

Steps of a typical pay-in tow

1. **Pre-flight & launch preparation** – The pilot prepares for the flight by first doing a safety check (pre-flight) with the help of the instructor/tow operator (TO). A special tow bridle is connected to the pilot's harness which has a quick release handle which can disconnect the pilot from the towline at any time. The TO ensures that the pilot is ready to fly and all safety equipment is present and working correctly, including radio communications. The TO chooses the correct weak-link for the pilot's weight.

2. Pilot to Tow Tech Instructions

Take up slack	Pilot repeatedly extends one leg out to the side and back into the center
Stop pre-tensioning	Pilot stops leg movement and braces self with both feet
Ready to launch	Pilot makes a single forward bend at the waist
Increase towline tension	Pilot repeatedly flaps both elbows or arms up and down
Decrease towline tension	Pilot repeatedly scissors both legs out to the sides and back into the center
Imminent release	Pilot spreads both legs out to the sides (a BIG scissors) and holds them there

3. **Layout** – The pilot will lay out the glider behind him. Depending on the wind speed, he may face forward for a forward inflation (calm – light winds) or he may face towards the rear for a reverse inflation (light winds or greater). Most new pilots are more comfortable doing forward inflations until they have practiced their kiting skills.
4. **Towline** – The pilot is hooked to the towline. Between the towline and tow bridle there is a weak-link of the proper size so that if there is some problem during the tow, such as the towline suddenly jamming, it will break and disconnect the pilot from the tow. There is also a bright orange drogue parachute attached between the weak-link and the tow line to aid in recovering the tow line after the tow. It also

allows the TO to easily spot the end of the tow line in order to bring it back to the launch area. The tow line stretches out about 1/2 mile in front, then goes through a pulley mounted high on a truck, and then all the way back to the winch which is very close to where the pilot begins the tow. The tow operator has a special knife (hook knife) that he can use at any time to instantly cut the towline, separating it from the winch, if there is some problem during the tow.

5. **Forward inflation launch** – When the pilot is ready (and is doing a forward inflation), he will bow deeply to indicate that he is ready to launch. The TO will never launch the pilot until he is certain that the pilot is ready and wants to launch. After bowing deeply (he is ready to fly), the tow operator will slowly increase the pulling force on the towline. Typically, to make the launch quick and easy, the pilot will resist the tow force by leaning back against the force of the towline. When the force becomes irresistible, the pilot will lunge forward and run with all his strength. The glider will popup overhead. At this time, the pilot may need to apply brake on one side or the other to ensure that the glider is flying in the forward direction. If it is and all things looks good, the tow operator will continue the tow, gently increasing the tow force as the pilot is running forward. If the winds are calm (most often), the pilot may run 10-20 yards during which time the lift on the glider will increase and the pilot will feel it in the harness. As often as not, the new pilot will think, *"I'm flying! I'm flying! I'm flying!"* – and promptly sit down in the harness. But there is not enough lift and he will be sitting on the ground, bouncing along for a second or two while the glider dives forward. The tow operator will stop the tow – and we must start over. Aborting the launch at this time is harmless. Depending on how the pilot feels, we may try things again, take a break, or quit for the day. Thankfully, with forward inflations the glider almost launches itself, requiring minimal input from the pilot. The TO must carefully observe the towed pilot for task saturation which is a common problem for those new to paragliding.
6. **Reverse inflation launch** – If the pilot is doing a reverse inflation, he will inflate (bring up) his wing and, facing backwards, kite it for moment in order to check everything. When he is ready, he will turn forward. This tells the TO that the pilot is ready to launch. The tow operator will gradually increase the tow force as the pilot begins his launch run. Depending on the level of training desired and the conditions, the tow operator may have the pilot run a long distance or short. Running a long distance might be typical of a launch from a shallow sloped site and it will require the pilot to both stay directly

under the glider and control its direction while he is on the ground. It is a great workout to run across the field and then slowly leave the earth. Recreational tows are somewhat different as the pilot must be experienced (P3 with the surface tow (ST) rating).

7. **Tow force during launch** – Before the pilot's feet leave the ground, the tow force can be light (experienced pilots) or stronger (new pilots). The reason for a stronger force for new pilots is that the glider will come up quickly and stabilize faster, making it easier for the pilot to get safely in the air. More experienced pilots can improve their skills and experience controlling the glider by less towing force. This will require them to run more and faster, watch, and control things more carefully and deliberately. It all happens on a flat grassy surface so errors, even gross ones, result in little more than grass stains on one's clothing.

Despite whatever the tow force is, the exact moment the pilot's feet leave the ground, the tow operator must instantly back-off on the tow force to the point where the pilot is just climbing out ($<100'$ /min.) for the initial 50' to 75' of altitude. Why is this?

There are two serious hazards when towing. One is known as lockout. The other is an uncontrolled surge of the glider when close to the ground and is typically caused by a break of the weak-link or the tow line itself. An uncontrolled surge is what must be prevented during launch when the pilot is less than 50' to 75' above the ground. Also, gently lifting the pilot off the ground will prevent parachutal stall (where the paraglider becomes a parachute with a much greater sink rate).

If there is a sudden stoppage of the tow when light tow force is being applied, the glider will be just a little bit behind the pilot as it rises, but not far behind. The glider and pilot will gently sink down and he can land safely and easily with an ordinary flare. On the other hand, if there is a stoppage of the tow when strong force is being applied, the glider will be far behind the pilot. If the resultant surge is not instantly stopped by applying the brakes the correct amount (something difficult to do for a new pilot), the glider quickly surges forward. In the next moment of an uncontrolled surge, the pilot will immediately begin to swing under the glider and down, potentially hitting the ground with enough force to cause serious injury or worse. At an altitude of 50' - 75' or more, this would be a benign event but not when near the ground!

Only after the pilot is high enough where a sudden release of the tow force would not result in him swinging into the ground, is it safe to increase the tow forces so that the pilot climbs up quickly (approximately 600'/min or 1,600 psi hydraulic pressure on the winch gauge). Towing up faster than this increases the forces on all of the equipment and pilot to uncomfortable and hazardous levels. With the proper location and equipment, 600'/min is completely adequate to get pilots to a reasonable altitude to do maneuvers.

In any case, tow force should never result in the glider being more than about 40 degrees from the vertical behind the pilot. While full stall (but not parachutal stall) is virtually impossible under tow because of the physics, a sudden release of the tow force is still frightening to the pilot. Such an event can lead to panic and is something we take the greatest pains to avoid in interest of pilot safety. All towed pilots are warned that sudden stoppage of the tow can occur at any time and to be ready to land normally. *"It may just be a short flight – and let's try it again."*

Ground school is an important and required venue where pilots become acquainted with the many possibilities of what can happen at launch, in particular. Eliminating surprise helps reduce panic when something goes amiss, such as a break in the tow line, a hidden cravat in the glider, a sudden change in wind speed and direction, a wrap of the brake line around the riser, etc.

8. **During the tow** – Once the pilot has left the ground, he has only ONE job and that is to ensure that the glider and the tow line are perpendicular to each other. This means that he must be looking up at the glider (the tips) and then down to the tow line while making adjustments with one brake or the other as needed. New pilots are so overwhelmed that they usually are incapable of knowing what to do, even if thoroughly briefed beforehand. This is why new pilots are given two radios attached directly to the helmet right next to the ears so that the TO can give them the correct commands on how to keep the glider and tow line perpendicular.
9. **If the tow goes wrong** – What happens when the tow "goes wrong"? If the pilot, for whatever reason, cannot keep the glider and the tow line perpendicular to each other, the glider will begin to enter lockout. **Uncontrolled lockout is exceedingly dangerous!** Referring to the boy with the kite, everyone knows what can happen to a kite. In the air, it may turn sharply to the left or to the right and then, if the boy does nothing but continue to pull on it, it

will quickly dive towards the ground and hit with tremendous speed. A paraglider or hang glider will do the same, usually with fatal results to the attached pilot. At first, the glider gets a little off perpendicular with little change in attitude. But as it continues to veer away from the direction of tow, the forces increase as the square of the difference in the angle off the perpendicular and both glider and pilot begin to head for the ground with increasing speed, like the boy's kite.

Thankfully, the remedy to lockout is simple, foolproof, and quick: immediately stop the tow. The moment the tow stops, the glider will immediately – and safely – stabilize directly over the pilot's head, where it should be. This is the passive safety only present in paragliders. If a pilot does absolutely nothing, the wing will fly overhead at trim in a straight line through the air. TO's must be thoroughly trained and certified to know exactly what to do in an emergency. What if the pilot does a sudden 180 degree turn while under tow? The glider will enter lockout very quickly – so quickly that the TO may have to cut the line.

Typically, new pilots who are towing for the first few times have difficulty keeping things lined up and, as a result, the TO will have to slow or stop the tow and wait for the pilot to fly "straight" (the direction of tow). If it does not happen, the TO will instruct the pilot to release from tow, if he is able to respond in that way, and then land somewhere. At the turf farms, we have hundreds of clear acres for pilots to land. Most new pilots require two or three tows to learn how to fly their gliders correctly while being towed.

10. **End of tow** – The end of tow can be any time the pilot or TO desires. There can be many reasons why. He may feel airsick or encountered rough air. Sometimes he may be so nervous that he wants to end the flight ASAP. Experienced pilots may sense a thermal and need to get off tow so they can grab it and fly up and away! Ordinarily, we desire the pilot to release at the highest part of the tow. This is usually when the pilot approaches the "turn around pulley" that is attached to the truck. If he flies past this point, he will begin descending and the TO will have to release the tow by letting the tow line free-wheel or by cutting the line.

a.) **TIME TO RELEASE** As the pilot approaches the point where he wants to release from tow, the TO asks that he performs a big "scissors kick" with his legs so the TO knows he is about to release. The TO backs off slightly on the tow force to lessen the surge of the glider after it is released from tow.

b.) **LET GO** of the brakes. You cannot pull the release handle AND hold the brakes at the same. To do so may cause the glider to stall (another extremely dangerous event) because he will have to bring the brake toggles why down and past the karabiners.

c.) **LOOK** for the release handle and grab it. Use the OTHER hand to grab the tow bridle strap that does NOT have the release handle.

d.) **PULL** the release handle. The drogue parachute and tow line will usually drop away.

e.) **SEPERATE BRIDAL STRAPS** With BOTH hands, separate the tow bridle straps. Why do this? Rarely, the release line may form a friction-knot that might prevent the tow line from disconnecting from the bridle. Sometimes pilots can get confused and yank on the straps rather than pull the release handle. They then might have to reach down and unclip the karabiner that connects them to the tow line. There is no danger because the TO knows they are having trouble and have stopped the tow or, in extreme situations, have cut the tow line. In case things jam at the turn around pulley or at the winch, the weak-link will break long before the tow line can cause dangerous lockout. In over (10) years, we have never had the line jam in the turn-around pulley. It could be possible so we have to be prepared.

In this video, the new pilot experienced 100% task saturation prior to releasing from tow – an easy task that he practiced on the ground. He got free eventually but it demonstrates what can happen to us when we get in the air.

11. **Flying away** – AFTER the tow, the pilot will use his hands to get comfortable in the harness and THEN reach up and grasp the brakes. It is then we will do maneuvers.
12. **Getting ready to land** – The first thing a pilot MUST do before landing is to stand up in the harness when he is about 100' above the ground. He is not quite vertical but his feet are down and ready. When he is a few feet or less above the ground (depending on the type of glider), he may bring his hands down 7"-10" to start slowing the glider down. Right before his feet touch the ground he must pull the brakes all the way down as far as he can. This will flare/stall the glider and it will stop moving forward and, depending on the glider type, it may "jump" making the landing a softer one. Once he lands, it is important for him to keep his hands down. He may then turn, face the glider, and gather it up (rosette it). He may also release the appropriate amount of brake by raising his hands the moment his feet touch the ground and kite the glider for as long as he wants.

13. **After landing** – At this time, the pilot should quickly rosette his glider because winds in the LZ can suddenly re-inflate the glider, pull the pilot over, and drag him. This is not a worry at the turf farms but at your typical LZ, it might matter!