also have tension and is clipping on mike. The Launch Marshall should check that the pilot is on constant transmit. [optional]

When ready the pilot will pick up the glider, telling the driver of this action. This prepares the driver for launch and indicates that the vehicle/winch should be in gear or ready to go. If conditions change and you put the glider down, tell the driver.

When satisfied with conditions the pilot will start the tow with the command "All out, All out, All out," the driver will respond immediately.

[If nothing happens within 10 seconds call "STOP, STOP, STOP" and release from the line. There is most likely a communication system failure, but other problems may have occurred so it is mandatory to get off the line].

At the start of the tow the pilot shuffles forward to keep the rope tensioned and allows the line to tow them off the ground. The pilot must not run towards the line as this will decrease the line tension.

YOU MUST LET THE LINE TOW YOU OFF THE GROUND.

After take off, and for the first 100 ft fly slightly faster (best L/D). This extra speed allows the pilot to recover if there is a weak link or line break close to the ground. Don't pull in too much as this may lower line tension.

Once the pilot has sufficient altitude or the car has reached the end of the tow strip, the pilot must tell the driver to, "stop, stop, stop". When the tow rope starts to go slack the pilot should release their end of the tow rope. This method of release is to eliminate the problem of pitch up associated with releasing under load.

After release, inform the driver you are clear of tow line and say "thank you".

BE SURE TO STOP CONSTANT TRANSMIT

7.6 Static Car Tow System - Driver's Aspect

CAUTION: SOME VEHICLES CREATE EXTREME GRASS FIRE RISK IN DRY SUMMER CONDITIONS.

(Low vehicles such as Subarus and cars with catalytic converters are notorious for this problem)

With the static car line system, the pilot may be 500+ metres away, and must rely more on the radio.

It is at this crucial time, that the observer in the car keeps an eye on the glider. If the pilot lowers the glider or take off looks at all suspect, they must tell the driver to "stop, stop, stop".

With the pay out winch the hang glider and car may be only 75 metres apart. So the driver and observer can see more of the launch.

With both systems, the tensions to be used during the tow are 15-20 kgs take-up tension.

On the command "ALL OUT, ALL OUT, ALL OUT" the driver should accelerate smoothly to 70-80 kgs.

At all times, the driver must be aware of the tension climbing too fast.

The words 'smooth and steady' are the only words to describe the driver's actions although there should be no hesitation in stomping on the brakes should line tension rapidly increase.

There must be a pre-set emergency tension limit, and it should be a 1 G limit, (weight of pilot and all equipment). Also dependent, is the wing loading of the glider - a weak link set to break at 100 kgs is a good safety standard. If the load exceeds this 1 G limit, the driver must reduce the tension immediately.

This is done by braking hard and fast.

Once the tension has stabilised, the tension must be increased to the optimum of 70-80 kgs.

In gusty air, it may feel strange driving on and off brakes, but the object is to give the pilot and glider a smooth safe tow.

7.7 Static Winch Systems - Driver's Aspect

7.7.1 Reflex Winch

The main advantage of the reflex winch system, is that it allows the winch driver and instructor to supervise towing pilots from directly behind. This allows the driver an uninterrupted view of the pre-flight, tension on, and launch phases. as well as being able to view the glider going up the line in front of them.

It also allows that the commands for launching may be done without the use of a radio thus reducing the potential for radio failure at the critical stage of launch.

This method allows the driver the opportunity to see anything going wrong, and to be able to do something about it, instantly.

E.g. If a lockout starts to occur, the driver can decrease the tension before pilot commands.

7.7.2 Pull-In Winch

The driver faces the pilot, but depending on the length of the strip usually cannot see the take-off clearly (some winches are set 1000 meters away from take-off).

7.7.3 All Winches

The launch and under-tow procedures are the same as for static car tows. The difference in the systems comes after release of the glider from tow when the tow line must be wound in back onto the reel. This is done by revving the winch motor to rapidly reel in the line preferably before it has time to drop onto the ground.

For winch systems which use a steel cable, a parachute or drogue chute must be used when winding in the wire to reduce the risk of tangles. When a kink occurs in a cable there is a good chance that the cable will break under towing loads - beware of this occurring!

7.8 Platform Launch

The pilot is hooked in and lying in prone with the glider mounted on the launch platform (back of a truck or trailer). Both releases (nose and towline release) must be tested and proved to be working properly. When all is ready the pilot commands, All out, all out, all out.

The truck accelerates smoothly and at about 25 mph the pilot pulls the nose release. Just prior to launch the pilot should adopt a bar-body position of best L/D. The glider and pilot should FLY from vehicle not rocket out like a jump jet. Actual release should occur at around 30 mph. The truck continues to accelerate up to 35 mph whilst the glider climbs out.

In flight procedures are the same as for static line towing.

It is preferable to have an observer to control the winch brake if no automatic tension regulation is used. Both observer and pilot should carry hook knives. Tension is critical for the first 150'.

Section 8**Emergency Procedures**

8.1 Weak Link Break**8.1.1 Low Level - Weak Link Break**

As the hang glider has a high angle of attack and/or airspeed whilst on tow, when a weak link break occurs the glider will pitch up into a stall. Considering that the glider transforms greater tow tension into greater lift force it is only to be expected that with increased tension the glider will pitch up more steeply at the instant of line or weak link break.

This pitch up effect should be reduced by holding the bar in until the glider stops climbing (a slightly weightless sensation) and it is at this precise moment that you should allow the wing to find trim position by feeding the bar out. It may go to full arm extension before returning a backward pressure as the nose begins to drop. Do not rapidly pull in on the bar as this will cause a severe nose drop/dive and altitude loss as well as reduce glider control until the airspeed for that angle of attack has been achieved. As airspeed increases return the bar to a more appropriate position in a smooth and steady action. Use the "feel" of the glider forces and airspeed determine the rate of return to trim. Be ready to enter immediate aggressive flare if near ground.

Land straight into the wind or on current heading if insufficient height remains to complete turn into wind. If heading down wind in greater than 2-3 knts initiate turn and then flare.

Remember to flare aggressively if necessary and to:

AVIATE, NAVIGATE, COMMUNICATE

Inform driver of break after control is regained or landing achieved. Observer should have already observed problem and notified driver.

8.1.2 High Level - Weak Link Break

This failure is not as critical as the low level break, although it is just as important to maintain control at all times. If this situation occurs, immediately stop the resultant pitch up and then inform driver that you are off safely.

8.1.3 Weak Link Break Scenarios

- 1 Weak link break at low altitude due to gusty thermic conditions. There is a danger of stall after release, glider nose dives into ground.
- 2 Weak link break during early stage of lockout could make matters worse. After notifying driver of problem, and a subsequent reduction in line tension by driver, the pilot may get glider back on course.
- 3 Weak link break at altitude due to pilot applying too much push out trying to max out on altitude.
- 4 Weak link break due to incorrectly tied weak link or one prematurely worn by dragging of rope along ground. (Recommended new link every launch).

8.2 Line Breaks

8.2.1 Low Level - Line Break

Similar to a low level weak link break. Always maintain control of your glider, release the trailing rope if possible before landing.

8.2.2 High Level - Line Break

Recover from pitch up and maintain control of your glider first. Then RELEASE, and inform the driver when you have released safely that there was a line break and the remaining rope has been dropped.

8.3 Release Failure

Call "STOP, STOP, STOP" then "Release failure" over the radio so the driver can select neutral and cut tow line. Try pulling the release up to you by the release line and releasing or untying by hand.

If this is too difficult use your hook knife to cut the bridle free of tow line.

If all else fails, fly in descending circles and land virtually in the circle of tow line. In windy conditions a "S" turn (figure eight) descent pattern should be used to avoid dragging the rope on the down wind leg of 360 degree turns.

Remember, do not trail rope over any obstacle big or small.

8.4 Loss Of Power

Loss of tension while under tow could be the result of a weak link break, a wire break or winch/tow system failure.

If you experience loss of tension and the drogue chute is not attached to your bridle you probably have broken the weak link.

If the drogue is still attached and the tension is lost - release immediately.

8.5 Lockouts

8.5.1 Lockout Causes

Lockouts are the most potentially dangerous situation that can occur to a glider on tow. A lockout can be caused a number of ways:

1. Too high angle of attack at launch causing the wing to stall and drop a tip. Too much tension thereby increasing the angle of attack. If this occurs at launch the increased stall potential and subsequent wing drop and lockout may result in a highly dangerous low altitude weak link or line break.
2. Tow line hooking under corner of Control bar (or catching on object eg. instruments mounted on base bar)
3. Failure to compensate for cross wind at launch
4. Not staying in line with tow vehicle or winch
5. Thermic conditions and willy (dust devil) activity

Any one of these examples can increase the lifting force on one side (relative to the other wing) causing the glider to bank as air speed increases. Once the glider's course approaches 90 degrees to the direction of tow, the increase in load and hence airspeed is dramatic and the forces of lift and line tension quickly outstrip the effectiveness of any pilot weight shift.

8.5.2 The Lockout Scenario

The worst scenario concerning a lockout would be the pilot diving into ground from as low as 50 ft.

The main contributing force in the lockout scenario is line tension so relieving line pressure quickly but not instantly is ideal. Cutting the line or releasing whilst under high load and close to the ground will cause a sudden increase in angle of attack with the glider banking. This will most likely initiate a "wing over" type turn straight into the ground.

With quick, but not total immediate, line tension reduction the pilot will have more chance of regaining control without worsening the situation.

Pay out systems achieve this most effectively by the reel paying out rope at the required rate until the load is gone.

Static vehicle systems can only rely on immediate stop then line cut or release. The value of an observer for reducing the time of reaction in this scenario is most evident.

Once the glider has more than 45 degrees of bank, the lockout will inevitably worsen. If the tension is not relieved, the glider (due to the towing force and direction of tow) will proceed to rotate further, and fly away from the tow vehicle.

By this time the line tension would be sufficient for the weak link to fail, thereby reducing the line tension. With sufficient altitude the glider can recover, although the resulting attitude could be way beyond the experience or coping ability of the pilot.

8.5.3 Recommended Actions

Pilot Actions:

Upon realising that a lockout is developing the pilot should call "Stop stop stop" to the driver and stay on the high side of the control frame while pulling in and continuing to attempt course correction. If some line slack can be achieved the pilot should release. Remember to use the low side hand to activate release or wait until the glider is on a better heading with lower line tension.

To reduce chances of lockout developing the pilot should:

1. Keep wings level and correct Angle of attack for launch. If in doubt, abort
2. Only tow in light cross winds (30 degrees x 3-4 knts)
3. Be aware of wind gradient
4. Be in constant radio contact with driver
5. Keep on direct line behind tow. (Get back on line with persistent correction).
6. Be aware of altitude and climb rate.

Drivers and Observers Actions:

Apart from constant listening to pilot communications and maintaining visual contact at all times during tow, the observer and driver should:

1. Be constantly aware of line tension and any fluctuations
2. Be aware of glider at time of tension on
3. Be aware of glider at time of launch, Observer can relay to driver that pilot is 'airborne'
4. Be aware of position of glider in relation to line and direction of tow
5. Reduce tension immediately if it exceeds the safety limit by stopping vehicle
6. Release the tow line from the vehicle if the tension does not reduce.
7. Points 5 and 6 should occur automatically since a weak link is designed into the system.

Observers and other pilots in launch area should give verbal acknowledgment to the pilot of cross wind speed and direction at time of tension on and just prior to launch.

The moral is - call "**STOP, STOP, STOP**" before a real lockout develops.

IF YOU GET OFF TRACK - GET OFF THE TOW

REMEMBER: AVIATE, NAVIGATE, COMMUNICATE

8.6 Communication Failure

A communication (radio) failure, be it loss of pilot radio, loss of driver radio, or "walk over" by more powerful transmitter is potentially disastrous especially if some other problem develops or equipment failure occurs.

In general the tow should be immediately aborted by either pilot or driver upon recognition of the problem.

However, if radios fail immediately following the "ALL OUT, ALL OUT, ALL OUT" call then to stop immediately or release of line tension would be ill advised, it would be best to gradually reduce tow tension and bring tow to a stop steadily so that pilot has a chance to adjust angle of attack and find normal flying speed enabling a line release before landing straight ahead.

Secondly, for experienced tow pilots, if the tow is fairly progressed a visual observer in tow vehicle can direct driver to either stop or continue depending on the appearance of the tow and according to tension readings. A far more conservative approach to the remainder of the tow can be attempted with the driver observer ready to stop and release rope at any moment the pilot wanders of line or if tension increases.

8.7 Landing

Fences, bridles, tow lines and gliders do not mix

Do not land near fences or obstacles that may endanger yourself or others.

Always pull bridle in before landing.

IMPORTANT - POWER LINES ARE A CONSTANT DANGER

NEVER TOW ADJACENT (PARALLEL) TO POWER LINES AND KNOW THE LOCATION OF ALL POWER LINES AROUND YOUR TOW STRIP

Section 9**Weather Conditions**

9.1 Wind Conditions

Light winds: 0-10 knts (0-20) km/hr) recommended student wind range.

Strong winds: 10-20 Knts (20-40 km/hr) experienced pilots only.

9.2 Strong Wind Launch

Similar to normal launch procedure until pilot request for line tension.

Once line tension 15-20 kgs is supplied by vehicle, the pilot then is ready to launch. A slightly neutral angle of attack may be required to stop the glider from wanting to fly up against the line tension.

When the glider is stable to the pilot's satisfaction, the pilot then informs the vehicle to 'ALL OUT, ALL OUT, ALL OUT'.

The vehicle then moves off slowly increasing the tension smoothly. This is due to the headwind component.

In these conditions cross winds are to be treated with extreme caution.

9.3 Cross Wind Launch

Strong and crossed wind launches should only be attempted by experienced tow pilots.

Very light to light cross winds are ok for all pilots.

In these conditions it is important to remember that obstacles such as powerlines or fences etc may exist on the down wind side of tow strip. The pilot should crab upwind during tow and then turn and fly directly into wind before releasing line in order to drop it onto the tow strip and free of obstacles.

In cross wind the driver will possibly have less trouble adjusting for wind gradient but may have to drive slightly faster than the wind strength would normally indicate.

Section 10

Training Procedures

10.1 Introduction

This section is a guide as to what to expect for yourself and from the instructor whilst learning to tow. You should be aiming at a total understanding of all facets of towing from driving, flying, system set-up and maintenance including bridles, weak-links, releases and emergency procedures.

Although your instructor may use special equipment for the purposes of training, by the end of your tow course you should be towing with standard bridle, pressures etc and be capable of making all necessary decisions.

Study this manual thoroughly and do not hesitate to ask your instructor about any aspects that concern or confuse you.

Although there exist some instructors living in flatland areas that have formulated training procedures based entirely on towing, this is not the norm in NZ. By far the majority of students learn to foot launch on slopes/hills and then move to tow launch at a later date.

If you have learnt or are learning to fly through a tow launch programme then you will conceivably require some further instruction when you first attempt to launch from a hill, ridge or mountain. Likewise, pilots who have learnt or are learning via a foot launch programme will definitely require formal instruction when first attempting to tow launch.

Qualified and competent instruction is recommended at the transition in both instances.

10.2 Training Programme Guidelines

- Basic flying skills are a pre-requisite for any tow instruction with the exception of tandem training operations under a fully certified and tandem rated instructor.
- Theoretical instruction for the specific method of tow with passes in corresponding theory examination before towing commences. Theory to cover the different forms of tow launch, their specific differences and strengths and weaknesses.
- All towing training operations are to be carried out at a site suitable for that form of towing. There will be adequate spacing from obstacles fixed or mobile .. eg cars, fences, wind socks, trees, landing lights, other aircraft etc. Eg 100m width [This spacing will ensure that if a student goes off line they can drag the line without any risk of snagging the tow rope on any obstacle.]
- ONLY equipment approved for that particular application to be used. (Do not mix equipment.. ie. Aero-tow bridle.. aero-tow only. Platform bridle platform tow only.)
- Only use gliders and harnesses with which you are familiar and have previously flown and are suitable for tow flight.
[Eg. If only flown in apron harness, then tow in apron harness, (do not introduce pod at this stage) do tows in hang position with hands on uprights for car and winch tow.]
- For Platform launch, pilot must be familiar with prone flying and have sufficient air time with the glider/harness combination to be confident with a good feel and understanding of the gliders speed range and roll and attitude change rates and pressures.
- Bridles (see tow equipment) must be correct for the method of tow.

NOTE: Instructors may use special bridles for instructional purposes..ie; self releasing in unusual attitudes.

- First tows should be conducted in mild conditions with lower than normal tow pressures used (at least 10kg -20kgs lower with smooth head wind). Throughout the training programme, tow pressures should be gradually increased to normal.
- Experienced pilots (Intermediate or Advanced rated) with no prior tow experience should expect to go through the same training programme although it is conceivable that the time taken to advance would be less with a greater range of conditions also being available once initial flights have been successful ... higher aspect/flat/high performance gliders can cause even very experienced pilots considerable yaw problems during initial tows.
- Observers are **STRONGLY** recommended in all towing operations and are mandatory for all pilots under instruction. Observers also must be briefed as to what is expected of them and what is their function.
- Communication is critical in towing and high quality radios with fully charged power packs are mandatory for learning/teaching situations.
- Initially **BOTH** student and driver listen to the commands given by the tow instructor. As skills develop the student and driver communicate direct and instructor listens.
- Driver instruction is also a critical part of the tow procedures. The training programme must include progression through competent vehicle or winch driving/operation with all appropriate safety checks and equipment testing.

10.3 Example Programme For Beginners

10.3.1 Conditions

Light winds: 0-8 knts (0-16 kmph) recommended student wind range.

When teaching to tow the wind should be light to moderate without thermal influence. Tolerance for variation in conditions will depend on the pilot skill level. Beginners on training type gliders often have less trouble than experienced pilots on high performance wings, however this should not be used as an excuse for stretching the conditions in which beginners must learn. It is very important that the instructor must use all their skill in providing the safest tow environment possible for all pilots learning to tow.

The driver must also be aware of the conditions at all times. The driver must understand what affects variations in wind strength, wind gradient and thermal strength will have on the pilot and tow situation and be able to make allowance for these variations or conditions. A driver should never apply more than 80% of tow tension for first 100 feet. This provides a safety margin and reduces the risk of a weak link breaking near the ground.

10.3.2 Towing Sites

For most ground based tow operations the areas within 100m either side of the tow line should ideally be clear of all obstacles.

If tow operations are at aerodromes where general or other aviation activities take place then a Launch Marshall will need to be appointed to co-ordinate your activities with GA and additional theory and briefing will be required on the airport and circuit pattern procedures each day. See Section 7.8 Airstrip Etiquette

10.3.3 Programme Synopsis

A thorough briefing of the towing system, theory and procedures, to be explained before any towing is carried out. Demonstrate practical towing techniques to students.

HAND TOW students up by instructors and helpers. This method allows students to experience the forces and loads that towing places on their harnesses and themselves. This will require some steady breeze.

Student is to be towed to an altitude of only 75 feet, with a line tension of only 50 kgs. The student does not release on the first tow but flies straight down to land in line with the tow rope.

Student to be under radio supervision.

Student is then towed to an altitude of 150 feet. Must wait for line slack and then release from tow to fly straight down the tow strip into wind. Student is still on radio.

Student is then towed to an altitude of 500 feet. After line slack they release from tow line and then do a 180 degree turn and fly back to launch area under radio control if necessary.

The student will then execute another 180 degree turn not below 150 feet AGL and land into wind in the tow landing area.

The student is then given a straight high tow to 600-700 feet AGL. Release when line slack to complete a 180 degree turn, fly back to launch point and complete circuit-type landing.

All student tows to be done at low tensions in light wind conditions.

Only after five high tows is the tow tension to be increased to 80 kgs after an altitude of 150 feet has been reached.

During these high tows line break and weak link simulations must be practised.

10.4 Exemptions For Experienced Pilots

(Intermediate to Advanced rated pilots)

1. Pilots to be briefed on the system and procedures.
2. Pilots to have at least one tow demonstrated for them.
3. Pilot to be towed at low tension i.e. 50 kgs on first tow to 600 feet. To release on line slack and to fly back to launch point.
4. Pilot to be towed to 600 feet at 75 kgs tension and release under tow tension to experience weak link break simulation. Must control pitch over oscillations.
5. Pilot to be towed to 1000 feet at tensions up to 95 kgs and weak link/line break simulation at altitude of 150 feet by releasing under load. Must be able to control "pitch up" and recovery.
6. Pilots to complete required number of high tows to gain tow rating after passing theory examination.

Appendix

Quick Reference Card For Pilots

Pilot Checklist

- * Bridle attached correctly
- * Weak link renewed

- * Hooked in
- * Release tested and attached

PILOT commands

- 1 Pilot ready**
- 2 Take up tension**
- 3 Affirmative hooked in**

- 4 All clear above and behind?**

- 5 Picking up glider, wind is...**
- 6 All out, All out, All out.**

DRIVER replies

- Tow Car /winch ready
 Are you hooked in?
 Taking up tension
 Tension on
 [Observer] - All clear
 Hang glider launching, Runway.....

Appendix

Quick Reference Card For Drivers

Driver Checklist

- * Tow line attached
- * Four wheel drive engaged

- * Gauge zeroed
- * Tow lane clear

DRIVER replies

- 1 Tow Car /Winch ready**
- 2 Are you hooked in?**
- 3 Taking up tension**
- 4 Tension on**
[Observer] - All clear
Hang glider launching, Runway.....

PILOT commands

- Pilot ready
 Take up tension
 Affirmative hooked in

 All clear above and behind?

 Picking up glider, wind is...
 All out, All out, All out.