CSA
WINCH
PROCEDURES

Cover photo courtesy Brian Lewis

TABLE OF CONTENTS

1. SCOPE

This manual is a guide to winch procedures unique to Owl Canyon Gliderport**. It is not a ground launch training syllabus or text**. A pilot who is training for a ground launch endorsement is expected to use Derek Piggott's *Ground Launch* as a primary text. The *CSA Winch Syllabus* should be used as a training guide. In particular, the *CSA Winch Syllabus* contains training standards and qualifications for pilots, winch drivers, winch captains, and other persons involved in winch operations. Where such standards are also mentioned in this document, the *Syllabus* is the final authority.

2. REFERENCES

Other sources of winching information:

Ground Launch, by Derek Piggott (available at http://www.dpflying.com/products.html)

BGA Winch Operators' Manual

BGA Instructors' Manual

American Soaring Handbook, Chapter 3

Soaring Flight Manual

The Joy of Soaring, by Carle Conway

Tost Winch Manual

CSA Winch Syllabus

CSA Flight Rules

3. WINCH DESCRIPTION

The CSA winch is a 1977 Chevy 350 V-8 with a four-barrel carburetor and a 3-speed automatic transmission. The operator sits in an enclosed cage with the engine in front of him and the axle and differential behind him. Although there is only one cable drum, both brake drums remain on the axle, so both ends of the axle are areas to avoid. The hydraulic hand brake operates both brake drums. The spider gear in the differential is locked, so the hubs turn in the same direction at the same speed. Since the drivetrain layout is the same as for a car, the drum turns in the same direction as the rear wheels of a car and the "take-up" side of the drum is on the bottom. A set of four small rollers guide the cable onto the drum, which is narrow enough that no level-wind mechanism is necessary. Bolt cutters serve in place of a guillotine. (As long as no guillotine is fitted to the winch, an observer is required to assist the driver in the event of a release failure. See Section RELEASE FAILURE.

The cable used on the winch is generally 4.5mm galvanized stranded cable (this may vary). When new, the breaking strength of the cable is in excess of 3000 pounds, far stronger than needed for a launch. This cable almost never breaks during a launch unless it has been mishandled, poorly spliced, or a splice has become worn. Splices are made with copper swages and a swaging tool. Shagging the cable on a grassy surface will reduce the abrasion.

The winch controls consist of a key-switch ignition, hand throttle, choke, hydraulic hand brake, and transmission gearshift lever. The gearshift positions are park, reverse, neutral, drive, and second, with a lock-out gate to prevent putting the transmission in reverse or park during the launch, and a stop to prevent using low gear. This means that in normal operation the gearshift lever is either against the forward stop (second) or against the lock-out gate (neutral). Launches are normally done in second gear and shagging in neutral. No drag brake is provided for shagging. Gauges include speedometer, temperature, hour meter, oil pressure, fuel level, and tachometer. The list of standard equipment is too long to mention here but includes a cigarette lighter, flow-through ventilation, and ten-tone paint.

The particular aspects of this winch that bear particular attention during training and operation include:

- lack of a guillotine
- lack of power for heavy gliders without a headwind
- no drag brake to limit unspooling tendency

4. CREW ROLES

The following roles are required to be filled during any winch operation. Some rotation between the roles is allowed as long as all qualifications are met and the handoffs are coordinated with the Winch Captain. Endorsements for any of these roles must be entered on the member's pilot card in the office to be valid.

Minimum Required Crew:

- Winch Captain
- Winch Operator
- Wing Runner (Winch Captain may perform this duty)
- Pilot

Conditionally-Required Crew:

- Winch Observer (if no guillotine is functional)
- Shag Driver (if available – Winch Operator or Winch Observer may perform this duty)
- GOD (if concurrent winch/aerotow operations are planned)
- Flagger (if radios are not in use for signaling; Winch Captain may perform this duty)

4.1 WINCH CAPTAIN

The Winch Captain is responsible for the overall organization of the operation. When someone asks "Who's in charge?", this is who answers the call. He or she is expected to spend the bulk of the time at the glider end of the operation. While not prohibited from trading roles for short periods (such as to take a flight), this must be kept to a minimum. Each person agreeing to act as Winch Captain must agree to do it for at least half a day.

Only members who are endorsed by the CSA Board of Directors may act as Winch Captains. This endorsement must appear on the member's CSA pilot card. Persons desiring to obtain this endorsement should make their case to a winch-qualified CSA instructor or Winch Captain.

The Winch Captain will wear a fluorescent yellow vest labeled "**WINCH CAPTAIN**" so the other crew members and newcomers can identify who is in charge. This vest is kept in the **WINCH KIT**.

The duties of the Winch Captain include:

- Consulting the tug pilot if concurrent aerotow/winch operations are planned.
- Organizing a pilot's meeting.
- Ensuring that every crew member is qualified to act in their role.
- Briefing any newcomers.
- Coordinating all role changes among the crew.
- Logging all flights.
- Supervising glider-end procedures, including making sure checklists are followed
- Generally being on the lookout for safety and efficiency issues.

See Section WINCH CAPTAIN CHECKLISTS for checklists to guide the Winch Captain.

4.2 WINCH OPERATOR

The duties of the Winch Operator include:

- Performing the daily inspection on the winch
- Providing launches as described in this document
- Supervising shagging of winch cable
- Training another winch operator, if available, and logging that training
- Logging all flights
- Logging all maintenance squawks

Only members who have met the requirements of the CSA Winch Syllabus may act as Winch Operators. They must have this endorsement on their CSA pilot card. See Section WINCH OPERATOR CHECKLISTS for checklists.

4.3 WINCH OBSERVER/TRAINEE

In the role of Winch Observer, this crew member's duty is to assist in the communication between the Winch Driver and the other crew members. In the event of a release failure and in the absence of a

functional guillotine, the Winch Observer's duty is to use the bolt cutters to cut the cable after the Winch Operator has stopped the cable.

In the role of Winch Trainee, the crew member's duty, in addition to those above, is to learn how to operate the winch and obtain an endorsement to act as Winch Operator. See the *CSA Winch Syllabus* for the training requirements.

Winch Observers/Trainees must be CSA members.

4.4 SHAG DRIVER

The Shag Driver's responsibility is to retrieve the cable from the winch end of the field to the glider end as safely and efficiently as possible.

Shag Drivers must be qualified Winch Operators or under the direct supervision of the Winch Operator with experience in driving a vehicle with a manual transmission.

No other endorsement is required.

4.5 WING RUNNER

The Wing Runner's responsibility is to hook up the cable to the glider, watch for ground and air traffic, and level the wings.

Any CSA member may act as Wing Runner. A non-member may perform the Wing Runner's tasks if closely supervised by a Wing Runner or Winch Captain. The Winch Captain may fill the Wing Runner role (except if already acting as Flagger).

4.6 FLAGGER

If the primary means of communicating between the winch and the glider end is not by radio, a Flagger is required. The Flagger's duty is to send correct and timely flag signals to and from the winch.

Any CSA member may act as Flagger. A Flagger may supervise a non-member in performing the Flagger's tasks. The Winch Captain may fill the Flagger role (except if already acting as Wing Runner).

4.7 PILOT

This includes instructors, students, and non-student pilots. The Pilot's role is to use these procedures to effect a safe launch. Only CSA members may act as Pilots in the winch operation. Pilots must meet the requirements found in the *CSA Flight Rules* and *CSA Winch Syllabus* and have an endorsement recorded on their pilot card.

4.8 GOD

If concurrent aerotow/winch operations are to take place, a Ground Operations Director is required. GOD's role is to oversee the safe flow of traffic between the hangar area and the launch points.

4.9 OTHER CREW

Any members who wish to take part in the winch operation, even if only to observe, are expected to either participate in the daily pilots' meeting or to receive a briefing from the Winch Captain upon their arrival.

4.10 ALL CREW

All members are expected to be heads-up when involved in the winch operation. Gabbing and not noticing what's going on with the shag or the traffic pattern are common problems. It is everyone's duty to be vigilant. If a member sees a potential problem, that member is expected to exercise a veto over the launch, and all other members are expected to respect that veto. The Winch Captain is authorized to override any single member's veto after discussion with the entire crew.

5. DEPLOYING THE WINCH

See Section WINCH OPERATOR CHECKLISTS.

6. COMMUNICATIONS

Due to the logistics and distances involved in a winch operation, clear and reliable signals are essential. Visual signals are reliable but limited in the variety of messages they can transmit. Radios can make an operation much more efficient, but may suffer from reliability problems. They are also vulnerable to breakdown in communication discipline, potentially adding to the confusion at critical times. At the winch, it will be hard to hear a radio when the winch is at full power. In the interest of maintaining reliable radios, CSA shall maintain a set of utility radios specifically for sending the critical launch signals. Under normal conditions, these radios will be the primary means of sending signals, rather than flags. It is the Winch Captain's responsibility to assess the condition of the radios before the pilots' meeting. If the radios are inoperative, the operation shall revert to the use of flags.

6.1 COMMUNICATION EQUIPMENT

6.1.1 FLAGS

Each end of the operation is equipped with 3-foot square fluorescent orange flag on a long handle. These are required equipment if the utility radios are not functional.

6.1.2 AIR-BAND RADIOS

Often, only the gliders contain air-band radios. The main purpose of air-band radios is to announce launches and landings to any other air traffic. However, if there is no other flying activity besides the winch activity, air-band radios are not required in the gliders. The Winch Captain must be equipped with an air-band radio if there is any likelihood of any non-winch air traffic. Air-band radios are also useful for conveying the pilot's assessment of the launch quality to the Winch Captain while airborne after release.

To avoid frequency congestion, air-band radios should not be used for long discussions or coordinating the logistics of the operation. When utility radios are in use, they shall be used for all winch-to-launch point radio communications.

6.1.3 UTILITY RADIOS

When the operation is using utility radios (as decided by the Winch Captain), the Winch Operator, Shag Driver, and Winch Captain must all be equipped with them.

6.2 MESSAGE TYPES AND DELIVERY

Message	From	Delivery Method			Response
		Visually	By Utility Radio Note: the receiver of the message should acknowledge receiving it	By Air-band Radio	
Winch standing by	Winch Operator	Winch flag up	"Launch point, winch is ready."		Winch operator waits ***Take Up Slack*** message. Wing Runner permitted to attach cable at pilot's direction. Shag Driver permitted to pull cable.
Winch not ready	Winch Operator	Winch flag down	"Launch point, winch is down for <purpose>"		Winch operator makes winch ready. Launch and shag crew must not move cable; wait for ***Winch Standing By***.
Glider not ready	Launch Point	Launch flag down			Launch crew readies glider. Winch crew waits for ***Take Up Slack***.
Take up slack	Launch Point	Launch flag up	"Winch, take up slack for glider <callsign>, take up slack for glider <callsign>."		Winch operator performs launch checklist, takes up slack. Pilot has already completed checklist. Flagger gives ***Go*** signal when slack is out.

Message	From	Delivery Method			Response
		Visually	By Utility Radio Note: the receiver of the message should acknowledge receiving it	By Air-band Radio	
Go	Winch Captain or Flagger	Launch flag waving in figure-8	"Winch, go, go, go."		Winch operator performs final check; launch.
Increase power	Pilot	Lower nose, or rock wings (discouraged)		"Winch, faster, faster, faster." (optional)[1]	Winch operator applies 25% more power, if available.
Reduce power	Pilot	Wag tail		"Winch, slower, slower, slower." (optional)[1]	Winch operator applies 25% less power.
Abort	Winch Captain or Flagger	Launch flag dropped to ground.	"Winch, stop, stop, stop."		Winch operator cuts power to avoid entanglement. If still stationary, Wing Runner keeps wings level until cable is detached. Pilot pulls release; if airborne, maintains flying speed and lands.
Proceed with shag	Winch Operator	Winch flag up	"Shag, proceed."		Winch operator starts engine, monitors cable. Shag Driver slowly accelerates, then maintains constant speed.

[1] Assumes winch has air-band radio and headphones.

Message	From	Delivery Method			Response
		Visually	By Utility Radio Note: the receiver of the message should acknowledge receiving it	By Air-band Radio	
Stop shag	Winch Operator	Winch flag down	"Shag, stop, stop, stop."		Winch operator makes sure Shag Driver will wait for ***Proceed*** signal, then fixes cable. Shag Driver comes to a stop with light braking, sets brake, gets out of car, waits for ***Proceed*** signal.
Proceed slowly with shag	Winch Operator	Winch flag horizontal	"Shag, go slowly."		Shag Driver proceeds at walking speed and waits for normal ***Proceed*** signal.
Launch Imminent	Pilot			"Owl Canyon traffic, glider <callsign> winch launch in 30 seconds; winch launch in 30 seconds."	

6.3 AIRBORNE SIGNALS FROM GLIDER TO WINCH

6.3.1 LOWERED NOSE / ROCKING WINGS

Increase power.

The pilot will lower the nose significantly. The nose could in extreme cases be lowered to the normal glide attitude (nose below horizon) to maintain airspeed. Once the pilot has obtained sufficient speed, he will raise the nose again.

The winch operator should respond by increasing the power immediately by approximately 50%, or as his or her judgment dictates.

An obsolete signal is rocking the wings. While the use of this signal may get you the desired response, its use is discouraged. This is a difficult signal to deliver unambiguously because adverse yaw at low airspeed causes the glider to yaw as well as roll. At low altitudes, it has the disadvantage of putting more demand on a wing already too close to stalling, and it distracts the pilot. A good wing-rock signal needs

enough roll that the winch crew will ignore any coupled yaw. And remember that the winch crew is looking at the bottom of the glider, so a rolling motion is hard to see.

Lowering the nose delivers a less potentially-ambiguous signal to the winch operator and gives the pilot the advantage of being better able to maintain flying speed if it turns out that the winch is unable to respond to the signal. One disadvantage to lowering the nose is that a speed-limited winch may not be able to "catch up" to the glider once the glider lowers the nose and reduces the kiting effect. With such a winch, a launch that might have marginally succeeded with only a slight lowering of the nose will have to be aborted if the nose is lowered too far. If the glider's nose is lowered below the horizon, extreme care must be taken that the glider has not over flown the drogue chute. If this has happened, or suspected to have happened, the winch operator must close the throttle immediately. Otherwise, the chute may catch up with the glider and there is a real danger that parachute can get entangled with parts of the glider.

6.3.2 WAGGING TAIL

Reduce power.

The winch operator should respond by reducing the power approximately 25%.

This signal is given by the glider pilot when the launch speed is too fast. The pilot will reduce pitch slightly to reduce the airframe load, then yaw the tail of the glider several times with the rudder. The signal should be not be rushed. Care should also be taken not to allow any rolling motion while yawing. A slow-down signal should be given well in advance of reaching the maximum winch-launch speed, because the speed can change very quickly.

The glider would normally stay at a high pitch angle after giving this signal. However, when the speed is dangerously fast, the pilot will also start lowering the nose slightly to reduce the forces on the glider. This must not be confused with the *increase power* signal. Where the likelihood of ambiguous signals is high, such as lowering the nose early in the launch to avoid overstressing the glider, the best course of action (as always) is simply to release.

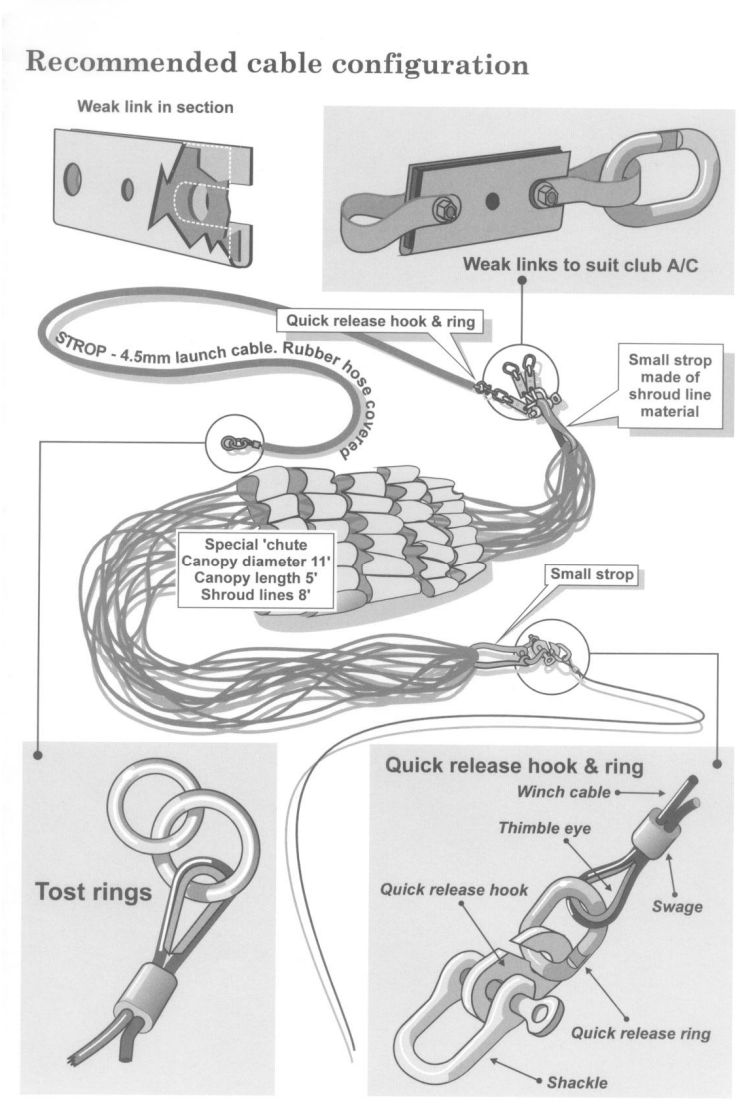
7. GLIDER-END PROCEDURES

The procedures to be followed by the pilot are well-described in Piggott's *Ground Launch*, which our operation follows pretty closely. A few of our procedures are different or bear repeating.

7.1 HOOKUP

The launch-point crew is responsible for disconnecting the cable from the shag vehicle, hooking up the glider, and conducting the launch messages. Mistakes here are more easily made than one might expect. See the Common Crew Errors below.

The following diagram is from the *BGA Winch Operators' Manual*. There may be minor variations in CSA's implementation due to equipment availability, but the intent is to duplicate this scheme. If in doubt about a given variation, question authority!



7.2 THE NORMAL LAUNCH

The pilot in command performs a normal checklist, except the hookup is left for last. Trim should be set according to the glider manufacturer's recommendations, or use "best glide" trim. No launch should be initiated with an aircraft on base or final legs in the pattern. Power traffic will be wary of sailplanes in general and a winch operation in particular, so the launch must be started and completed, with the cable on the ground, before an aircraft enters the pattern. The Wing Runner clears away all spectators, livestock, etc. from the vicinity of the glider and especially along the intended launch path. The Wing Runner checks that the proper weak link is selected, confirms that with the pilot, then hooks up and tests as usual, keeping clear of any entanglement with the cable. A release test is more desirable when winch launching because of the higher forces the hook is subjected to. The rope is laid straight out from the hook for several feet and then the slack is laid out in an S pattern off to the side so the pilot can observe the taking-up of the slack.

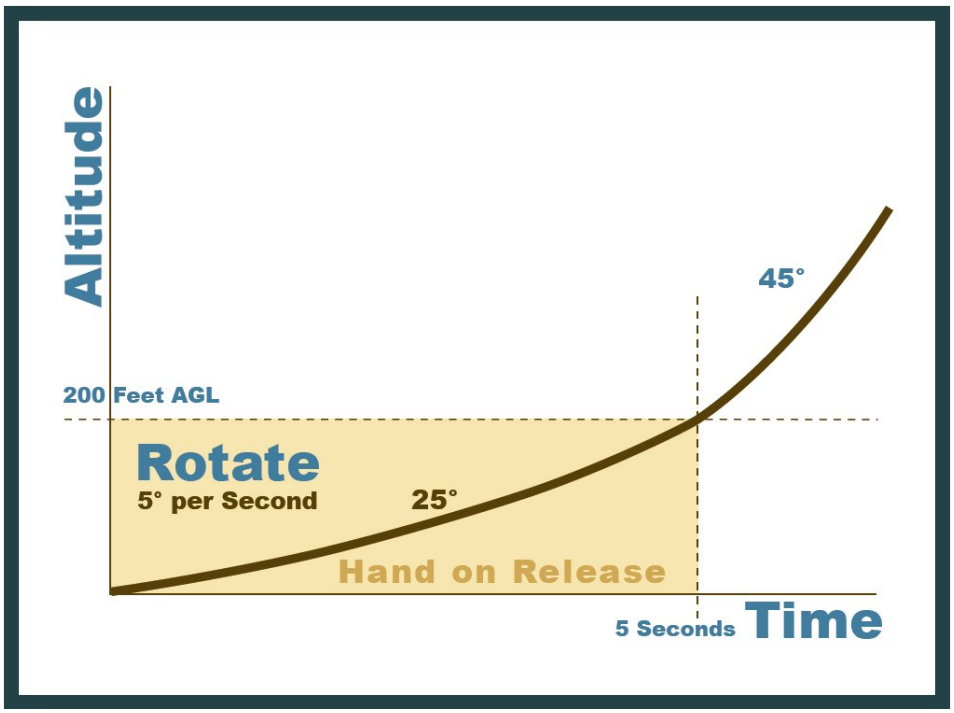
When ready, the pilot makes an announcement on the air-band radio, and then gives the thumbs-up signal. The wing runner delivers the "take up slack" message to the winch. The pilot optionally holds tension in the cable with the wheel brake. When the slack is out of the line, the pilot closes the brakes and the launch crew sends the ***Go*** message to the winch. A rudder-wag signal is not required as it is with aerotow. *When using flag signals, the flag must continue to wave until the glider has established its climb*. If the launch is aborted before climb is established, the flag must be dropped to the ground immediately. (See ***Abort*** in Section 6.2.)

Common Crew Errors
• Not checking for traffic on the field and in the air before giving the "take up slack" message.
• Not having the pilot ready for launch when the cable arrives.
• Failing to keep waving the flag until the glider is airborne.
• Attaching the chute backwards.
• Not tightening the links attaching the parachute.
• Using a Tost ring on a Schweizer release.
• Using the incorrect weak link.
• Holding the wingtip back when the glider launches.

During the first 5-10 seconds of the launch, the pilot must exercise great caution because:

- The glider is in continual transition; speed, attitude, and altitude are all changing simultaneously.
- Cable tension is highest.
- There is less altitude for a stall recovery.
- Shear layers may be traversed.
- The pilot may yield to the temptation to pitch to steeply to soon to attain maximum altitude

Because of these issues, CSA has adopted pilot flight guidelines adapted from those developed by the BGA. Following is a diagram illustrating the CSA guidelines.



Descriptively, these guidelines are summarized as follows:

STAGE	HAZARD	AVOIDANCE
Ground Roll	Wing touches the ground, glider cartwheels or ground loops violently.	• Start the launch with your hand on the release. • If you cannot keep the wings level, release immediately.
Rotation	Stall/spin during rotation.	• Avoid taking-off with a significant amount of yaw required due to cross-wind component. • Maintain a shallow climb until adequate speed is seen with continuing acceleration. • Ensure the transition from level flight at take off to 200' (typically 25º) is controlled, progressive (avg. 5º per sec.), and lasts at least 5 sec. After 5 sec. and above 200' full climb (typical. 35º) can be attained.
	Stall or heavy landing after launch failure below 100ft.	• If the launch fails, immediately lower the nose to the *appropriate* recovery attitude. Minimizing the reaction time is crucial. • Do not use the airbrakes until the glider has attained an appropriate attitude combined with a safe speed. • Instructors: simulated power loss with less than 50ft and 55kt by instructor demonstration only.
Climb	Stall, spin, or heavy landing, after launch failure.	• Adopt the recovery attitude; do not turn or use the brakes until the approach speed is attained. • Land ahead if it is safe to do so.
	Controlled flight achieved after launch failure but subsequent stall, undershoot, overshoot, heavy landing, or	• Plan provisional circuit options before taking off.

	collision.	

In general, the BGA has observed that with CG release gliders, a neutral stick position will achieve the desired climb transition in the first 5 seconds of flight.

Never fly with any combination of low altitude, low airspeed, and nose-high attitude that will prevent a safe landing if the cable breaks.

7.3 ABNORMAL PROCEDURES

If *anything* goes wrong in preparing for takeoff or if the pilot in command has any doubts about the launch, he should release first and then resolve the problem.

7.3.1 LOW SPEEDS

The first priority during the launch is to maintain flying speed. If any condition develops that the pilot in command is unsure of or creates a safety hazard, the pilot should immediately lower the nose to the *appropriate* recovery attitude and release. If the airspeed is very slow and getting slower, or very fast and getting faster, the pilot should not attempt to signal, but rather lower the nose to the *appropriate* recovery attitude and release.

7.3.2 HIGH SPEEDS

The BGA has not observed any case of an airworthy glider being damaged by excessive airspeed on a winch launch which is why it is not listed as a hazard. The placarded maximum winch launch speed may safely be exceeded during the early part of the launch since the g-loading is significantly less.

If the speed is excessive near the ground, climb gently to several hundred feet and release, or signal if the excess speed is now moderate. Releasing below 100ft could be hazardous, not least from hitting the cable. Signaling could overstress the tail. Pulling back to control the excessive speed may break the weak link leading to a difficult recovery.

7.3.3 LAUNCH FAILURE BELOW 100ft

Launch failure can be caused by loss of winch power or a cable break. From the BGA winch launch guidelines:

A safe recovery from power loss below 100ft requires sufficient energy, and the avoidance of a stall. The height and the airspeed determine the available energy. The angle of climb, the airspeed, and the delay before lowering the nose to the *appropriate* recovery attitude determine whether the glider stalls.

It is suggested that the minimum desirable surplus energy should be that which permits a round out at ground level at 55kt (55kt is a generalization, check the operator's manual for each sailplane). This energy is generally achieved with about 55kt at 20ft or 50kt at 50ft. Adequate surplus energy can be achieved by delaying rotation until the minimum launch speed is attained and continuing acceleration is present.

It is imperative that the glider is not allowed to stall. If power is lost in a 25º climb at 51kt and pushover to a recovery dive is delayed for 1.5 seconds the airspeed at the beginning of the recovery dive will be at the stall speed of 34kt. **Minimizing the pilot's reaction time is crucial.**

7.3.4 LAUNCH FAILURE ABOVE 100'

The pilot must be aware of his options and how they change with altitude and wind speed. Upon recognition of a break or unexpected loss of airspeed, the pilot must pull the release and lower the nose to the *appropriate* recovery attitude to attain a safe airspeed. Piggot recommends literally watching the airspeed indicator until the required number appears, because the dynamics and stress of the situation reduce the pilots ability to judge airspeed by other references.

Usually the glider can land straight ahead if an abort occurs below 400 feet, and can do a 360° pattern if higher. OCGP provides a lot of options for doglegs, 270° patterns, etc. (The itinerant pilot will be wise not to attempt such patterns on fields that don't have those options available.) If the wind is light and at least 300 feet is gained, a teardrop pattern to a downwind landing can be made, although the hazards of teardrop patterns tend to go under-appreciated. The pilot must bear in mind that the angle of ascent is steeper than the angle of descent with full dive brakes. Consequently the glider should continue upwind for some distance after release before turning downwind to avoid running out of field. The hazards of the teardrop pattern are such that Piggott discourages them in favor of straight-ahead and 360° patterns.

7.3.5 SIMULATED LAUNCH FAILURE

Simulated cable breaks require prior agreement between the instructor and the winch driver. At some designated point in the launch, the winch driver will reduce the power. From the BGA guidelines:

- Instructors should never surprise a student with a simulated cable break below 100ft because delay in pushing over, pulling the nose up, pushing the nose down too much, confusion, wind gradients, and other adverse circumstances can make a crash inevitable.
- Demonstrations of recovery from power loss below 50ft should be by a pre-arranged reduction of power.

The student should immediately identify the "break," lower the nose and release the cable. If the student doesn't, it is the instructor's responsibility to salvage the situation before it gets out of hand.

Simulating a cable break, by pulling the tow release while the cable is under tension, risks damage to both the winch and the glider. Until alternate methods can be shown to be safe, CSA's policy will be that simulated breaks will be done only by reducing winch power. *Under no circumstances will the winch driver attempt to salvage the situation by increasing power to the winch.*

7.3.6 RELEASE FAILURE

In the event of a release failure, several fail-safe mechanisms come into play.

- The automatic back-release mechanism
- The weak link
- The guillotine (or bolt cutters)

If the glider is still attached after the pilot has pulled the release, flying straight ahead for 15 seconds will allow the back release mechanism or weak link to do their job. If this fails and the winch crew fails to cut the cable, the pilot can in theory fly in circles around the winch until a landing of sorts can be made. (History marks at least one success.) If the cable is cut, the pilot must fly a high pattern so the dangling cable does not snag and the pilot should land well clear of objects or people.

7.3.7 OPENED CHUTE BEFORE RELEASE

This is caused either by a loss of power from the winch or by poor piloting technique. A loss of power may be due to a cable break. This is a slightly different situation than a weak link break, because a cable break leaves the pilot with the chute attached to the glider, while a weak link break may leave it darting disconcertingly in front of the pilot until the winch operator cuts power. In any case, mild maneuvers to avoid the chute may be beneficial. As always, it's helpful to have considered the tradeoffs ahead of time. Becoming entangled with a chute under power is considerably riskier than becoming entangled with one simply dangling from the belly.

Poor piloting comes into play when the pilot fails to perform a continuous rotation into a climb attitude. It is this continuity that keeps tension on the cable and prevents the chute from opening.

If the chute doesn't immediately close again, the glider should establish a gliding attitude and release, making limited maneuvers to avoid the chute.

Common Pilot Errors

- Rotating too early, putting the glider in an unsafe attitude.
- Rotating too late, causing the winch to overspeed.
- Hesitating before getting the stick forward after a break or power loss.
- Failing to signal when the airspeed approaches a limit.
- Failing to crab into a crosswind.
- Failing to lower nose before releasing.
- Failing to pull the release three times.
- Delivering rushed and ambiguous signals.
- Forgetting to pull release after a break or power loss.
- Climbing too shallowly to keep tension on the cable, causing airspeed to remain low and chute to open.

8. WINCH-END PROCEDURES

8.1 THE NORMAL LAUNCH

8.1.1 STARTING UP

- Select neutral gear and apply the brake.
- Open the throttle slightly, use choke if cold, and crank the engine. Pump the throttle to enrich the mixture further if cold.
- Once engine has started, bring throttle back to idle setting.
- Warm up engine for launch (if required). Minimum water temperature 160°F.
- Make sure the winch flag is up.
- Wait for the *take up slack* message.

8.1.2 TAKING UP SLACK

- Check that spectators are in a safe area.
- Be sure you know which glider is about to be launched.
- Engage the brake.
- Gear selection: 2nd gear (full forward).
- Release the brake – verify that drum starts turning. This can usually be done at engine idle.
- Control the drum rotation speed with brake lever if the drum is turning too fast – maintain a rotation speed of approximately ½ revolution per second. If the drum becomes stationary, it may be necessary to apply a touch throttle.
- Continue until the *Go* message is received. If you expect the *Go* message but other radio stations block the radio channel, continue very slowly taking up slack to prevent the glider over running the cable. Proceed with the launch only once the channel is clear.

8.1.3 ACCELERATION

- Do not proceed with the acceleration unless a clear *Go* message has been received and that the launch can be executed in a safe manner.
- Release the brake.
- Open throttle gradually**.** From idle to about 1/3 throttle should take several seconds, as the cable may still be slack. Also, nose-dragger gliders are vulnerable to having their tails slammed down. From 1/3 throttle to full power should take from 2 to 4 seconds.
- Once you have started with the acceleration and the winch engine should falter or fail momentary, abort the launch immediately and wait for instructions from the launch point. The glider could have overrun the drag chute and to continue with the launch could result in serious damage or and accident. Also never decelerate while the glider is still on the ground, for the same reason.
- Do not use the speedometer as airspeed reference. The winch speedometer only indicates the drum rotational speed and is not calibrated.

- Once glider appear in the steep climbing attitude on the horizon, the current throttle setting should be maintained. (When the glider is in the correct steep climbing attitude, the winch supplies sufficient power for that specific glider – it is not necessary to open the throttle further.)

8.1.4 THE CLIMB

- Once the glider appears in the steep climbing attitude above the horizon, it must be observed for any signals. See section on signals for details.
- During the climb the winch speedometer does not indicate the glider's airspeed. Therefore the speedometer should not be used as reference.
- During the latter half of the launch, the throttle setting must be reduced gradually to less than 50% power.
- The top of the launch is reached when the glider is at an angle of about 70° above the horizon. At this stage the throttle setting must be very low – approximately 25% power. The winch operator determines this release position and closes the throttle **completel**y.
- Wait for the glider pilot to release. (It can take up to 5 seconds for the pilot to release.)
- When launching in tail wind conditions, the release position must be at lower angle of about 60°. This is to prevent the chute being blown over the winch.
- Note: The release position must never be too high: the risk of causing a snarl increases and little or no extra height is gained.
- Note: A properly executed launch depends on the winch driver and the pilot meeting each other's expectations. Control at each end must be smooth and deliberate. If either end fails to keep the cable under tension, the parachute may bloom (see emergencies, below). If either end puts the cable under too much tension, the weak link or cable may break.
- Just before the glider lifts off, the transmission will shift from second to third gear. The engine note will change, but this should not be cause for alarm. After rotation, almost full throttle is maintained through the rotation until the glider is about 30 degrees above the horizon. From there the throttle is eased back continuously until the glider is about 60 degrees above the horizon, where the throttle should be at about ¼. If porpoising occurs, it can be mitigated by slightly reducing speed. The throttle is then closed to signal the glider to release. Once you are sure the glider has released (the chute is open and behind the tail of the glider; see Emergency Procedures: Release Failure below) open the throttle about ¼ and reel the cable in. If the chute is drifting to the side, more speed may be required. When the chute is 5 feet off the ground—or if there is any danger of the cable being dragged across a fence, aircraft, car, etc. -- close the throttle quickly and simultaneously apply the brake to stop the drum before the chute hits the ground. Put the transmission in neutral and leave the engine idling for shagging.

8.1.5 CHUTE RETRIEVAL

- Once the glider has released, the access cable must be wound in.
- It is important to "catch" the falling cable before it touches the ground. Failure in doing this may result in slack loops of cable on the drum. The easiest method to catch the cable successfully is by opening the throttle immediately, but only about 1 inch of throttle (quarter throttle), as soon as the cable is released.
- Once the dropping cable has been "caught" successfully, the throttle may be opened gradually.
- Do not wind in too fast (up to 70MPH indicated is OK), but the objective is to land the chute close to the winch.

- Close the throttle before the chute lands to reduce any wear and tear on the chute caused by dragging it along the ground.
- Use the brake to stop the chute in front of the winch **and select neutral.**
- Do not wind the chute in from the rough areas next to the runway. Stop the drum and replace the chute with a tire, dragging the tire through the rough areas.
- **Do not at any stage brake excessively** – the cable on the drum could continue turning with the drum standing still.
- Set light braking action to reduce chances of an overrun. The friction should be sufficient to slow down the drum to prevent overruns. Approximately 20 – 40 Lbs. drag on the cable is adequate.
- Apply additional brake lightly during cable retrieval, if required. When an oscillation on a drum starts developing, it is better to apply the brake moderately when the cable **tightens up**. Sufficient friction will dampen oscillations quickly.
- Apply additional brake carefully during the retrieval because it could trigger an oscillation (cable tightens up and drum is accelerating, followed by a slack cable where the drum runs away).
- When one or more cables get slack, the brake must be applied in such a manner as to restore tension. This could result in a weak link breakage, but this option is preferred over any action that results in a crow's nest.
- In case of an overrun or weak link breakage, apply brake firmly to stop drums. Warn retrieval vehicle operator (if communication is available) when immediate action is to be taken.
- Always stay well clear of cable and drum during the retrieval process. Keep your hands and neck well clear of the action!
- In case of an overrun, always treat the cable as if the retrieval vehicle operator may proceed at any time.

8.2 ABNORMAL PROCEDURES

8.2.1 RELEASE FAILURE

A release failure is when the glider fails to release the cable at the top of the launch trajectory.

- Wait until the glider has passed 100° before initiating emergency action. A sudden increase in cable tension (without back-releasing) will confirm a release failure.
- The immediate action is to close the throttle, apply brake to stop drum, and have the observer cut the cable with the bolt cutters, taking care to keep arms clear.
- Perform shutting down procedures.

8.2.2 CABLE BREAK

- A cable break can be immediately recognized by a sudden increase in engine RPM. The immediate action is to close the throttle. Wait 2-3 seconds before applying brake. Apply brake lightly to stop the drum. Any sudden application of the brake may cause an overrun of the cable, resulting in a snarl.
- Perform shutting down procedures.

8.2.3 OPENED CHUTE BEFORE RELEASE

Occasionally, the parachute will open briefly and then close early in the launch, as when snagged on weeds, or when the pilot fails to continuously raise the nose of the glider. However, if the parachute opens during a launch and the winch sounds as if there is no load on it, it means the glider is over-running the cable or is no longer connected. This is most likely to happen during the initial part of the launch, before the glider rotates to climb attitude. If the parachute does not close again within a few seconds and the engine continues to over-rev, a problem with the launch is indicated and the launch should be aborted.

8.2.4 COLLAPSED CHUTE AFTER RELEASE

If, for some reason, the chute does not open properly, the cable will fall faster than the winch can smoothly reel it in. In this situation, it is usually best to simply cut engine power and stop the drum with the hand brake. The cable may snarl on the ground, but at least it won't snarl under tension or on the drum.

8.2.5 ABORTING THE LAUNCH

- When an emergency occurs, or the launch has to be aborted, launch point will transmit the ***Abort*** message. The immediate action is to close the throttle. Wait 2-3 seconds before applying brake. Apply brake lightly to stop drum. Any sudden application of the brake may cause an overrun of the cable resulting in a snarl. While it may seem prudent to "pull the cable away from the glider," and this often works, the consequences of fouling the glider with the chute or cable are so dire that it is much safer to cut the power. On the other hand, it is important not to prematurely cut power early in the launch when poor pilot technique may cause the winch to over-rev as if the cable had broken.
- Perform shutting down procedures.

8.2.6 SIMULATED CABLE BREAK/WINCH FAILURE

A simulated cable break is performed as part of the training syllabus. Simulated cable breaks where the instructor releases from the cockpit are strongly discouraged. Incidents have been reported where the glider flew into the open drag chute and cable.

- In case the cable is released prematurely, close throttle immediately.
- On request from the instructor, the winch operator can initiate the simulated cable break or winch failure by completely closing the throttle at a suitable moment in the trajectory. The exact point will be determined by the instructor prior to launch.
- After closing the throttle, allow the drum to continue turning. Apply brake lightly to stop drum once the chute has landed. Any sudden application of the brake may cause an overrun of the cable, resulting in a snarl.
- Never open throttle again after a simulated winch failure. The drag chute could open and be pulled into the descending glider.
- Perform shutting down procedures.

8.2.7 SHUTTING DOWN

- Cut power to the cable to prevent the chute from ballooning and possibly snagging the glider.

8.2.8 FIXING A CABLE BREAK OR SNARL

- To fix a broken cable, ideally 2 persons are required.
- Tools required: Crimping tool, 3 swages, gloves (optional).

- To solve a snarl, at least 4 persons are required.
- Avoid causing more twists in the cable by undoing all loops in the slack cable.

Common Winch Operator Errors

- Starting a launch without clearing the area around the winch.
- Using too much initial acceleration, causing the tail of the glider to slam down.
- Not using enough power through rotation.
- Increasing or reducing power erratically.
- Making too large a change in response to a signal from the glider.
- Pulling the chute under too much power.
- Pulling the end of the cable through the rollers.
- Slamming on the brake when the chute reaches the ground.
- Failing to keep spectators at a distance and on the safe side of the winch.
- Failing to take the flag down when fixing a cable snarl.

9. CABLE RETRIEVAL PROCESS

The cable retrieval process ("shagging") is the part of the launch cycle most likely to cause cable breaks, overruns and snarls.. Therefore extreme caution must be exercised.

9.1 EQUIPMENT NEEDED

- Retrieval vehicle - capable of maintaining a constant speed of 20MPH. If multiple cables are being retrieved, the connecting points for the cables must be at least 6 feet apart.
- Weak links. Breaking strength of approx. 500 Lbs.

9.2 OPERATORS' TASKS

9.2.1 WINCH OPERATOR

The cable is spooled out with the transmission in neutral and the engine running at idle. The winch driver will watch the cable for snarls as it spools out. If the drum begins to overspeed and unspool too much cable, carefully use the hand brake to increase the drag. If a snarl develops, immediately send the *stop* signal to the shag driver ("Shag, stop, stop, stop" by utility radio; flag down by flag signal). If a snarl is observed before shagging begins, arrange with the shag driver to expect a *stop* signal. As the unwinding cable approaches the snarl, have the shag driver slow down.

9.2.2 SHAG DRIVER

Note that improper shag procedures are by far the most frequent cause of cable breaks. Also note that there is little to no drag on the cable drum, so it is essential to keep a constant speed.

Prior to the first launch from any position, survey the shag route for potential snags by walking or driving the route very slowly.

- Make sure winch flag is up. If not, inquire with the winch operator.
- Retrieve the end of the cable. Pull on it to ensure that the transmission is in neutral.
- Remove the chute leaving one quicklink on the cable; fold it neatly and stow it in the shagmobile.

- Secure the cable to the shag vehicle for towing by attaching the quicklink on the cable to the towrope ring. Use weak links to attach the cables to the shag vehicle. Nothing attached to the cable must be able to snag on the shag vehicle in case of a weak link breakage.
- Accelerate and decelerate moderately.
- Keep constant speed (maximum 20MPH when winch is manned). If the cable is clearly not wound up tightly onto the drum, keep the retrieval vehicle speed low (about 5MPH).
- Be ready for a *stop* message at any time, whether delivered by flag or radio.
- If a *stop* message is received, decelerate moderately to a stop. Set the parking brake and get out of the vehicle so the winch operator can see you. Wait for a *proceed* message.
- Always follow a straight path to the launch point. Minor deviations to seek smoother terrain or avoid making ruts are permissible.
- If a weak link has been broken, decelerate moderately to a stand still. After any stoppage, check with the winch operator before proceeding with the retrieval.
- Begin to decelerate well before the launch point and come to a gradual stop. If the glider is at the launch point, you will have to pass beside it being sure to clear the wing tips.
- The wing runner retrieves the chute from the shag vehicle.
- Back up slightly at the request of the wing runner to relieve tension on the cable.
- The wing runner attaches the chute and positions the cable for the next launch.
- The cable must always be spooled in under tension. If it becomes necessary to spool the cable in without doing a launch, the usual method of keeping tension on the cable is to pull a car back to the winch. Headlights are used for signaling: headlights on means the car is ready to be pulled.

Common Shagging Errors

- Slowing too quickly.
- Driving too fast.
- Failing to monitor winch flag or radio.
- Forgetting to take the parachute to the glider end.
- Forgetting to convey messages between pilot and winch.
- Causing delays by returning to the winch when the glider is ready to launch.
- Failing to hand off shagging duties clearly!

10. SPECIAL OPERATIONAL CONSIDERATIONS

10.1 CONCURRENT AEROTOW/WINCH OPERATIONS

The potential for compromised safety goes up substantially when the winch operation doesn't have the field to itself. While it may be simple enough to conduct concurrent aerotow and winch operations under normal operations, the opportunities for grief multiply when the unexpected occurs. Greater latitude must be allowed when concurrent operations take place. Such operations are only permitted under the following conditions.

- Each day is either a "Winch Day" or an "Aerotow Day" as determined by the Operations Committee Chief (usually as delegated to the ship scheduler). Concurrent operations may take place in either case, but the scheduled type of operation has priority.

- If the day is scheduled as an Aerotow Day, the Winch Captain must consult the Tug Pilot for operational considerations. The Tug Pilot may elect to veto winch operations at his discretion.
- If the day is scheduled as a Winch Day, the Tug Pilot must consult the Winch Captain. The Winch Captain may elect to veto aerotow operations at his discretion.
- At OCGP, concurrent operations may only take place to the north or south. The aerotow operation is allowed full use of runways 19L/19R/1L/1R. The winch operation shall restrict its movements to an area at least 200 feet east of runway 1R/19L. Towplanes or other aircraft are not allowed to use other runways when concurrent operations are in effect.
- Neither aerotow nor winch launching gliders may stage for take-offs upwind of the other. Potential risks with launch failures, cable drifts or other abnormal situations are not acceptable when either operation is staged upwind of the other.
- Towplanes or other aircraft should not land or take off when the winch cable is in the air or when the cable is not laying on the ground or being shagged on a direct line from the winch to the winch launch staging are.
- In addition to the usual considerations for wind when winch launching, the wind must be such that the winch is not directly upwind of any portion of 19L/1R. This is to avoid any possibility of a tug landing across the cable.
- All takeoff and landing operations shall be announced on the air-band (123.3). No NORDO gliders are permitted when concurrent aerotow/winch operations are being conducted.
- Concurrent operations require working air-band transceivers in the glider, towplane and on the Winch Captain and Winch Driver.
- It is even more critical than normal during concurrent operations that no persons who are not highly familiar with both aerotow and winch operations be allowed to roam the field unsupervised.

11. PACKING UP THE WINCH

See the Winch Shutdown Checklist in section 11.1.5.

12. CHECKLISTS

12.1 WINCH OPERATOR CHECKLISTS

12.1.1 DAILY INSPECTION CHECKLIST

- ü Fuel – sufficient for day's usage (approx. 1 qt per launch); premium unleaded. If the winch fuel tank does not contain sufficient fuel for a full day's activity, determine and note the number of launches that can be completed with the available fuel. This should include at least a 1 gallon useable reserve."
- ü Oil level -- top with 20W50
- ü Transmission fluid – check hot; top with ATF Type A
- ü Water level -- top with 50% antifreeze
- ü Tire pressure adequate
- ü Check required equipment
  - Flags
  - Guillotine (bolt cutters)
  - Parachute and attachments

- Weak link and spares
- Sledgehammer
- Gasoline (premium)
- Oil (20W50)
- Automatic Transmission Fluid (Type A)
- 10 feet of ~200 lb cord for shagging cable
- Binoculars
- Fire extinguisher

ü Check optional equipment (as operations dictate)
- Radios
- Spare thimbles, swivels, links, etc.
- WD40 to preserve cable

ü Fill in the winch logbook before starting the engine. Note fuel and oil additions. Note winch captain, winch driver and observer, if any. Store the logbook in the ammo box.

ü Tidy up the operating cage. Remove all rubbish, including pieces of cable.

ü Hook the winch up to a vehicle and remove the tongue stand.

ü Start the winch and warm it up. A little choke may be required if cold. Check the oil pressure. When the engine idles smoothly without choke, the engine is ready for launch operations.

12.1.2 STAGING CHECKLIST

ü Position the winch. It is crucial that the winch points directly down the runway. Misalignment will cause the cable to wear out the cable guides rapidly.

ü Winch secured to ground with wheels chocked

ü Test required radio communications

ü Fire extinguisher – accessible and fully charged.

ü Attach the chute to the cable and check all connecting links, including retrieval weak links.

ü All cable joints should be inspected and replaced if required. This will prevent unwanted cable breaks during the day.

ü Put the bolt cutters in their holder on the right side of the engine.

ü Chocked the wheels. Place the stand under the tongue, drive an axle into the ground and chain the tongue to it.

ü Start the engine and pull the cable out ("shag" the cable) and walk it. Shagging is done with the engine running and the transmission in neutral; this provides some drag on the cable to prevent over-spooling and keeps the transmission lubricated. When the cable has been fully laid out, check for any abnormalities in the cable (e.g., kinks, abrasions) by walking along its entire length. Check the condition of each splice. Cut out and replace any worn or poorly-done splices. The splice must be trimmed neatly so it does not foul on the drum.

ü Cable: on all pulleys and no slack loops on the drum

ü Check the condition of the parachute, leader rope, tow ring, and weak link.

ü Attend the pilots' meeting. Relay any issues found with the winch.

ü Conduct launch checklist

12.1.3 LAUNCH CHECKLIST

ü Fuel quantity – 1/2 gallon minimum

ü Temperature – warmed up but water temperature not exceeding 180°F

ü VHF Radio – switched on, sufficient volume and frequency set to 123.30MHz

ü Bolt cutter – available

- ü Spectators/helpers – well behind winch, opposite side to the drum

12.1.4 POST-LAUNCH CHECKLIST

- ü Transmission in neutral
- ü Log launch

12.1.5 SHAG CHECKLIST

- ü Pass messages for launch crew to shag driver
- ü Winch engine running
- ü Transmission in neutral
- ü Traffic check

12.1.6 SHUTDOWN CHECKLIST

- ü Fill in the winch logbook after the last launch. Store the logbook in the ammo box.
- ü Switch off all radios.
- ü Reel in the excess cable and secure the end. Put the transmission in Park (fully aft).
- ü Remove the chutes from the cables and store them in the chute box.
- ü The hand-held radios are on charge and locked up in the charger box.

12.2 WINCH CAPTAIN CHECKLISTS

12.2.1 GO - NO GO CHECKLIST

- ü Adequate members to fill roles
- ü Winch is serviceable
- ü Winch can be positioned with no hazards within 2000' downwind
- ü If concurrent aerotow/winch operations planned, tug pilot has been consulted

12.2.2 PILOT MEETING CHECKLIST

- ü ***All personnel on field in attendance, not just winch crew***
- ü Entire length of cable and cable path inspected (repeat later if winch is repositioned)
- ü Radios tested
- ü Primary ground signal method established (i.e., radios, flags, wing up/down)
- ü Each signal verbally reviewed
- ü Starting crew roles assigned
- ü Pilot rotations assigned
- ü Wind hazards discussed
  - Pilot compensation for wind
  - Potential for re-siting the winch
  - No persons or structures within 2000' directly downwind of winch in case of power failure
- ü Concurrent operation requirements discussed if applicable

12.2.3 LAUNCH CHECKLIST

- ü Shag vehicle stopped at one end or the other
- ü Required roles filled (Wing runner, Flagger if flag signals in use)
- ü Screw links all checked
- ü Parachute "right side up"
- ü Correct weak link selected
- ü Correct release hook selected
- ü Ground traffic clear
- ü All persons clear of glider and cable

12.2.4 POST-LAUNCH CHECKLIST

- ü Log flight
- ü Alert crew to any upcoming crew rotations

12.2.5 SHUTDOWN CHECKLIST

- ü Number of snaps and any squawks entered into the logbook. Any signficant squawks should also be forwarded to the winch maintenance captain ASAP.
- ü All tools, parts and pieces, including weak links, parachute, etc. repacked in the appropriate places in boxes on the winch.
- ü Radios returned to chargers.
- ü Anchors, sledge and chocks stored in winch.
- ü Winch returned to hangar.

12.3 SHAG CHECKLISTS

12.3.1 SHAG CHECKLIST

- ü Parachute is either placed in external carrier, or detached from cable and rolled up
- ü Cable attached with weak link
- ü Traffic is clear
- ü Winch is signaling *proceed with shag*
- ü No persons near cable or drum

12.3.2 RESUME AFTER HALT CHECKLIST

- ü Winch is signaling *proceed with shag* and signal is confirmed
- ü Shag speed desired by winch is understood

12.3.3 UNHOOK CHECKLIST

- ü Slow down well in advance of glider with minimal use of brake
- ü After coming to a stop, back up a foot to relieve tension on the cable
- ü Make sure chute is handed off
- ü Stay at launch point or return to winch, whichever causes the least delay

12.3.4 WIND-IN CHECKLIST

- ü Hook up the shag vehicle to the cable with a weak link, nose toward winch
- ü Put transmission in neutral
- ü Turn on headlights to signal readiness
- ü Be ready to brake at the winch

13. MAINTENANCE

The integrity of the winch is critical to the safety of the pilots and operators involved in the winch operation, and it must be maintained to the same standards as other aviation equipment. *No repairs shall be performed on the winch without the explicit consent of the Winch Crew Chief.* The Winch Crew Chief must be approved by the CSA Board of Directors.

Periodic maintenance, such as topping off fluids, replacing fan belts, and the like, shall be performed by the Winch Operator and logged in the Winch Maintenance Log, which is kept with the winch. The Winch Crew Chief shall keep a permanent record of these logs and other maintenance.

14. LOGS

14.1 GLIDER LAUNCH LOG

The same form as used for aerotows shall be used.

- Release altitudes can be estimated and are not critical to log.

14.2 WINCH CONDITION LOG

The winch condition log is to be updated at the start and at the end of each day's flying. Faults/problems must be noted clearly. Do not make an entry after each flight.

	Date	Entry by	Hobbs start	Hobbs End	Engine hours	Fuel added	Oil added	Squawks / Resolutions / other comments
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

14.3 WINCH LAUNCH LOG

Date: Winch Operator:

	Launch Time	Glider ID	Winch Operator	Winch Trainee	Trainee Activity (O)bserve, (D)rive	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						