USHPA Pilot Proficiency Program

Paragliding ST Administrator

USHPA
UNITED STATES HANG GLIDING
& PARAGLIDING ASSOCIATION
™

UNITED STATES HANG GLIDING & PARAGLIDING ASSOCIATION, Inc.

Dear USHPA Paragliding ST Administrator:

Congratulations on your new appointment as a certified USHPA Paragliding ST Administrator! Enclosed you'll find materials needed to administer the Pilot Proficiency Program for Surface Tow Special Skill (ST) and Tow Technician Appointment (TECH).

Please review the information provided carefully. It is critical to administering the Surface Tow Special Skill and Tow Tech Appointment. When issuing a Surface Tow or Tow Tech, please be sure to fill out the rating applications correctly and completely. **Rating applications that do not include the $15.00 processing fee will NOT be processed.**

For more information please contact the USHPA office at 1-800-616-6888 or email info@ushpa.aero.

May all your landings be touchdowns,

USHPA Membership & Instructor Services

Mailing: P.O. Box 1330
Colorado Springs, CO 80901-1330

The United States Hang Gliding & Paragliding Association
(a 501(c)(3) corporation)
719.632.8300 • 800.616.6888
fax: 719.632.6417
www.ushpa.aero

Physical: 1685 W. Uintah St.
Colorado Springs, CO 80904

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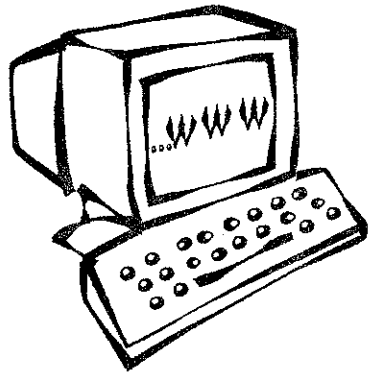

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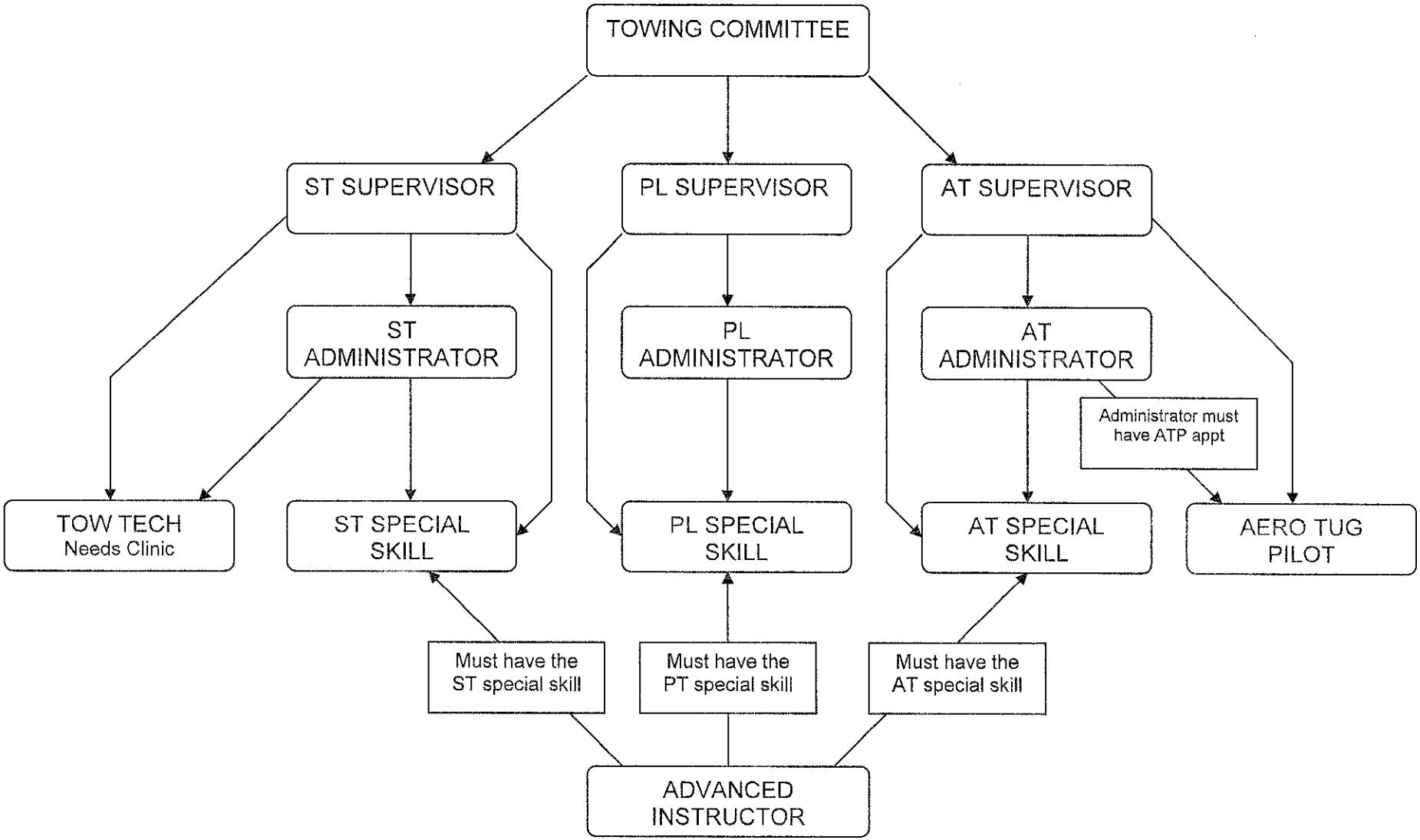
Towing Flowchart



United States Hang Gliding and Paragliding Association, Inc.
Standard Operating Procedure - 12-10

TOWING/AEROTOWING ADMINISTRATION

INTRODUCTION

This SOP outlines operating procedures for towing related sections of the Pilot Proficiency System (Part 104).

10.01 TOWING COMMITTEE

The Towing Committee meets during the Board of Directors' spring and fall meetings. The committee is comprised of the Chairman (appointed by the President) and interested Directors and members of the USHPA. The committee structure is generally outlined in SOP 2-3 and Towing Committee specifically in SOP 3-14.

10.02 TOWING SUPERVISORS - GROUND BASED TOWING

A. General Information

1. Towing Supervisors (hang gliding or paragliding) are appointed by the Towing Committee during the spring or fall meetings. A majority vote of the committee is required. The term of Towing Supervisors is indefinite unless revoked or changed by the committee due to inactivity or performance.
2. Supervisors may only operate in the flight discipline (hang gliding or paragliding) and launch method (PL, ST) for which they are appointed.
3. Supervisors must be current Pilot or Rogallo members of USHPA.

B. Operations

1. Supervisors appoint PL and ST Administrators by sending an appointment form to USHPA Headquarters indicating the desired appointee.
2 Supervisors are to ensure the knowledge and abilities of Administrator appointees are adequate for instructing, demonstrating, and following procedures for ground-based towing.
3 Supervisors should be able to personally witness and be secure with an Administrator's towing operations and abilities.
4. Any accidents or complaints involving an appointee should be investigated and reported to the Towing Committee.
5. Supervisors may revoke any appointments they have made.
6. Supervisors may also issue the launch special skills (PL, ST) for which they are appointed.

10.03 *TOWING ADMINISTRATORS - GROUND BASED TOWING*

A. General Information

1. Towing Administrators are appointed by Towing Supervisors in their respective disciplines (hang gliding or paragliding). Their term is indefinite unless rescinded by the appointing Supervisor due to inactivity or performance.
2. Administrators may only operate in the flight discipline (hang gliding or paragliding) and launch method (PL, ST) for which they were appointed.
3. Administrators must be current Pilot or Rogallo members of USHPA.

B. Operations

1. Ground based supervisors and administrators may sign off the PL and ST launch special skill for novice (H2/P2) and higher. However the skills required for safely towing may vary according to method, glider type, and pilot experience. The Administrator should be familiar with the pilot's level of experience when instructing this launch method. It is imperative that a pilot have sufficient flying experience and the course of learning towing techniques be thorough. Not all sites and instruction methods are equal.
2. Administrators should be familiar with the towing launch required witnessed tasks for Beginner and Novice levels and with the towing instruction curriculum.
3. Administrators are required to submit accident reports for both injury and injury potential incidents. These reports go to the USHPA office and should be noted as towing related. Failure to submit accident reports may result in revocation of the appointment.

10.04 AEROTOW SUPERVISORS - AIR-TO-AIR TOWING

A. General Information

1. AeroTow Supervisors (hang gliding) are appointed by the Towing Committee during the spring or fall meetings. A majority vote of the committee is required. The term of AeroTow Supervisors is indefinite unless revoked or changed by the committee due to inactivity or performance.
2. Supervisors must be current Pilot or Rogallo members of USHPA.

B. Operations

1. Supervisors appoint AeroTow Administrators by sending a letter or appointment form to USHPA Headquarters indicating the desired appointee.
2. Supervisors are to ensure the knowledge and abilities of Administrator appointees are adequate for instructing, demonstrating, and following procedures for air-to-air towing.
3. Supervisors should be able to personally witness and be secure with an Administrator's towing operations and abilities.
4. Any accidents or complaints involving an appointee should be investigated and reported to the Towing Committee.
5. Supervisors may revoke any appointments they have made.
6. Supervisors may also issue the AeroTow (AT) special skill and the AeroTug Pilot (ATP) appointment.
7. Supervisors may restrict an appointed Administrator to only issuing the AeroTow (AT) special skill if the applicant is inexperienced with the powered AeroTug Pilot.

10.05 AEROTOW ADMINISTRATORS - AIR-TO-AIR TOWING

A. General Information

1. AeroTow Administrators are appointed by AeroTow Supervisors. Their term is indefinite unless rescinded by the appointing Supervisor due to inactivity or performance.
2. Administrators must be current Pilot or Rogallo members of USHPA

B. Operations

1. The skills required for safely towing may vary according to method, glider type, and pilot

experience. The administrator should be familiar with the pilot's level experience when instructing. It is imperative that a pilot have sufficient flying experience and the course of learning towing techniques be thorough. Not all sites and instruction methods are equal.

2. Administrators should be familiar with aerotowing instructional curriculum and guidelines.
3. Administrators may be restricted by the appointing Supervisor to sign off the AeroTow (AT) special skill only.
4. Administrators may issue the AeroTow (AT) special skill according to Part 104.11.03.
5. Administrators that possess the Aero Tug Pilot appointment may also issue the AeroTug Pilot (ATP) appointment according to Part 104.11.01.
6. Administrators are required to submit accident reports for both injury and injury potential incidents. These reports go to the USHPA office and should be noted as towing related. Failure to submit accident reports may result in revocation of the appointment.

10.06 *PARAGLIDING TOW EQIPMENT OPPERATOR (TECH)*

A. General Information

1. A tow TECH is appointed by paragliding Towing Supervisors and Administrators.
2. The TECH as the operator of the tow system is responsible for operating the system in the interest of the safety of the pilot.
3. A tow TECH need not possess any pilot ratings.

B. Must give a complete discussion of paragliding tow equipment, normal and emergency procedures, and signals between operator and pilot, in accordance with USHPA paragliding towing guidelines.

C. Must pass the TECH written exam.

D. Must observe, operate under supervision, and demonstrate safe and proper operation of tow equipment.

E. It is recommended that a TECH candidate be towed either solo or dual.

USHGA Paragliding Towing Guidelines

The USHGA Towing Committee establishes these guidelines for the sole purpose of enhancing the safety of towing paragliders.

I - PERSONNEL

A - Tow System Operator

General: The USHGA has a Special Skill rating for a paragliding tow system operator known as a tow technician (TECH). The TECH does not need to be a paraglider pilot although this is recommended. It is required that all paragliding tow system operators have this rating, or be in training for this rating under the direct supervision of a USHGA Paragliding Tow Supervisor or Tow Administrator[1]. The term TECH will be used throughout the remainder of this document to refer to the tow system operator.

Qualifications: A TECH should understand all matters concerning the towing of paragliders, including: 1) The problems associated with lockouts. 2) The problems of overtowing, such as canopy surges and structural damage. 3) The problems of applying liftoff towline tension before the canopy is properly inflated. 4) The problems of allowing the pilot to fly upwind of the tow system or the reversing pulley[2].

Special Note: When using a payout reel, it is recommended that the TECH be a separate person from the tow vehicle driver. The TECH focuses on the pilot and controls the tow system. This frees the driver to concentrate on coordinating with any traffic and controlling the vehicle's speed and direction.

Responsibilities: 1) The TECH is responsible for ensuring that the tow system is operationally ready prior to commencing each tow. This includes such things as the towline being free to spool on and off the reel, the winch or vehicle is fueled, etc. 2) The TECH is responsible for ensuring that any pedestrians and all spectators are clear of the towline prior to commencing each tow. 3) The TECH is responsible for ensuring that the canopy is ready for liftoff before applying sufficient towline tension for liftoff, following canopy inflation. 4) The TECH is responsible for ensuring that the towline tension is reduced, or eliminated as appropriate, if any of the following situations occur: (a) The towline can not or does not spool freely on or off the reel. (b) The pilot diverges from the towline track by greater than 45°. (C) The pilot's body is more than 45° in front of the paraglider. (d) If the paraglider rolls greater than 45° from level flight. (e) The pilot flies upwind of the tow system or reversing pulley[2]. 5) The TECH is responsible for safety recovering the towline after the pilot releases.

[1] A Tow Supervisor is appointed by the USHGA Towing Committee to appoint Tow Administrators. Both of these officials can conduct tow clinics for tow training and each can issue TOW and TECH ratings.

[2] A reversing or turnaround pulley can be used with a stationary winch. The pulley is anchored at the upwind end of the field, and the towline is routed from the winch, through the pulley, and back to the pilot. This allows the winch and the TECH to be located adjacent to the pilot at launch, but also requires twice as much towline.

B - Launch Director

Discussion: 1) The Launch Director is the commander of the launch, and it is recommended that this person be a USHGA Tow TECH. He or she must communicate with the pilot and the tow system operator to coordinate the launch. 2) Either the Launch Director or the TECH must supervise the pilot by radio during the tow to keep the pilot tracking with the towline to avoid lockouts. This is often a shared activity where the Launch Director directs the pilot from inflation and takeoff until airborne, and then the TECH assumes pilot supervision for the remainder of the tow. 3) A Launch Director acts as "the close-up eyes" of the TECH. This ensures, in addition to other factors, that the Launch Director will issue the ABORT command if the pilot's feet get entangled with the towline during launch. When using a stationary winch with a reversing pulley and the TECH is adjacent to the pilot, then the TECH can also act as the Launch Director. 4) When using a payout reel, the Launch Director may be the TECH riding in the tow vehicle. This assumes the towline leader length is within 300 feet (91 m), which is the USHGA recommended minimum length. The towline leader length is the length of towline that separates the tow vehicle

from the pilot prior to launch. The shorter this length, the quicker the towline angle increases and the greater the chance of a lockout occurring. 5) The Launch Director may perform as the tow system operator.

C - Pilot

General: 1) The USHGA has a Special Skill tow launch rating for paraglider pilots (TOW). This rating indicates that the pilot has the knowledge, and has successfully demonstrated the skills required for towing paragliders safely. 2) Once the pilot is airborne, the TECH and pilot must act together to avoid overtowing and lockouts.

Responsibilities 1) The pilot is responsible for inflating the canopy fully and cleanly overhead and ensuring that he or she is ready for liftoff. 2) The pilot is responsible for running during the launch to keep up with the pull of the towline while steering the paraglider toward the towline. 3) The pilot is responsible for minimizing brake usage to prevent the canopy from climbing at too steep an angle. 4) The pilot is responsible for steering to track the paraglider toward the towline to avoid a lockout This is accomplished by looking repeatedly at the canopy and using weight shift steering as much as possible. 5) The pilot is responsible for releasing from the towline at the end of the tow, or when a lockout is imminent 6) The pilot is responsible after release for avoiding the towline and it's retrieval parachute if used 7) The pilot is responsible for where the towline falls after release with respect to the safety of persons and property on the surface

Recommendations: 1) The ideal sequence for a beginner pilot to learn to tow paragliders is: (a) First observe a solo tow demonstration by the instructor to become familiar with tow flight. (b) Second, make one or more tandem tow flights as a student passenger to experience tow flight, high altitude, release actuation, canopy surge after high-tension release, and landing. (c) Third, make one or more low tow flights (approximately 50 feet (15 m) to demonstrate steering along the towline and stand-up landings without releasing, using beginner level canopies in steady light winds (less than 7 mph (11km/hr)), with no thermal activity. (d) Fourth, make repeated high tow flights, demonstrating releasing and stand-up landings into the wind with the wings level, on the same equipment, and in the same conditions. 2) Experienced pilots should learn to tow in smooth conditions on intermediate canopies, then progress to more challenging conditions and canopies in a gradual manner.

III - EQUIPMENT

A - Bridles and Releases

Requirements: 1) The bridles should be hooked by separate links or loops to the bottom of the risers, or to the harness, either above or below the harness riser attachment carabiners. 2) The bridle lines should be no more than 5116 inches (8 mm) in diameter or width. 3) An easily accessible hook knife should be carried. 4) The release should function properly with a zero tow force and at a tow force twice the breaking strength of the weak link. 5) The release should function properly with the towline pulling at 60° to either side of straight-ahead and up, or 90° down, or 180° down and back. 6) The release trigger must be within easy reach of the pilot, preferably by either hand.

Recommendations: 1) The bridle should be hooked above the carabiners for inexperienced tow pilots and below the carabiners for experienced tow pilots. 2) Bridle lines should be at least 18 inches (46 cm) long. 3) The release should contain no metal or hard plastic parts other than a grommet and steel pin. This avoids pilot injury if the release bridle "snaps-back" into the pilots face.

Discussion: 1) The bridle should not be hooked to harness carabiners because the carabiners are not designed to take side loads. They may fail, or twist and change the canopy trim. 2) Bridle attachment to the risers or harness must not apply force to the stitching during any phase of the tow in any way that would pull the stitching apart. (Load the stitching in shear not in tension.). 3) Fatter bridle lines are harder to cut in an emergency. 4) The only emergency release capability comes from a hook knife. 5) The release must be reliable in every possible situation, especially lockouts. 6) Hooking the tow bridle higher on the harness increases stability. Inexperienced pilots require more stability while experienced pilots desire more maneuverability. 7) Bridle lines that are too short can pull the harness together, thereby reducing stability. Ideally, the release should be within reach, but a close release can result in a snap-back to the pilots face. The weak link should be reachable with a hook knife.

B. Weak Links

Requirements: 1) A weak link, also known as a safety link, is required to be used on every tow flight. 2) Weak link strength should ideally be no more than 150% of the total payload weight (a range of 75% to 125% is typical).

Discussion: 1) A weak link prevents excessive tow forces from being exerted upon the paraglider, which may lead to structural damage. 2) A weak link should not be sized to break as a lockout prevention or recovery method. 3) Weak link strength is very important and ideally should be varied with the weight of the pilot. Weak links for paragliding should be weaker than with hang gliding, due to canopy surges if a line break occurs under a high tow force. A weak link that is too low in strength may break soon after launch which is also dangerous due to the fact that towing pulls the pilot in front of the canopy, and the pilot can swing forward or backward into the ground.

C - Tow Systems and Towlines

Requirements: 1) The tow system must have a means of limiting the tow force. 2) The tow system must have a means of instantly zeroing the tow force (e.g. a guillotine, machete, etc.). 3) The tow system must have a means of starting at nearly zero tow force and gradually increasing the force to the appropriate level. 4) The tow system must have a means of gradually reducing the tow force to nearly zero from any amount of tow force. 5) The towline should be attached to the spool by tape so that if the towline were pulled to the end, the towline would easily and automatically separate from the spool. 6) When a reversing pulley is used. (a) The pulley should be free to swivel to each side and to twist without binding the towline to accommodate differences in the angles between the pilot and the tow system. (b) The towline should not be able to become lodged between the pulley sheave (wheel) and the pulley block. (c) Some towline resistance method such as a retrieval parachute should be utilized to prevent the towline from the "bungee effect" of entangling itself into a knot and then jamming in the pulley sheave (wheel) because the knot is too large to pass through the pulley.

Discussion: 1) Paragliders are very sensitive to the level of tow force due to the fact that the tow force is applied well below the wing. Too much force can pull the pilot well in front of the wing which can pull the paraglider into a stall. It is also dangerous due to canopy surge in case of sudden loss of tow force such as weak link or line break, or pilot release. Thus, maximum tow force must be carefully limited while at the same time a quick elimination of tow force at the tow system end is necessary in case of a lockout 2) Towlines are typically the same as those used with hang glider towing. However, to minimize the weight on the system, the lightest possible lines are recommended.

III - OPERATIONS

A - Lockouts

General: 1) If you've ever observed a kite impacting the ground on a downward slanted trajectory, you have witnessed a lockout. The difference when towing paragliders is that the pilot will be injured or killed if the lockout is allowed to continue until impact. 2) By recognizing the warning signs of an impending lockout, the lockout can be avoided by either the pilot releasing, or by the TECH eliminating the towline force. 3) By understanding the actions that lead to a lockout, the lockout can be prevented. 4) A weak link should not be depended upon to break if a lockout occurs.

Warning Signs of an Impending Lockout 1) A lockout could occur if the pilot is pulled out in front of the paraglider more than 45°. 2) A lockout could occur if the flight path of the paraglider diverges from the direction of the towline force by greater than 45°. 3) A lockout could occur if the paraglider rolls past an angle of 45° from level flight.

Actions That Lead to a Lockout: 1) The TECH applies enough towline force that the pilot is pulled greater than 45° in front of the paraglider. 2)The pilot slows the paraglider by excessive braking during the tow so that the paraglider is greater than 45" behind the pilot. 3) The pilot allows the paraglider to diverge from the direction of the towline by more than 45°. 4) The pilot allows the canopy to roll greater than 45° from level flight.

Actions for Recovery from a Lockout: 1) The TECH should significantly reduce the tow force. The TECH should consider instantly zeroing the tow force as long as the pilot is high enough to avoid pendululming into the ground or

an obstacle. 2) The pilot should either: (a). immediately release from the towline (The pilot should anticipate complications due to pendulum swing and canopy collapse due to this sudden loss of tow force) or (b) the pilot should deploy his or her reserve parachute.

B - Communications

Requirements: 1) Radios are recommended to communicate among the pilot, the TECH, and the Launch Director 2) Visual signals are required and are to be mutually agreed upon among the pilot, TECH and Launch Director prior to operations. These signals may not be needed as long as radio communication is reliable, but using them in addition to the radios confirms the communication and keeps them fresh in everyone's mind. 3) The recommended visual signals are: (a) Pilot to TECH 1) Take up slack-pilot extends one leg out to the side and back into the center. 2) Ready to launch-pilot makes a forward bend at the waist. 3) Increase towline tension -pilot flaps both elbows or arms up and down. 4) Decrease towline tension-pilot scissors both legs out to the sides and back into the center. 5) Imminent release-pilot spreads both legs out to the sides and holds them there. (b) TECH to Pilot
1) Release-TECH significantly reduces towline tension. *Note: Voice commands must be distinctive, therefore the terms "GO", "NO', and "TOW' should not be used because they can be mistaken for one another. 'LAUNCH' and "ABORT" are recommended.*

C - Launch Preparation

General: 1) It is highly recommended that a pre-launch checklist be used. An example is listed below. 2) The Launch Director should assistance to the pilot when preparing for launch including canopy layout, testing the release, and thoroughly utilizing the pre-launch checklist 3) When the pilot is performing a reverse inflation, it is recommended that the pilot turn to face the canopy so that the towline is on the opposite side of the harness from the reserve deployment handle. 4) At least two windsocks should be used when towing. (a) One at the launch so it can be seen by the Launch Director and by the pilot during either a forward or reverse inflation. (b) One by the TECH at the tow system end of the towline. In the case of a payout reel the windsock should be mounted on the vehicle where both the TECH and the driver can see it.

Pre-Launch Checklist: 1) Paraglider and harness preflighted? 2) Canopy layout good and lines clear?
3) Leg loops, waist strap and carabiners secured? 4) Bridle symmetrically connected and release properly set?
5) Weak link condition good and strength appropriate? 6) Towline retrieval parachute properly connected?
7) Pilot's radio check (set the volume moderately loud for good in-flight reception)? 8) Towline free and clear on reel? 9) Radio check among all personnel? 10) Wind speed and direction good? 11) Ground and air traffic clear? 12) Command: TAKE-UP SLACK!
Command: READY TO LAUNCH!

D - Tow Procedure : 1) The TECH should take-up slack gently so that the canopy is not disturbed until the pilot is ready to launch. This is particularly important in a no-wind or a light wind forward inflation when the canopy layout is more critical. 2) When the launch signal is given, the TECH should merely apply light towline tension until the canopy is successfully inflated. Continuous towline tension assures that the pilot won't trip over the towline during inflation. 3) Once the canopy is inflated properly, the towline force should be increased gradually to the normal amount. 4) Towline force should be dropped to zero when the paraglider diverges from the towline direction by greater than 45° or when the paraglider reaches a point of 60' up from the tow system or reversing pulley. 5) Once release takes place, the towline should be reeled in immediately to avoid interfering with the pilot or contacting ground objects or people.

USHGA Paragliding Surface Towing Program

The USHGA Towing Committee establishes these guidelines to enhance the safety of towing paragliders.

I. PERSONNEL

A. Tow System Operator (TECH)

General

The USHGA has a Special Skill rating for a paragliding tow system operator known as a tow technician (TECH). The TECH does not need to be a paraglider pilot although this is recommended. It is required that all paragliding tow system operators have this rating, or be in training for this rating under the direct supervision of a USHGA Paragliding towing Supervisor or Administrator [1]. The term TECH will be used throughout the remainder of this document to refer to the tow system operator.

Qualifications

A TECH should understand all matters concerning the towing of paragliders, including:

1. The problems associated with Lockouts.
2. The TECH error of Over-towing, which can lead to Lockout, canopy surges and paraglider line stretch.
3. The problems of applying liftoff towline tension before the canopy is properly inflated.
4. The problems of allowing the pilot to fly upwind of the tow system or the reversing pulley [2].

Special Note: When using a payout reel, it is recommended that the TECH be a separate person from the tow vehicle driver. The TECH focuses on the pilot and controls the tow system. This frees the driver to concentrate on coordinating with any surface or air traffic and controlling the vehicle's speed and direction.

Responsibilities

The TECH is responsible for:

1. Ensuring that the tow system is operationally ready prior to commencing each tow. This includes such things as the towline being free to spool on and off the reel, the winch or vehicle is fueled, the towline-severing device is functioning properly or is readily available, etc.
2. Ensuring that any pedestrians, all spectators, and any aircraft are clear of the towline prior to commencing each tow.

3. Ensuring that the canopy is ready for liftoff before applying sufficient towline tension for liftoff, following canopy inflation.
4. Ensuring that the towline tension is reduced or the towline is severed, if any of the following situations occur.
   a. The towline cannot or does not spool freely on or off the spool
   b. The paraglider's flight path diverges from the direction of the towline pull by greater than 45°
   c. The pilot's body is more than 45° in front of the paraglider (Over towing)
   d. The paraglider rolls or banks greater than 45° from level flight
   e. The pilot flies upwind of the tow system or reversing pulley[2]
5. Safely recovering the towline after the pilot releases.

Note 1 A Tow Supervisor is appointed by the USHGA Towing Committee to appoint Tow Administrators. Both of these officials can conduct tow clinics for tow training and each can issue ST and TECH ratings.

Note 2 A reversing or turn-around pulley can be used with a stationary winch or a static line. The pulley is anchored at the upwind end of the field, and the towline is routed from the winch or vehicle, through the pulley, and back to the pilot. This allows the winch and the TECH to be located adjacent to the pilot at launch when using a stationary winch, and allows the driver to observe the pilot and the roadway simultaneously, but use of a reversing pulley requires twice as much towline.

B. Launch Director

1. The Launch Director is the commander of the launch, and it is recommended that this person be a USHGA Tow TECH. He or she must communicate with the pilot and the tow system operator to coordinate the launch.
2. Either the Launch Director or the TECH must supervise the pilot by radio during the tow to keep the glider tracking with the towline to avoid Lockouts. This is often a shared activity where the Launch Director directs the pilot from inflation and takeoff until airborne, and then the TECH assumes pilot supervision for the remainder of the tow.
3. A Launch Director acts as "the close-up eyes" of the TECH. This ensures, in addition to other factors, that the Launch Director will issue the ABORT command if the pilot's feet get entangled with the towline during launch. When using a stationary winch with a reversing pulley and the TECH is adjacent to the pilot, then the TECH can also act as the Launch Director.
4. When using a payout reel, the Launch Director may be the TECH riding in the tow vehicle. This assumes the towline leader length is less than 300 ft (90 m), which is the USHGA recommended minimum length. The towline leader length is the length of towline that separates the tow vehicle from the pilot prior to launch. The shorter this length, the quicker the towline angle increases and the greater the chance of a Lockout occurring.
5. The Launch Director may perform as the TECH.

C. Pilot

General

1. The USHGA has a Surface Tow (ST) Special Skill tow launch rating for paraglider pilots. This rating indicates that the pilot has the knowledge, and has successfully demonstrated the skills required for towing paragliders safely, whether using a stationary winch or a payout reel.
2. Once the pilot is airborne, the TECH and pilot must act together to avoid over towing and Lockouts.

Responsibilities

1. The pilot is responsible for inflating the canopy fully and cleanly overhead and ensuring that he or she is ready for liftoff.
2. The pilot is responsible for running during the launch to keep up with the pull of the towline while steering the paraglider toward the towline.
3. The pilot is responsible for minimizing brake usage to prevent the canopy from climbing at too steep an angle.
4. The pilot is responsible for steering to track the paraglider toward the towline to avoid a Lockout. This is accomplished by looking repeatedly at the canopy and using weight shift steering as much as possible.
5. The pilot is responsible for releasing from the towline at the end of the tow, or when a Lockout is imminent.
6. The pilot is responsible after release for avoiding the towline and it's retrieval parachute if used.
7. The pilot is responsible for where the towline falls after release with respect to the safety of persons and property on the surface.

Tow Training Recommendations

1. The ideal sequence for a beginner pilot to learn to tow paragliders is:
   a. First observe a solo tow demonstration by the instructor to become familiar with tow flight.
   b. Second, make one or more tandem tow flights as a student passenger to experience tow flight, high altitude, release actuation, canopy surge after high-tension release, and landing.
   c. Third, make one or more low, tow flights (less than 50 ft or 15 m) to demonstrate steering to track the towline, and stand-up landings without releasing, using beginner level canopies in light, steady winds (less than 7 mi/hr or 11 km/hr), with no thermal activity.
   d. Fourth, make repeated high tow flights, demonstrating releasing and stand-up landings into the wind with the wings level, on the same equipment, and in the same conditions.

2. Experienced pilots should learn to tow in smooth conditions on intermediate canopies, then progress to more challenging conditions and canopies in a gradual manner.

II. EQUIPMENT

A. Bridles and Releases

Requirements

1. The bridles should be hooked by separate metal links or webbing loops to the bottom of the risers, or to the harness, either above or below the harness riser attachment carabiners.
2. The bridle lines should be no more than 5/16 in (8 mm) in diameter or width.
3. The pilot should carry an easily accessible hook knife and another should be immediately accessible to the TECH.
4. The release should function properly with a zero tow force and at a tow force twice the breaking strength of the weak link.
5. The release should function properly with the towline pulling at:
   a) 60° to either side of straight-ahead and up,
   b) 90° down, or
   c) 180° down and back.
   d) The release trigger must be within easy reach of the pilot, preferably by either hand.

Recommendations

1. The bridle should be hooked above the carabiners for inexperienced tow pilots to enhance stability and below the carabiners for experienced tow pilots too enhance weight-shift.
2. Bridle lines should be at least 18 in (45 cm) long.
3. The release should contain no metal or hard plastic parts other than a grommet and steel pin. This avoids pilot injury if the release bridle "snaps-back" into the pilot's face.

Discussion

1. The bridle should not be hooked to harness carabiners because the carabiners are not designed to take side loads, especially across the gate. They may fail, or twist and change the canopy trim.
2. Bridle attachment to the risers or harness must not apply force to the stitching during any phase of the tow in any way that would pull the stitching apart. (Load stitching in shear not in tension.).
3. Fatter bridle lines are harder to cut in an emergency.
4. The only emergency release capability comes from a hook knife.

5. The release must be reliable in every possible situation, especially Lockouts.
6. Hooking the tow bridle higher on the harness increases stability. Inexperienced pilots require more stability while experienced pilots desire more weight-shift maneuverability.
7. Bridle lines that are too short can pull the harness together, possibly reducing stability. Ideally, the release should be within reach, but a close release can result in a snap-back to the pilot's face. The weak link should be reachable with a hook knife.

B. Weak Links

Requirements

1. A weak link, also known as a *safety link*, is required to be used on every tow flight.
2. Weak link strength should ideally be no more than 150% of the total payload weight (1.5 Gs). A range of 75% to 125% is typical (0.75 – 1.25 Gs).

Discussion

1. PURPOSE - A weak link prevents excessive tow forces from being exerted upon the paraglider, which may lead to structural damage.
2. NOT FOR LOCKOUT PREVENTION - A weak link should not be sized to break as a Lockout prevention or recovery method.
3. NARROW RANGE - Weak link strength is very important and ideally should be varied with the weight of the pilot. Weak links for paragliding should be weaker than with hang gliding, due to canopy surges if a line break occurs under a high tow force. A weak link that is too low in strength may break soon after launch which is also dangerous due to the fact that towing pulls the pilot in front of the canopy, and the pilot can swing forward or backward into the ground.

C. Tow Systems and Towlines

System Types

There are three general types of tow systems:

1. Static Line
   a. Uses a fixed length of line attached to a moving vehicle.
   b. Towline tension is controlled solely by vehicle speed.
   c. Towline tension must be monitored by TECH with pressure gauge.
   d. Requires lake or smooth roadway or runway.
   e. Requires the greatest TECH skill.
   f. Reversing pulley can be used.

2. Stationary Winch
   a. Winch is stationary during operations.
   b. Towline is rewound onto spool as the tow progresses.
   c. TECH must be able to reduce rewind power and allow spool to payout towline.
   d. Can be used in rough fields.
   e. Reversing pulley can be used.

3. Payout Reel
   a. Machine is mounted on a moving vehicle
   b. Towline pays out from reel as tow progresses
   c. Requires longest operating distance.
   d. Reversing pulley cannot be used.

Requirements

1. The tow system must have a means of limiting the tow force.
2. The tow system must have a means of instantly zeroing the tow force (e.g. a guillotine, machete, hook knife, etc.).
3. The tow system must have a means of starting at nearly zero tow force and gradually increasing and decreasing the force to the appropriate level.
4. The tow system must have a means of gradually reducing the tow force to nearly zero from any amount of tow force.
5. The towline should be attached to the spool by tape so that if the towline were pulled to the end, the towline would easily and automatically separate from the spool.
6. When a reversing pulley is used:
   a. The pulley should be free to swivel to each side and to twist without binding the towline to accommodate differences in the angles between the pilot and the tow system.
   b. The towline should not be able to become lodged between the pulley sheave (wheel) and the pulley block.
   c. Some towline resistance method such as a retrieval parachute should be utilized to prevent the towline from the "bungee effect" of entangling itself into a knot and then jamming in the pulley sheave (wheel) because the knot is too large to pass through the pulley.

Discussion

1. Paragliders are very sensitive to the level of tow force due to the fact that the tow force is applied well below the wing. Too much force can pull the pilot well in front of the wing, which can pull the paraglider into a stall. It is also dangerous due to canopy surge in case of sudden loss of tow force such as weak link or line break, or pilot release. Thus, maximum tow force must be carefully limited while at the same time a quick elimination of tow force at the tow system end is necessary in case of a Lockout.

2. Towlines are typically the same as those used with hang glider towing. However, to minimize towline drag in-flight, the lightest possible lines are recommended such as 7/64 in (3 mm) Spectra (Dyneema).

III. OPERATIONS

A. Lockouts

General

1. If you've ever observed a kite impacting the ground on a downward slanted trajectory, you have witnessed a Lockout. The difference when towing paragliders is that the pilot will be injured or killed if the Lockout is allowed to continue until impact.
2. By recognizing the warning signs of an impending Lockout, the Lockout can be avoided by either the pilot releasing, or by the TECH eliminating the towline force.
3. By understanding the actions that lead to a Lockout, the Lockout can be prevented.
4. A weak link should not be depended upon to break if a Lockout occurs.

Warning Signs of an Impending Lockout

1. A Lockout could occur if the pilot is pulled out in front of the paraglider more than 45°.
2. A Lockout could occur if the flight path of the paraglider diverges from the direction of the towline force by greater than 45°.
3. A Lockout could occur if the paraglider rolls or banks past an angle of 45° from level flight.

Actions That Lead to a Lockout

1. The TECH applies enough towline force that the pilot is pulled greater than 45° in front of the paraglider.
2. The pilot slows the paraglider by excessive braking during the tow so that the paraglider is greater than 45° behind the pilot.
3. The pilot allows the paraglider's heading to diverge from the direction of the towline by more than 45°.
4. The pilot allows the canopy to roll or bank greater than 45° from level flight.

Actions for Recovery from a Lockout

1. The TECH should immediately and significantly reduce the tow force. The TECH should consider instantly zeroing the tow force, including cutting the towline, as long as the pilot is high enough to avoid pendululming into the ground or an obstacle.

2. The pilot should immediately release from the towline. Due to the sudden loss of tow force when releasing under high towline tension, the pilot should anticipate managing the momentum of the climbing turn away from the towline followed by the rapid loss of airspeed that will immediately follow. The pilot is reminded that even if towline separation is not possible, deploying the reserve parachute will slow the descent and thereby soften an impending impact and probably prevent more serious injuries or possibly prevent a fatality.

B. Communications

Requirements

1. Radios are recommended to communicate among the pilot, the TECH, and the Launch Director.
2. Visual signals are required and are to be mutually agreed upon among the pilot, TECH, and Launch Director prior to beginning operations. These signals may not be needed as long as radio communication is reliable, but using them in addition to the radios confirms the communication and keeps them fresh in everyone's mind.
3. The recommended visual signals are:

Pilot to TECH	
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 and holds them there
TECH to Pilot	
Release	TECH significantly reduces towline tension

Terminology Note

Voice commands must be distinctive, therefore the terms "GO", "NO", and "TOW" should not be used because they can be mistaken for one another. "LAUNCH" and "ABORT" are recommended.

C. Launch Preparation

General

1. It is highly recommended that a pre-launch checklist be used. An example is listed below.
2. The Launch Director should assist the pilot when preparing for launch including canopy layout, testing and preflight the release, and thoroughly utilizing the pre-launch checklist.
3. When the pilot is performing a reverse inflation, it is recommended that the pilot turn to face the canopy so that the towline is on the opposite side of the harness from the reserve deployment handle.
4. At least two windsocks should be used when towing.
   a. One at the launch so it can be seen by the Launch Director and by the pilot during either a forward or reverse inflation.
   b. One by the TECH at the tow system end of the towline. In the case of a payout reel, the windsock should be mounted on the vehicle where both the TECH and the driver can see it.

Pre-Launch Checklist

1. Paraglider and harness preflighted?
2. Hook knives accessible by pilot and TECH?
3. Canopy layout good and lines clear?
4. Leg loops, waist strap and carabiners secured?
5. Bridle symmetrically connected and release properly set?
6. Weak link condition good and strength appropriate?
7. Towline retrieval parachute properly connected?
8. Pilot's radio check (set the volume moderately loud for good in-flight reception)?
9. Towline free and clear on reel?
10. Radio check among all personnel?
11. Wind speed and direction good?
12. Ground and air traffic clear?
13. Command signal: TAKE-UP SLACK!
14. Command signal: READY TO LAUNCH!

D. Tow Procedure

1. The TECH should take-up slack gently so that the canopy is not disturbed until the pilot is ready to launch. This is particularly important in a no-wind or a light wind forward inflation when the canopy layout is more critical.
2. It is recommended that the pilot brace himself or herself against the towline pull as the towline is pre-tensioned to avoid disturbing the canopy layout and to ensure that the towline lifts off the ground, indicating that it's free of ground snags. When the launch signal is given, the TECH should merely apply light towline tension until the canopy is successfully inflated. Continuous towline tension assures that the pilot won't trip over the towline during inflation. Once the canopy is inflated properly, the towline force should be increased gradually to the normal amount.
3. Towline force should be dropped to zero when the paraglider heading diverges from the towline direction by greater than 45° or when the paraglider reaches a point of 60° up from the tow system or reversing pulley.
4. Once release takes place, the towline should be rewound immediately to avoid interfering with the pilot or contacting ground objects or people.

E. Step-Towing

1. Step towing is a method of increasing the altitude gained on tow within a limited operating area. When using a payout reel, the tow vehicle simply moves around an oval or circle pattern. With a stationary winch, the pilot remains connected to the towline after the initial upwind leg, but the towline is allowed to payout while the pilot turns and flies the downwind leg. The pilot then turns back upwind and the tow continues for multiple laps. The length of the towline is the only limit on the number of laps or repetitions possible.
2. Step towing is ideal for calm wind conditions, both at the surface and aloft.
3. Step-towing greatly increases the risk of towing because if the towline prematurely tensions while the glider is headed away from the towline, the glider can surge forward and beneath the pilot with probable disaster.
4. Therefore, step towing should only be conducted between an experienced pilot and an experienced TECH.
5. The towline can prematurely tension in four ways:
   a) Towline slack can snag on ground objects
   b) The towline spool locks up and stops feeding towline to the pilot
   c) The towline jams in the reversing pulley and stops feeding towline to the pilot
   d) The TECH doesn't properly coordinate the timing of de-tensioning and re-tensioning the towline with the glider's heading
4. The TECH must begin feeding towline as the pilot begins the downwind turn and re-tension the towline as the pilot completes the upwind turn

FAA TOW EXEMPTION No. 4144K

INTRODUCTION

Pursuant to the authority contained in Sections 313(a) and 601(c) of the Federal Aviation Act of 1958, delegated to me by the Administrator (14 CFR 11.53), the individuals authorized by the USHGA are granted an exemption for the FAR's to the extent necessary to allow unpowered ultralight vehicles to be towed aloft by powered ultralights.

The exemption is subject to the following limitations:

1. Each operation must comply with all sections of Part 103 except #103.1(b) of the FAR.
2. No charge, assessment or fee may be made for the operation of the towing ultralight except the actual expenses of the specific flight.
3. Both pilots on both ultralights must possess a current pilot rating issued by the USHGA.
4. For identification purposes, the USHGA shall issue an individual authorization to each person allowed to conduct operations under this exemption. Each authorization shall include an identification number and a copy of this exemption. The USHGA shall have a procedure to rescind this authority when needed.
5. Operations conducted under this exemption shall be in accordance with the safety and certification rules and guidelines, as amended, established by the USHGA, including those specified in paragraphs 1 through 12 in the petitioners supportive information.
6. Each individual who operates an ultralight vehicle under the authority of this exemption must be familiar with the provisions contained herein and must have in his or her personal possession a copy of the authorization issued by the USHGA and a copy of this exemption. These documents shall be presented for inspection upon request by the FAA.

This exemption terminates on June 30th, 2008, unless sooner superseded or rescinded.

Daniel C. Beaudette
Director of Flight Operations
Issued in Washington, D.C. on October 25, 1984

The following requirements must be understood and adhered to:

1. Both vehicles (powered and unpowered ultralight) must meet the vehicle standards of Part 103.
2. Both vehicles must meet the requirements of the USHGA Towing standards.
3. While towing, both vehicles may be used for recreational purposes only.
4. The pilot of the powered ultralight vehicle must possess and have in his possession a current tow rating issued by the USHGA.
5. The pilot of the unpowered ultralight vehicle must possess and have in his possession a current pilot rating issued by the USHGA. This rating shall be at least a USHGA Intermediate (level 3) for a recreational pilot and a USHGA Novice (level 2) for a student pilot under the supervision of a USHGA certified instructor.
6. The unpowered ultralight (hang glider) may be used for two place instructional purposes if the instructor possesses a current USHGA instructor rating and is operating under the conditions of the two-place exemption.
7. Prior to a students first flight in a towed ultralight (hang glider), the pilot of the powered ultralight and the instructor must inform the student that instruction under tow is conducted under an exemption granted to the USHGA by the FAA.
8. The instructor must keep written record of all operations conducted under this exemption. The record shall include the students name, the date and the location of the instruction. The record must be maintained for 12 calendar months. The instructors shall present this record for inspection upon reasonable request by the USHGA or the FAA.
9. The instructor shall notify the USHGA within 30 days of any accident occurring while operating under this exemption. This information shall be made available upon reasonable request by the FAA.
10. The structural integrity of the tow hitch and tow line must be substantiated in accordance to USHGA standards and recorded in the tow launch vehicle records by the owner.
11. The operational capabilities of the powered ultralight to tow and release a hang glider satisfactorily must be demonstrated in an assigned test area under actual operational conditions to a USHGA observer and be duly recorded in the tow vehicle records.
12. Both towed and towing pilots must obey operational procedures set forth in the USHGA Towing standards.

