

Blue Sky Scooter Towing Method Equipment & Practices

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Introduction

What follows is an outline of the equipment and practices used in the Blue Sky Method of Scooter Towing. A companion video illustrates this material. The manual and video are based on methods developed and used by Steve Wendt of Blue Sky Hang Gliding in Penn Laird, Virginia, USA. Steve's methods have gained wide recognition among instructors in the United States as representing the current, best practices in scooter towing. (For brevity, we will refer to these specific methods using the generic term "Scooter Towing" – by which we will mean the Blue Sky Method of Scooter Towing. Many different methods and practices have been used for many years under the general term of "scooter towing," and not all of these have proven to be safe or effective.)

This manual does not teach instruction; the material herein is intended for use by trained and qualified hang gliding instructors, and assumes in the user a thorough knowledge of the principles and practices of teaching hang gliding. Instructors wishing to use scooter towing as a training tool must also have significant experience as pilots in at least one method of ground based towing, and have a thorough understanding of the general principles of towing. A suggested reference book on towing is Towing Aloft by Dennis Pagen and Bill Bryden - available from www.Amazon.com or direct from the author at <http://users.lazerlink.net/~pagenbks>.

Finally, since much of the equipment typically used for scooter towing is not available "off the shelf" in the form or configuration in which it will be used, some practical knowledge of the basics of mechanical engineering and some mechanical and fabrication skills are required of, or need to be available to, anyone who wants to set up a scooter tow operation. Continuing efforts are underway to establish and provide convenient sources and additional technical support for the equipment required – and these will be listed as they are developed at www.willswing.com/learn/scooterTow.

The intent of this document is to summarize a recognized set of best practices for scooter towing. The methods described herein have been used to conduct thousands of safe scooter tows, they have been taught and demonstrated to a large number of experienced instructors during scooter tow clinics, and they have been widely recognized as producing a safe and productive training experience for the student. As such, instructors new to scooter towing are emphatically advised to adopt and follow the specific methods and recommendations provided here, and to be very cautious and conservative about any deviations from these prescribed procedures. There is no progress in any endeavor without experimentation and innovation, and scooter towing itself would not exist if instructors had not ventured outside of the previously established practices for hang glider training. Today, however, the specific methods and practices of scooter towing as described here are at a highly advanced stage of development, and it is thus now possible to specify a standardized set of proven practices that incorporate the lessons learned from years of development and experimentation. Any decision to deviate from these methods should be very carefully weighed. In no case, should any experimentation be carried out on actual students. Instructors being trained in scooter tow methodology should, whenever possible, learn the skills involved under the supervision of a highly qualified scooter tow instructor experienced in these specific practices, and should practice and develop their skills using other instructors or experienced pilots as "students" until they have developed a high degree of proficiency.

Background – What Is Scooter Towing – and Why?

Scooter Towing is the use of a motor scooter as a stationary winch to tow a hang glider or paraglider into the air. (Note: This document covers only the use of scooter towing for initial hang gliding training up through the novice level of proficiency.)



The rear wheel of the scooter is modified to become a drum that holds the tow line. The scooter is secured in place in an open field, adjacent to the point from which the pilot will be launching. The tow line runs from the scooter to a turn-around pulley anchored to the ground some distance away, and then back to the glider.

Why Scooter Towing?

Towing, as a launch method, has been around since the beginning of hang gliding. The idea of using a scooter as a powered stationary tow winch has also been around for a number of years. In the last few years, however, a number of developments in equipment and technique have brought scooter towing to a highly refined state of development and made it an exceptionally useful tool for training. The key aspects of the Blue Sky Scooter Towing method that make it such a valuable training tool are:

- The use of a low horsepower scooter to provide a gentle and precisely controllable tow tension
- The use of special, purpose built large area, light-weight training gliders that allow slow flight speeds in no wind or very light wind conditions
- The combination of these two factors in an instructional technique that involves extended, low speed, low altitude tows, providing the student with an ideal learning environment and experience.

Common Training Challenges and How Scooter Towing Can Address Them

If asked to describe the perfect site for introductory hang gliding training, an instructor might respond as follows: A thirty foot (10 meter) tall sand dune with a 3:1 slope ending in a 500 foot (150 meter) wide stretch of smooth, level beach, and facing directly into a perfectly smooth and consistent 10 mph (16 kph) breeze coming off the ocean, on an overcast day with a temperature of 60 degrees Fahrenheit (16 degrees Celsius).

Why is this the perfect site? A student's first flights in a hang glider present a number of problems:

- First, the glider is heavy and awkward to balance, and feels unfamiliar.
- Next, it is somewhat intimidating to try to run headlong down a slope carrying this glider, knowing that if you fail to execute correctly, you will likely have a painful fall.
- Third, everything happens very quickly – more quickly than the student can assimilate and react to effectively.
- Fourth, if there is no wind, the student's running speed has to be extremely fast, but if there is wind, and there are any gusts or variability in the wind direction, it becomes very difficult for the student to separate the effects of the wind on the glider from the effects of his or her own actions.

How does our perfect site address these problems? The constant, moderate breeze makes the glider weightless to hold, reduces by half the speed required to run in order to launch, and slows down everything that is happening to the student. The smooth and consistent terrain and lack of thermal activity eliminates any turbulence in the air and any resulting confusion in the student, and the soft sand makes falling less painful, and less frightening.

Unfortunately, sites like this are exceedingly rare, and most instructors have to make do with sites that are much less favorable for training.

At most sites that are not on the ocean, only the lightest of winds are smooth enough to be truly suitable for training new students. In years past, a number of innovative instructors have used very large size gliders, specially modified to reduce the glider weight, for introductory training in an attempt to slow down the student's flying speed in light wind conditions, in much the same way that a moderate, smooth breeze would do. In 2000, Wills Wing introduced the Condor 330 – a purpose-built 330 square foot (30.7 square meter), 39-foot (11.9 meter) span, 53 lbs. (24.1 kg) training glider, which is capable of flight at speeds as low as 13 mph (21 kph).



The use of the Condor 330 has allowed instructors to train in light winds or even no wind, in the smooth air of the early morning or late afternoon / evening, without the excessive ground speeds normally required by these conditions.

Even so, a smooth, properly sloped hill facing reliably and directly into whatever breeze is present, with a large, smooth, flat landing area at the bottom is still a relatively rare thing. By contrast, a large, smooth flat field (which can “face” in any direction) is easier to find.

Enter the scooter tow winch system. With a scooter tow system, the “hill” can be placed at any location within the field, and pointed in any direction. By varying the tension and duration of the tow, the hill can also be any “height” desired, and the height can be changed from one flight to the next. The instructor who is operating the scooter tow winch can be positioned directly alongside the student’s launch point, facing in the direction the student will be flying – giving him a perfect vantage point to observe the student’s actions and mistakes. And, when the time comes to carry the glider back up to launch, the “hill” disappears, and the glider can be rolled to the launch point on flat ground.



General Summary of Layout and Use for First Day Training

A location is chosen in the field for the student's launching point, and the scooter is set up adjacent to that spot, and secured against movement. (Since tow line tensions are light, simply chocking the scooter's front wheel with the scooter on the center stand is normally sufficient. Alternately, the scooter can be permanently mounted to a small trailer, as shown above.) Directly upwind of the launch point, and at least 1000 feet (300 meters) away, the turn around pulley is anchored to the ground. (For tows above 75 feet altitude, the pulley would be anchored at least 1500 feet – 450 meters – away.)



This can be done with a simple screw-in type auger. A clearly visible marker, such as an orange plastic cone, should be placed about 2/3 of the way from the launch point to the pulley – this is the limit marker for student flights under tow, so as to avoid the student flying close to the pulley and being pulled towards the ground by the tow line. This marker can also be used as a visual target for the student, even if it is not expected that he will fly that far. (Looking at a target that is more distant than the ground directly in front of the student is a good practice for students to acquire, as it will help their flying and landing skills at every stage of development.) If the field undulates in elevation, the scooter and pulley should be located on relatively higher points, to reduce drag on the line. There should be nothing in the path of the tow line on which it could snag. Wind indicators should be placed at various locations in the field. They should be clearly visible, offer indications of the presence of even very light winds, and should present no danger to the student if he should fly into one. There should be no obstacles, obstructions, or natural terrain features out in front of the student that could cause an injury in the event the student flew into it, nor should there be any holes or ruts in the field that could cause an injury if stepped on or into.

The tow line runs from the scooter, out to and around the pulley, and back to the student and glider. The instructor applies tension to the tow line, and controls the tension with the scooter throttle. The student responds to the tow line tension by moving smoothly into a walk – jog – and then run.

Initially, the glider should be at a relatively nose-high attitude, (angle of the keel relative to the horizon), and the student should allow the glider to plane out to a trim angle of attack as he moves into his run and the glider lifts off of his shoulders. To achieve the proper angle of attack, the glider's initial attitude and the glider's attitude in towed flight need to be higher than that for a normal slope launch or free flight, because of the fact that the launch area is not sloped downwards and the direction of the "thrust" force on the glider has a forward component from the tow line instead of being only downwards from gravity.

In addition, it is better to have the glider's nose initially a little too high than to have it a little too low, because if the fore and aft location of the attachment of the tow bridle to the keel is correct, the glider will naturally adjust its angle of attack as the tow begins, and the tow line tension will overcome any initial excess drag. You don't want to get into the situation of the glider flying out ahead of the student, and the student having to run hard to chase it. The student should accelerate in response to the tow line tension, and not try to run faster than the tow line is trying to pull him, as this would slack the tow line.

If everything is done correctly on the part of the student, the glider and student will be pulled slowly into the air as the glider gains flying speed. During a student's first flights, if the student is flying the glider properly at trim, or just a little faster than trim, the instructor should moderate the tow line tension to keep the student within no more than 3-6 feet (1-2 meters) above the ground. The thrust provided by the scooter gives the instructor the ability to correct for student mistakes, but the temptation to do this should generally be avoided. For example, if the student is pulling in too far on the control bar, causing the glider to fly too fast to become airborne or to climb, the instructor should *not* add power to force the glider into the air. (One obvious danger in doing so is that if the student then lets the bar out, or pushes out, he could climb quickly to an unsafe altitude.) It is better in this case to simply reduce power smoothly and let the flight attempt come to an end, and then de-brief with the student to discuss his mistakes in technique. The idea is to reward proper technique with flying (the way the natural world will do), and to avoid rewarding mistakes in technique. Both the student and the instructor need patience in this regard – there is nothing wrong with a failed attempt to fly, so long as something is learned.

The instructor should also terminate the flight attempt by smoothly reducing power if the student is having directional control problems. The idea is that the instructor controls the situation, and gently ends the flight anytime the student is headed for trouble, and does so before the trouble can become in any way serious or threatening to the student's safety. The instructor should not suddenly chop the throttle, but only gently reduce power to smoothly reduce line tension.

If the student is flying properly, and under good directional control, the instructor can continue to pull the student along at a low altitude for a while and then gradually reduce power, gently bringing the student down to the ground. The eventual goal is to have the student land on his feet, but if he doesn't achieve this right away and rolls in on the wheels instead, it's not a problem.



Because of the complexity of the situation the student is dealing with at this stage, and the prospect of sensory and cognitive overload, any instructions you give the student have to be fairly simple. You can give a few simple rules for in-flight control, such as “ground coming up, ease the bar out,” and “ground falling away, let the bar in.” This will get the student started on the process of rounding out and flaring for landing, which will eventually allow him to land on his feet, and train him to let the bar come back to trim as he gains altitude, so he’s not flying at altitude in a mush. “Pull yourself gently towards the target,” could be a rule for directional control – getting across the idea that moving his body in the direction he wants to go while also looking towards his target will help keep him flying in the right direction. (You may want to replace “pull” with “bump” – after you’ve explained what bump means in this context. What you’re trying to convey here is that there is a lag in the glider’s response, and the student does not want to hold a directional control input until the glider has reached the desired heading, because it will then overshoot.)

There is no need at this stage for the student to release the tow line, nor should this be attempted. On subsequent training days, as the student builds skill and consistency over multiple flights, altitude can be gradually increased (up to about 20 feet or 6 meters) and the length of the flight can be extended, until the student is flying all the way to the marker at the $\frac{2}{3}$ point between the scooter and the pulley, and beginning to practice releasing the tow line.

The student should not be attempting to transition from holding the downtubes to holding the basetube at this stage – that skill is better taught considerably later in the student’s training after the student has mastered all of the basic skills of flying.

Some More Detailed Notes On Equipment

Gliders

The Condor 330

The Condor 330 is NOT a utility class glider, and some special precautions need to be observed in using it for training, and especially for towing. The Condor 330 is built very light, from a structural point of view. During vehicle load tests, the crossbar went out of column at a gross load of only 884 lbs (440 kg), at a speed of 32 mph at the maximum lift angle of attack. Applying a safety factor of 1.5, this means that loads in flight – including any tow line tension - should be limited to no more than 590 lbs (268 kgs). Towing of the Condor 330 should only be done with light tow line tensions, and only at low altitudes - 20 feet (6 meters) or less. The Condor 330 also does not exhibit normal utility class stability characteristics in pitch or in roll. The glider should not be flown at speeds in excess of 32 mph (51 kph) in smooth air, or 24 mph (38 kph) in rough air or when maneuvering. Bank angles should be restricted to 25 degrees or less, as the glider can become unstable in roll and pitch at higher bank angles.

The Condor 225

The Condor 225 is also not a utility class glider, and the same limitations apply to it that apply to the 330, although it has a little more margin in terms of both the structural strength and the stability. In general, however, the same limitations should be observed as for the 330. The 225 does not provide quite the same slow speed performance as the 330, though student pilots of very small stature and light weight may find it easier to handle for their initial flights. The 225 is also useful in slightly higher winds that might make the 330 too difficult for the student to handle.

Falcons

When the student has demonstrated consistent mastery of the skills required to launch, fly at low altitude while maintaining control of direction and airspeed, make small corrections to speed and direction in flight, and land, and is deemed ready to advance to higher flights and more advanced skills, they should be transitioned first into an appropriate sized Falcon. The transition process should start with a return to short ground skimming flights at the lowest altitude, to allow the student to become accustomed to the faster launch, flying and landing speeds of the Falcon and the differences in control response.

Student Harness

A suitable training harness is required which allows the student to run without restriction and to fly comfortably in a mostly upright position without the need to hold himself upright by hanging from the downtubes. There should be attachment points for the tow bridle at the hips, and a horizontal back strap at approximately the same vertical location on the harness to keep it from being pulled away from the pilot's body while on tow.

Safety Equipment

The basket of the glider should be equipped with large diameter wheels that will roll freely on the terrain being used.

A suitable helmet, eye protection, and knee pads should be used.



V-Bridle and Release System



An aero-tow type V-bridle and release system works well for scooter towing. This system uses a short V-bridle attached to the harness, with a barrel type release at the right side attachment point. This bridle is passed through a loop at the lower end of a longer V-bridle, which passes through the ring or carabiner on the tow rope, and is then attached, via a weak link, to the top release mounted on the keel of the glider. The activation handle for the top release is attached on the downtube, near the location where the student will be holding the downtube in flight. (Note that neither release will be used by the student during his initial flights.) Because the student will be both launching and flying in an upright position during his initial training, the V-bridle attached to the harness is best attached at the hips, as shown. The specific fore and aft location of the attachment point on the keel of the primary release – to which the top end of the longer V-bridle is attached, is critical to proper trim of the glider during launch and on tow – if the attachment is too far forward, it will tend to pull the nose down and make it difficult for the glider to get into the air. The ideal position will vary on each glider model, and should be determined ahead of time by instructors flying the glider under tow. In general, on a Falcon, locating the top release one inch forward of the hang loop works well. On the Condor, a few inches forward of the hang loop is preferred.

Tow Rope

A recommended tow rope is Samson Amsteel Spectron 12, 7/64 inch diameter. This is a 100% Spectra 12-strand hollow braided rope with a Teflon coating to reduce abrasion and low stretch. It is fast and easy to splice. The approximate breaking strength is 1200lbs. Approximately 2500 feet of line is appropriate for use on the smaller scooter that will be used for tows up to 75 feet in altitude, and 3500 feet of line is appropriate for the larger scooter, for tows up to 300 feet in altitude.

A small fabric drag device on the tow line (see photos) while not necessary for initial ground skimming flights is helpful for finding the end of the line after the line has been dropped from a higher tow.

Return (Turn-Around) Pulley

The requirements for the turn-around pulley are that it allows the rope to feed without any excess drag, and that it be completely incapable of fouling or snagging the rope. The pulley should be a minimum of three inches in diameter, and should have ball or needle bearings in the center rather than just a bushing. The rope must be captive on the pulley both when under tension and when slack – there must be no way that the rope can become caught between the sheave and the side plates. A set of pins that fit close to the outside edge of the sheave can serve this purpose. The sheave should be a solid piece, not made of two tack welded halves, and should have a radius in the bottom larger than that of the rope, so that the small diameter rope cannot be caught in the bottom of the sheave under load.





The Pulley Anchor

A simple auger, 12 to 16 inches long, can be used to anchor the return pulley in the ground. The type of auger shown works well in a relatively substantial soil such as clay. For looser, sandier soils, a longer auger may be required. Spiral coil type augers generally do not provide enough holding strength to be reliable. The connection of the pulley to the anchor must allow for rotation of the pulley assembly as a whole, in both the horizontal and vertical planes, in response to changes in the direction of pull from the rope.



The pulley should not be anchored to a vehicle, or by any means that creates a dangerous obstruction that the student might fly into.

The Scooter

For initial training and up through the novice level, a relatively lower powered scooter works best. A 50cc scooter with a 4.5 horsepower engine that will carry a full size adult at a speed of at least 35 mph (57 kph) will normally work fine. (If it won't carry an adult at that speed, it probably doesn't have enough power). Often the temptation is to use a scooter with more power than needed, but the significant advantage to having a relatively lower powered scooter for initial training flights is that it makes precise control of the tow line tension significantly easier, and this is very important when you're trying to keep the student flying, but not tow them to an altitude of more than a few feet off the ground. If you plan to use scooter towing for training flights beyond the beginner level (flights to altitudes of more than 75 feet / 23 meters), you'll need a scooter with more power, but you should then plan to have two scooters (or maybe even three), rather than compromise your initial flight training program by using a scooter with too much power. (Note: If you're operating in the mountains or at a high density altitude, then 50cc becomes, perhaps 90cc or 125cc in terms of your power requirements. The basic point, however, remains the same – you don't want more power than the minimum necessary for your initial flights training program.) Also, keep in mind that power is one requirement, but appropriate gearing is another. When you convert the rear wheel to a drum for use as a winch, the diameter of the drum on which the line is spooled will be considerably less than the outside diameter of the original tire, and the line speed, (i.e. the speed of the glider under tow) for a given engine rpm in a given gear, will be reduced by the same proportion as the reduction in diameter compared to the riding speed of the scooter at that rpm in that gear. Scooters of this type will generally have a variable speed – torque converter type of transmission, which is what you want for towing purposes – you don't want to be shifting gears while towing.

When building the drum for the winch, use side flanges of at least 3/16 inch (5mm) thickness – thinner flanges can bow outward from the pressure of the rope being pulled onto the drum.



Some type of line guide or guides will also be required where the line is routed forward under the scooter and out towards the return pulley. Use rollers to guide the line to avoid unnecessary wear on the line.



The scooter can be secured in place by raising it on the center stand and chocking the front wheel. However, you may find it more practical to mount the scooter permanently on a small trailer, which can facilitate moving it around, and can provide a convenient place to mount the required line guides and to mount a larger, automotive type battery for the frequent use of the electric starter. The battery that the scooter comes with will probably not be adequate for the number of times you'll need to start the scooter during a day of training.



When using a scooter with more power for more advanced towing, you may find that the increased power makes the throttle too sensitive for smooth tows. You can counter this problem by a simple modification to the throttle grip – an extended “joystick” clamped to the twist grip serves to “de-sensitize” the throttle control and allow for finer, more precise adjustments to the tow line tension. (Anything that increases the diameter of the throttle grip – such as adding foam pipe insulation over the grip – will also reduce the throttle sensitivity and make it easier to be more precise in the application of power.)



Ground Markers

As already discussed, at least one clearly visible ground marker – such as an orange cone – should be placed at a point 2/3 of the way from the scooter to the return pulley. This marks the limit of how far the beginning student should fly under tow. Under no circumstances do you want to have any risk of the student overflying the return pulley and being pulled towards the ground by the tow rope (which, at this stage of the training, passes OVER the basetube). On the initial flights, when there is no plan for the student to release from the tow rope, the instructor will ease the student back down to the ground before he reaches the marker by gently reducing tension on the tow line. On later flights where the student has been instructed to release, if he fails to do so the instructor will again gently reduce power to ease the student back to the ground before reaching the marker. In either situation, the instructor should never cut the power suddenly, but rather gradually reduce power to reduce the tension on the rope and make the glider descend, without stopping the rope entirely. Enough power should be maintained on the scooter to continue to take up the rope onto the winch reel as the glider flies forward, until the landing occurs.

Students at more advanced levels will, of necessity, be achieving altitudes that would allow them to overfly the return pulley. For this reason, a reliable means of cutting the rope at the scooter must be available to the instructor, and, once again, it is fundamentally necessary that it not be possible for the rope to be snagged or fouled by the pulley or the pulley anchor. Also, no student who has not clearly demonstrated the ability to release properly and reliably, using both the standard and the back up releases, should be allowed to attain an altitude or position from which he could overfly the return pulley.

Additionally, when students are making higher flights, it is of paramount importance for the instructor to be aware, at all times, of the relationship of the tow line to the basetube – the angle of inclination of the student's location above that of the turn around pulley must never be allowed to approach the point where the tow rope would contact and impinge on the basetube, as this could cause the rope to impart a nose down pitching moment to the glider and create a very dangerous situation.

Other ground markers can be set out as targets or points of focus for the student for use in various tasks, but it is important that the 2/3 limit marker be clearly distinguishable to both the students and the instructor and that everyone clearly understand the significance of it.

Wind Indicators

Wind indicators should be placed at various locations to give the instructor and the students a clear picture of the conditions the students will be flying into, and to help the students visualize and understand how wind conditions can vary on a micro meteorological level. In the 90 degree quadrant ahead of the launch point, yet within the flying range of the student (fair territory on a baseball diamond if launch is at home plate), all wind indicators should be such that it would be safe for the student to fly into them. Lightweight poles with soft, padded tops, fitted with light streamers, stuck lightly into the ground and leaned slightly away from the direction from which the student would be approaching would meet this requirement. Since all initial flight training will be done in very light winds, the wind indicators must be responsive to such wind conditions. In the area outside of the 90 degree quadrant, or beyond the student's flight range, larger windsocks on taller, more substantial poles can be used to pick up wind conditions that may be occurring above the gradient or the wind shadow of a tree line.

Line Retrieval

After each tow, the end of the tow line that was attached to the student needs to be retrieved and brought back to the launch point for the next tow. A golf cart or ATV provides a simple way to do this. It is important to bring the line back slowly and carefully to the launch area, to avoid back lash on the drum, or tangles in the line. It is also helpful for preventing backlash to have a way to apply a light and consistent braking pressure on the rear wheel/drum during line retrieval, such as the simple modification shown below – in which a light weight bungee pulls the brake handle against a calibrated stop. It is important that the cart be driven cautiously and responsibly, and be kept out of any location where it could cause a hazard to a glider in the air.



The Training Site

The training area should be large, unobstructed, flat, and either level or slightly uphill (not downhill). There should be no holes or ruts that could catch a glider's wheel or pilot's foot and cause injury. There should be no fences, poles, posts, and no vegetation capable of snagging the tow line. Grass is softer and less abrasive than dirt, as well as cooler in hot weather.

Radios

Radios are not necessary when using a turn around pulley, as the instructor and student are at the same location at the beginning of the flight. Also, communicating by radio over the noise of the scooter engine can be problematic. If you feel that you need to use radios, make sure that you can communicate clearly and reliably under the actual conditions that you will be using them – a garbled and unreadable command from an

instructor to a student can be worse than no communication at all – especially if the student has come to depend on getting such instruction during the flight.

Tension Monitoring Device

On low altitude training flights, which are conducted under very low line tensions, all the important information about the tow is given to you by your view of the student and glider – the attitude, altitude, student body position, glider speed and rate of climb and descent, etc. tell you exactly what you need to know. Looking away to monitor a tension gauge would just be a distraction in this situation.

As you tow to progressively higher altitudes, more and more line tension is required, as the direction of application of the tow force becomes oriented more downwards and less forward. At some point in this progression, you may find that a tension monitoring device is helpful.

Additional Instructors

One instructor can handle all aspects of the scooter tow training operation. Having additional instructors and assistants can help make the process flow more efficiently, provided that everyone knows what his or her job is, how to do it, and is working effectively together as a team. Keep in mind that essential functions can only be delegated to assistants who are competent and reliable, and non-essential functions do not need to be delegated at all – by definition, they can be dispensed with.

Outline Of A First Day Through Novice Training Program

This part of the document will focus on those aspects of the training program that relate specifically to the scooter tow methods and practices. You may decide to include additional teaching materials in your training syllabus beyond what is covered here. Keep in mind, however, that even at its barest essentials, the initial training experience involves a tremendous amount of new information for a student to absorb. It can be very helpful in this regard to keep theory and lecturing to a minimum during the on site training, and focus on demonstration and practical experience as a means of conveying needed information.

Glider To Be Used For Initial Training – Condor 330 or Condor 225

First Day Introductory Ground School

The following sequence represents a simple and reasonable first day introduction to pre flying skills and information.

1. Have students help set up the glider, with a brief description of the parts and associated nomenclature.
2. Show the harness and how it is put on and checked.
3. Demonstrate in a simulator or suspended control bar the various hand and body positions for holding the glider prior to launch, transitioning the grip (grapevine to bottle) during the launch run, hanging in the harness during flight, pulling the body forward for increased speed, letting the control bar out (as opposed to pushing out) to slow down to trim speed, using a light grip, moving the hands up slightly prior to flare, the landing flare motion, and bumping to the side for turn control. The most effective way for students flying upright to effect proper turn control is to pull an elbow towards their hip – this ensures that the weight shift is being accomplished correctly. Demonstrate the difference between this effective means of lateral weight shift and the ineffective movement of leaning with the head to one side.
4. Demonstrate the routing and connection of the tow line and bridles, and the use of the primary release and the secondary release.
5. Demonstrate hooking in, doing a hang check, lifting and holding the glider at the proper angle of attack.
6. Demonstrate the walk – jog – run method of initiating a run with the glider, accelerating smoothly until it is flying its own weight and lifting off the shoulders.
7. Demonstrate running with the glider on level ground, with the glider flying and carrying its own weight, and then letting go of the control bar such that the glider is being towed by the pilot's harness during the ground run.
8. Have students practice each skill as demonstrated.

First Day Ground Skimming Tow Flights

1. Establish the student's signal to the instructor that he is ready for the tow to begin – student says "Clear" in a loud, clear voice.
2. Begin first student tows – focus on student properly holding and balancing the glider, and properly initiating the run in response to the tension from the tow line. Smoothly and gently reduce tow pressure when the student is not performing correctly, so that only properly executed skills result in flying. Student's goals are to lift and hold the glider in a wings level, appropriately nose up attitude, to smoothly accelerate the run in response to the tow line tension, to properly transition his grip from grapevine to bottle grip as the glider lifts, to achieve a loose grip on the bar and let the glider go to trim, to keep running as the glider exerts increasing lifting force so that he flies smoothly into the air, to look ahead towards a target rather than down at the ground, and to remain centered so the glider flies straight.
3. Follow each flight attempt with a de-briefing on what was done well, and what could be done better. As student's demonstrated skills improve, extend duration of the flight, and add a very slight increase in altitude.

Note: Some students may not progress this far on their first day, while some may progress farther. Patience is vital, for both the student and the instructor – only the student's mastery of skills should drive the rate of progression towards the next step.



Subsequent Ground Skimming and Slightly Higher Tow Flights

1. Continue to work on refining student skills, and reward progress with slightly increased altitude, and longer flights.
2. Have students begin working on trying to land on feet consistently. This requires the student to be hanging in a relaxed and upright position, to be looking ahead rather than down, to be mentally relaxed enough to be aware of approaching the ground, to be able to get their feet moving under them in a running motion, to move their hands slightly up the downtubes, and to smoothly push up and out as they touch down and run out any remaining forward motion.
3. Have students work on pulling in just slightly (perhaps one inch) to fly at just slightly above trim speed while on tow.
4. Have students work on refining directional control. Lateral bumps to induce a small turn, or to correct for a turn should be deliberate and properly executed, keeping the body in a proper vertical position, while pulling one elbow to the hip, and releasing back to center.
5. Have students work on refining landing skills, letting the bar out to trim as the ground approaches, maintaining wings level and directional control during the descent and roundout process, and transitioning smoothly into a properly timed, gentle flare, with appropriate runout as required.
6. As all of these basic skills are mastered gradually increase altitude to about 15 feet, to prepare students for practicing releasing from tow.
7. Review the release procedure sequence: Confirm flying straight and level towards target, pull in slightly to increase speed, squeeze release until line drops away, maintain direction of flight during descent, look out towards target, let bar out to trim to round out with feet 1 to 3 feet off the ground, slide hands up slightly, get feet moving underneath you, ease the bar out to maintain height, push out and up to flare and run out landing as necessary.
8. Practice releasing (using primary release) and descent and landing flare sequence.

Transition To The Falcon – Higher Tows – Laying the Foundation For Working On Novice Level Skills

When the Beginner Level skills as described above have been mastered on the Condor, the student can be transitioned to the Falcon in preparation for working on the next level of skills.

The transition should start with the student being returned to ground skimming tows on the Falcon, so that the student can become accustomed to the Falcon's faster flying speed and quicker, more sensitive response. The progression of steps one through eight above is then repeated on the Falcon, making sure that the student is mastering each skill along the way. Avoid any temptation to rush this stage of development – even though the student has previously mastered these skills on the Condor, it may take them significant additional practice to master them again on the Falcon.

Beginner Level Student Rating

When the student has mastered the skills and clearly demonstrates both mental and physical relaxation in flight, situational awareness, and the ability to focus on goals such as releasing prior to a marked location while handling the demands of controlling the glider, the pilot has reached the Beginner (Hang 1) flight skill level and can take the Beginner Rating written test for that rating. Following that, the instructor can again begin gradually increasing the altitude and distance of each flight beyond what the student experienced on the Condor.

When the student is flying the Falcon with consistent skill at altitudes of 20-25 feet, making smooth, proper and accurate course corrections, and performing good landings, the instructor can again begin to add new skills.

Review the procedure for using the secondary release and have student practice using this release.

Have student make small, deliberate turns of 15 degrees change in heading at predetermined points, while on tow, using shallow bank angles, and return to the original heading. Student should be able to repeatedly turn away from the original heading by a consistent amount, and turn accurately back to original heading before the instructor allows the student to practice turns of greater deviation. Any evidence of loss of execution of skills mastered earlier, such as airspeed control, landing technique, releasing at the proper location, etc. should be cause for stopping the progression in skills and taking a step back. When 15 degree turns are mastered, student can progress to 25 degree turns. Do not allow student to turn more than 30 degrees off the tow line direction without reducing power.

When the above is mastered, increase altitude of tow to 50 feet – student's task is to tow straight ahead, release and land.

Next, tow to 50 feet, have student fly slightly faster than trim, and slow to trim, while on tow.

Next have student repeat turns of 15 degrees away from original heading and back, while on tow, at the higher 50 foot altitude. Verify that student is using proper technique.

The following steps should be done in sequence. The student should only move on to the next step after demonstrating mastery of the current step being worked on. The goal is not to see how quickly the student can progress, but to strive for a combination of relaxed focus and precise execution of skills. (Note all specifications of degrees in this section refer to heading change, NOT bank angle. All turns should be at no more than 30 degrees bank maximum.)

Next, tow student to 75 feet, have student release and perform one 45 degree turn, turn back to original heading, execute straight approach and landing. Repeat with initial turn in the opposite direction.

Repeat, with student performing one 60 degree turn, and turn back to original heading, execute straight approach and landing. Repeat with initial turn in the opposite direction.

Transition to More Powerful Scooter For Higher Tows

For flights to altitudes above 75 feet, it will be necessary to transition to the more powerful (125 cc) scooter with the longer (3500 feet) tow line.

Continuing With Tasks Working On Novice Level Skills

Repeat the two prior tasks (one each with initial turns in opposite directions) on the more powerful scooter – towing to 75 feet, performing one 60 degree turn and turn back to original heading, and executing straight approach and landing.

Repeat, except tow is to 100 feet, have student perform one 90 degree turn, then a 90 degree turn back to original heading, execute straight approach and landing.

Repeat with initial turn in the opposite direction.

Repeat, except have student perform an initial 45 degree turn, then a 90 degree turn in the opposite direction, then 45 degrees back to original heading, execute straight approach and landing. Turns to be over points on ground marked by cones.

Next, student releases at 100 feet, accelerates smoothly, straight ahead to 30 mph, slows smoothly to trim, and executes straight approach and landing.

Next, tow is to 200 feet, student performs an initial 45 degree turn, then 90 degrees in the opposite direction, then reverses for another 90 degree turn, then 45 degrees back to original heading, and executes straight approach and landing.

Repeat with initial turn in opposite direction.

Next, explain “Box” pattern to student – four 90 degree turns in the same direction: an initial 90 degree turn to crosswind, a 90 degree turn to downwind, a 90 degree turn to crosswind, and a 90 degree turn to upwind. Turns to be smooth, square, 90 degree changes in heading, separated by brief segments of straight flight.

Student tows to 300 feet and executes a box pattern and straight approach and landing.

Repeat with initial turn to the opposite direction.

Repeat with two alternating 45 degree turns on the final, upwind leg.

Repeat with the student trying to adjust the location of turns to land on a target.

When student has mastered all of the above, and can land reliably within 100 feet of a target, the student can take the Novice level written test.