FARIBAULT WINCH OPERATIONS

Introduction
Cross Country Soaring, Inc. is a commercial glider FBO in its fifth year of operation at FBL. In the Spring of 2008 it acquired a winch to launch gliders. There are fewer than a dozen winches in operation in the U.S. and as a result there is considerable excitement about having one here at FBL. With rising fuel prices, insurance, and tow plane maintenance, there is a growing consensus within the U.S. soaring community that this is the way of the future. This winch is one of 15 built by the Canadian Air Force for their Air Cadet program. It is mounted on a trailer, powered by a 350CI, 330HP Corvette engine with 4000FT of hi-tech, light-weight Spectra synthetic rope on the drum. It is capable of launching gliders up to 1800 FT AGL with this length of rope. The picture to the right is the view after less than eight seconds from the beginning of the launch. What a ride! We made about 50 launches during a winch training clinic in May of 2008. This clinic was delivered by two well-known and respected instructors, Frank Whiteley and Bill Daniels. It is anticipated that regular winch operations at FBL will take place during selected low-traffic weekdays, but not during the busier weekends.

This document is intended to provide enough detailed information so that both glider pilots and power pilots at FBL can understand our procedures and feel comfortable with them. It is also a document that can be used in discussions if there is a request to adjust operations in some way so that glider ops and winch launches have a minimal impact on other aviation activity at FBL. This document is also REQUIRED READING for all participants in the winch launching process. This applies to the glider pilots, winch drivers, retrieve drivers, and launch-line personnel.
OVERVIEW
To set up the daily operation, the winch is driven to the up-wind end of the runway, and then about 500 feet further into the over-run area, and off to one side. It can remain on the vehicle’s trailer hitch, as in the picture below, or the wheels can be chocked and the four vertical leveling posts secured.

Once the winch is in position, the engine is started and warmed up. The retrieve vehicle attaches the rope to it’s hitch and pulls it off the drum and down the grassy area between the runway and the runway lights to the launch point. When everyone is ready and in position, the launch is announced on CTAF and the glider is pulled onto the runway, turned into wind and attached to the ring-pair.
The airspace is again cleared visually by the launch crew and a second winch-launch announcement is made over CTAF. If the area is clear, the winch driver is given the radio call to take up slack. The rope slowly winds onto the drum. As it becomes taught, it slides off the grass and onto the runway. Once the glider just begins to move, the GO signal is given to the winch driver over the radio. The winch driver opens the throttle and the glider accelerates toward the winch. As the glider accelerates, it climbs progressively steeper to an attitude of about 45-55 degrees at about 60-65 knots (all in about 5 seconds). While this pitch attitude appears extreme, the AOA is at about best L/D – far from stall.

About 35 seconds later, at the top of the 1500 foot climb, the glider pilot hears the rope back-release from the CG mechanism (the bow in the rope at the apex of the climb supplies enough back-pressure to release). The launch is over. The rope, with a small parachute attached for drag, is then reeled in by the winch driver. It takes about 15 seconds to reel in the chute and drop it in the grass in front of the winch, ready for the retrieve car.

Launching by winch is an absolute E ticket ride the Europeans have been enjoying for decades! It’s fun to drive the winch, too.
SAFETY

The process of launching a glider by winch is a short duration, high energy event that requires certain procedures to minimize the inherent dangers.

These inherent dangers are no more extreme than those encountered in aero-tow but because winch launch is less familiar to Americans and more dramatic, it will no doubt appear more dangerous.

The dangers of winch launch may actually be less than with aero-tow. For one thing, there is only the glider and the glider pilot at risk. For another, the glider is always in a position to return to the runway.

Simple, standardized procedures will eliminate most hazards and greatly mitigate the rest. Explaining these procedures in simple, understandable ways will greatly alleviate the concerns of the uninitiated.

New winch operations in the US are very likely to be observed by skeptics who lack knowledge of winch practices. At the very least, these skeptics should come away with the impression that, “these guys sure seem to know what they are doing”. Winch operations must not only BE safe but they must also LOOK safe if they are to proliferate. It behooves us to make our safety procedures as obvious as possible.

Winch operations are being conducted at public airports and private airfields all over the world. In many cases, the same runway is used for both aero-tow and winch while it is also shared with transient aircraft. In each case, airfield users have agreed to rules that ensure safe and convenient access to all. There are no FAA regulations specific to winch launching, so common sense should prevail when operating at a public airport.

A launch from the start of the takeoff roll to the final recovery of rope onto the winch drum will require the exclusive use of the runway for a period of less than ONE minute. Staging, signaling and taking up slack may extend this to two minutes. This should be
good news to local powered aircraft both on the ground, wanting to take-off, or in the air, wanting to land.

A typical light aircraft approaching the airfield will travel about two miles during a winch launch so the airspace around the airfield must be visually cleared to a radius of about a three miles before the “GO” signal is given. Launch point crew will be trained to animate their scan for traffic so that the pilot and others know it is being done just prior to giving the “up-slack” call to the winch. An early transmission on the CTAF frequency warning other airport users of the impending launch should be SOP (standard operating procedure). A rotating, flashing strobe mounted on the winch is also activated prior to a launch.

Winch operations at FBL will use runway 30/12 exclusively, as this runway length is ideal at 4200FT of length with 500-700 foot grass over-runs on either end. It is also ideal because there are no power lines, houses, parked aircraft or cars near the winch point where a dropping chute could pose a problem. It is also good that the winch areas are free of noxious weeds and brush that might ensnare the rope.

They way winch operations at FBL are laid out, it is always possible for a glider to land shortly after launch, or immediately after a launch failure, without conflict with other runway users or the winch operation itself. A good winch site, such as ours, will never place the glider and it's pilot in a position where a safe return to the runway is anything other than a simple, straight-forward maneuver.

**THE TEAM**

Although winch launch operations can proceed with no more help than aero-tow (a winch driver and a glider pilot), more people can be usefully employed to make the operation run more efficiently.
The key to safe winch teams is organization and discipline. All launch team members should know their job thoroughly and be in constant radio contact with each other. At FBL we will use 123.30 for this purpose, with a radio in the winch (both a speaker and a headset), retrieve car, launch point and glider. Every team member will be alert for any unsafe situation and will transmit “STOP, STOP, STOP” to alert other team members and halt operations.

No duties may be assigned to a new person without the consensus of the whole team. No outside person may be allowed to “take charge” no matter his background or experience. The Launch Team is solely in command of the launch operation.

Overall, a winch launch operation is not unlike aircraft carrier operations. The Navy has found it wise for all flight deck personnel to wear jerseys with distinctive colors to identify their job responsibilities. At FBL, launch team members will wear bright orange vests while on launch duty.

The winch driver: Much depends on the skill and judgment of the winch operator. The less automation employed, the greater the skill required. The winch driver should be thoroughly familiar with all equipment and its proper operation. He must also be completely familiar with all gliders to be launched. He must never initiate a launch if he has any doubts about the outcome.

The wing runner/launch captain: This person is in charge of the start line and surrounding area. He is the designated communicator with the winch. No launch will proceed without this person’s approval. He must ensure that the rope assembly is intact and that the correct weak link is used. He must control any on-lookers and the glider launch queue. Before each launch, he must check the surrounding airspace and hold the launch until there is no conflict with other air traffic. He must understand all potential hazards and be prepared to order a stand-down if hazards exist. He may choose to delegate the actual wing running duty (but must supervise).
The rope retrieve driver: The retrieve-car driver must be thoroughly familiar with the whole winch operation. This person may also be the winch operator, but it might also be a person solely designated to retrieve the rope. Watching for landing aircraft and not getting distracted by talkative ‘helpers’ takes concentration.

Glider pushers: Any active winch operation needs gliders to be moved around the airfield. Just-landed gliders must be quickly moved clear of the landing area and into the launch queue or to tie-down areas. Most glider pilots and crews will know how to do this but they must also be aware of the winch and airfield rules. When launching on 30, landing gliders should take 30-grass (or 30 itself, stopping at the launch point, if intending to re-launch). When launching on 12, landing gliders should take the taxi-way (or 12 itself, and stopping at the launch point, if intending to re-launch). This way, winch operations are totally unaffected.

A formal training program at FBL will be established for Launch Team members. A natural progression is from glider pusher to cable retrieve to launch captain to winch driver.

On occasions that we operate with volunteers, we will plan a brief meeting of all participants to review standard practices and assign duties before the days first launch. Anyone arriving late should be required to meet with the Launch Captain or the Duty Instructor before flying or joining the operation.

Giders

Most newer European gliders exhibit exemplary behavior on winch launch. Some gliders, however, are totally unsuited to winch launch. Schweitzer 2-32’s and 1-34’s are examples. Any glider without a CG release is problematical and is likely to exhibit porpoising or other behaviors that make winch launch unpleasant or impractical. A list of unsuitable gliders will be maintained by the Team (who will refuse to launch them).
Giders with a high CG and a low tow hook will exhibit a strong nose up tendency on acceleration that the pilot must be prepared to deal with. If this is combined with limited down elevator authority, the glider may pitch up uncontrollably if the acceleration is too strong. These gliders will require special acceleration profiles that permit the pilot to retain control. Examples: 2-33, Standard Austria SHK and K8. Radio communication, prior to launch, between glider and winch will be SOP.

The stresses imposed on a glider during a winch launch are equivalent to mild aerobatics. The weak link called for in the POH will limit stress imposed on the glider to a value the manufacturer has calculated to be safe. The manufacturer will have set the maximum airspeed for winch launch ($V_{W}$) such that the wing cannot develop destructive forces. The Launch Captain must check for the correct weak link and ensure the pilot knows the maximum airspeed for winch launch.

**Pilots**

The FAA requires a logbook endorsement for ground launch from a qualified CFIG before a pilot can act as PIC of a glider being launched by winch or auto tow. The winch launch team is within its rights to demand to see this endorsement before launch services are provided.

If, at any time, a Launch Team member has reason to believe that a pilot does not possess the skills required to fly a winch launch safely, launch services must be denied until a qualified CFIG endorses the pilot for ground launch.

Pilots are responsible for preparing their gliders for flight. They have the final responsibility for the weak link used, the launch airspeed selected, and, in the end, the final decision to launch. They must know everything about their gliders behavior on winch launch - $V$ speeds and any special requirements such as ring sets or acceleration profiles. They alone are responsible for how the launch is flown.

Finally, unlike aero-tow, things happen very rapidly during a winch launch. A pilot must maintain an extremely high state of alertness BEFORE and during the launch. If a pilot can't maintain this level of alertness for one minute, it is questionable whether he should be a pilot at all.

**The Weather**

Launches should be into the wind as nearly as possible. Never launch down wind because the winch engine will reach redline RPM before the glider reaches a safe airspeed.
Each 10 knots of headwind is the equivalent of an additional 40 HP. Furthermore, the “winch moving away effect” as the British call it, is the equivalent of lengthening the winch runway by 676 feet for each 10 knots of headwind. Wind is good, more wind is better.

If the launch has a crosswind component, the pilot should hold a shallow bank into the wind after liftoff such that the glider tracks to the upwind side of the runway. This helps the rope fall back onto the runway. Note that a “crab” into the wind will not work. In any event, no glider should be launched with a crosswind component greater than that allowed in the POH.

If a cloud deck is present whose base is unknown, great care should be taken with the first few launches. Winching a glider into a cloud deck is likely to have bad results.

**The Winch and Associated Equipment**

The winch, cable and attached hardware should be of the best quality and in good repair. There should rarely be delays while repairs and adjustments are made.

To the greatest extent possible, launch failures should be avoided. Winch ropes should be spliced or replaced at the first sign that breaks are imminent. Winch maintenance should be intensive and pro-active. Daily inspections should be detailed and thorough. A 30-point check sheet must be signed off before each day’s winching. With such attention, winch launch failure should occur no more frequently than with aero-tow.

Any winch that exhibits unpredictable or inconsistent throttle response such as stalling or balking is extremely dangerous and should not be used until the cause is found and corrected.

There is a very remote (but non-zero) chance the glider will be unable to release the rope at the top of the launch. For this reason, our winch is equipped with a rope-cutting device called a “guillotine”.

The few stories where the guillotine has been employed seems to be the result of ropes getting entangled with landing gear as a result of thin, flexible strop material
and jerking the glider forward so it rolls over the rope just before full power is initiated. Actual glider release failures seem to be extremely rare.

The cable assembly at the glider end conforms to the German Aero Club requirements in regard to the lead rope (strop), weak links, parachute and attached hardware. The world standard for weak links are those from Tost. Each glider type has a specific Tost weak link called out in the POH. THIS LINK MUST BE USED FOR EVERY LAUNCH. We have them at FBL in our operations kit.

Launch Procedures (Ground)

It is imperative than no person should be in harms way. This means that once the rope is attached, the space between the glider and winch should never be occupied. The area around the winch should be kept clear of people and cars. Observers and trainee winch operators should be either adjacent to the actual winch operator or further back. Fortunately, the Spectra rope used on our winch poses none of the hazards of steel cable.

The whole winch operations area will be tightly controlled so that on-lookers and gliders don’t clutter the area. Gliders will be kept in a launch queue, in position to launch or off the runway. On-lookers not involved in the operation will be grouped in a designated “safe area” behind the start line. The area ahead and 45 degrees to the right and left of a glider ready to launch must be clear of gliders and other obstacles.

The whole launch operation will be highly repetitive with each successive launch as nearly like the one before it as possible. This means that all glider will use the same start line and not be launched from “wherever the landing roll stops”. This consistency allows everyone on the ground and in the air to know what to expect even if they are not in radio contact with the Launch Team.

If these conditions are not met, the Launch Team will order a stand-down until they are.

In preparation for each launch, the wing runner/launch captain will inspect the ring set, lead rope, weak link and parachute to ensure correct assembly and integrity. The rope assembly should be handled carefully so that if the winch operator yanks it away, no injury will result (don’t put your finger through the Tost rings).

The wing runner will show the pilot the weak link color before attaching the rope. The rope should never be attached to the release until the pilot has closed the canopy and
signaled with a “thumbs up” that all pre-flight checks are complete. At this point, the glider and its pilot should be COMPLETELY ready to launch.

After the cable is attached to the release, the wing runner will get out from in front of the glider as quickly as possible and allow no one to stand ahead of the glider’s wings.

The wing runner/launch captain will then scan the airspace above and around the airfield for any traffic that might encroach, pantomiming so the pilot is reassured that a traffic check is being made.

If all is clear, he will raise the wing and radio, “UP-SLACK, UP-SLACK, UP-SLACK”, repeating three times to ensure the signal is understood. If the conditions remain safe as the cable slack is taken out, he will continue to hold the wings level. If at any time a condition is noticed that might compromise the safety of the launch, he will radio, “STOP, STOP, STOP” and lower the wing. Otherwise, with the slack out and the glider starting to move, the wing runner will radio, “GO, GO, GO” and the launch will commence. THERE IS NO RUDDER WAG USED.

At any point the pilot may stop the launch by pulling the release. Any observer may also yell “STOP” to abort the launch if an unsafe condition is seen.

“UP-SLACK”, “STOP” and “GO” are words that are easily understood over radio static and unlikely to be confused with each other. These are the ONLY words that are recognized as launch signals.

The German Aero Club, DAeC, requires the use of wire line duplex telephones for communications between the launch line and the winch arguing that simplex radio transmission can be blocked. This is a reasonable view but difficult to implement on airfields with many runways. At FBL we will use the 123.30 glider frequency. If the winch operator receives conflicting signals, i.e. “UP-SLACK” while the wing is on the ground, he will not move the winch cable until all signals are in agreement.

In the event that a glider is yanked forward while taking up the slack, the launch must be stopped, the rope inspected and the glider repositioned. A Tost CG hook can be partially released in a roll over event such that an uncommanded release occurs during the launch. Releasing and re-attaching the rope is a good idea.

If the winch balks or the engine coughs or stumble, the launch will be aborted and the cause of the problem found and solved before launches resume.

If the launch is aborted with the glider airborne, the pilot should release the cable and make every effort not to land on it. The danger is that the engine might “catch” or the winch operator might apply power after the glider has overrun the cable and cause the parachute to overtake the glider from behind. After and airborne launch abort, the winch
operator must stop the cable and never start moving it again until signals from the rest of the Launch Team say it is OK.

**Cable Retrieves**

The cable retrieve vehicle is a Nissan Pathfinder which is radio equipped and must be in communication with the winch driver. The parachute and strop are pushed in through the back window opening, while the weak link (piece of string) is connected to the trailer hitch.

The person assigned the duty of retrieving the cables is key to efficient operations. The driver should position himself a safe distance to the side of the winch while launches are underway. When the parachute has landing following a winch launch, the driver will go to the front of the winch, load the chute and strop in through the window and loop the weak link over the hitch. He will then take his position behind the wheel and **WAIT** for the “UP-SLACK” signal from the winch operator.

Upon receiving the “UP-SLACK” signal, he will slowly drive forward until he receives the “GO” signal. He will then accelerate smoothly on a perfectly straight path toward the start line at 30 MPH. Once at speed he will not change it or deviate in any way from a perfectly straight line until near the start line. When nearing the start line, he will lift his foot from the accelerator and let the retrieve vehicle slow to a stop just past the start line, using the brakes as sparingly as possible.

If at any time during the retrieve, he receives a “STOP” signal, he will stop immediately and **REMAIN STOPPED** until he receives a “SLACK” or “GO” signal. The winch operator may be untangling a snarl and could receive severe injuries if the rope is pulled taut! So wait for the signal.

Once at the start line, he will remove the ropes and drop them in the grass just off the runway. **THE LEPO DRIVER MUST ENSURE THAT ALL ROPES ARE REMOVED FROM THE VEHICLE BEFORE DRIVING AWAY!**

With the ropes disconnected, he will return to his position alongside the winch by a route that does not place him in danger from launches in progress.
FARIBAULT-SPECIFIC WINCH OPERATIONS

1. Check-lists
2. Phone in the NOTAM
3. The Day’s Team
4. The Day’s Weather/Wind
5. Preparing the Winch
6. Retrieve Operations
7. The Launch Point
8. Glider Staging Area
9. Piloting the Launch
10. Accommodating Power Traffic
11. Communications

1. **Checklists**
   - The winch driver will make sure the “winch bag” is in the cab when the winch is driven out into position. The winch bag is a black ballistic nylon bag containing pre-use checklists for the winch as well as other documents and tools (for rope splicing). This checklist will be ticked off and initialed by the day’s first winch driver.

   - The retriever driver will use a checklist that includes radio, weak links (for the retrieve), strobe on car and/or emergency flashers and headlights in operation at all times.

   - The launch crew will use a checklist that includes a radio, orange vests, duct tape (for signs of rope abrasion).

   - The pilot will use a standard pre-launch checklist on EVERY launch, even when returning from a circuit and rolling up to the launch point again.

2. **Phone in the NOTAM**
   A reminder to ask the airport manager to phone in a NOTAM will be on the launch crew’s checklist. This must be done prior to first launch.

3. **The Day’s Team**
   We will gather the team prior to staging the first glider and review intended operations for the day. The ideal team will consist of a winch driver, a retrieve driver and a launch-line captain. Communication frequency will be agreed upon, retrieve driver route, etc.
4. The Day's Weather/Wind
The wind will determine which end of 30/12 we will launch from. The max crosswind is determined by the max allowable crosswind for the glider. However, drift of the rope after release must be considered also, especially taking in the possibility of a break. We want to avoid dropping a broken rope on a roadway or forested area.

5. Preparing
There is a checklist in the winch for preparation of use. This list will be used and ticked off and initialed prior to first launch.

6. Retrieve Operations
The retrieve driver will connect the rope at the winch to a weak link at the trailer hitch. The parachute and strop will be pushed in through the back window. Upon hearing “up-slack” on the radio, the retrieve driver will begin slowly driving toward the launch point. Once the winch driver sees the slack is out and the drum is turning, he will give the “go go go” signal over the radio. The retrieve driver will then accelerate to about 30MPH and drive down the grass between the runway and runway lights so the rope does not abrade on the hard surface. Once the driver is about 50 feet from the launch point, he will slow down gradually so as not to spool rope of the drum by stopping suddenly. The weak link is removed form the hitch (by the launch captain or retrieve driver) and the parachute and strop are removed from the back of the vehicle. When the driver is given the all clear signal, he will drive across the runway and return to the launch point using a prescribed route for the day. ALWAYS STOP and clear for traffic before crossing the grass runway 02/20. Once back at the winch end, the driver will park clear of the winch so a dropping parachute won’t dent the hood or brek a sunroof. Once the rope has landed, the driver will drive over to the spot and repeat the procedure.

7. The Launch Point
The launch captain will ensure the launch area is secure at all times. This includes crowd control, landing aircraft control and connecting the staging glider to the rope, leveling the wing, as well as calling for ‘up-slack’ and ‘go’. Communications are on 123.3, but 122.8 will be monitored also!

8. Glider Staging Area
A area for gliders waiting to be launched will be designated according to the days launch point and cleared with the airport manager if it is unorthodox. The main goal is that the parked gliders are not ‘obstacles’ to landing aircraft. Landing gliders should be moved into this area ASAP or back to their hangars/trailers.

9. Piloting the Launch: At the “GO” signal, the winch operator will smoothly apply sufficient throttle to produce a cable tension approximately equal to the weight of the glider being launched. This will result in the glider accelerating at one “G” or 32FPS². If the glider lifts off at 43 MPH, this speed will be reached in two seconds. Aileron control speed will be reached in less than one second or in about 15 feet.
Although it seems unlikely that a wing tip could touch the ground in less than a second, should this happen, the pilot must release instantly or risk a ground loop.

Once airborne at an airspeed between liftoff and the desired launch speed, the pilot must control any tendency of the glider to prematurely pitch up. He will just allow the glider to gently pitch up so that at any point a landing straight ahead could be made with generous margins if the launch should fail.

Once the target climb speed is achieved the pilot will continue smoothly pitching up so that at about 150 feet AGL he is in full climb attitude of about 45 –55 degrees nose up.

With a reasonably constant cable tension the glider pilot can control airspeed with pitch changes. If airspeed cannot be controlled with increasing pitch, signal to reduce power by wagging the tail. If the airspeed still increases, release.

During a normal launch the glider's angle of attack is very close to best L/D. There is a tendency for the uninitiated to think that the steep nose up attitude signifies a high angle of attack and impending stall. They are confusing pitch attitude with AOA. The AOA should NEVER be near stall.

Throughout the launch, the pilot is “spring loaded” to instantly lower the nose well below the horizon in the event of a rope break. He will keep the nose down until the airspeed is seen to be at a safe value and increasing. THIS MUST BE INSTINCTIVE.

If a launch failure occurs at less than 350 feet, a normal landing straight ahead is made. If a failure occurs above 350 feet, a 360 turn or a short pattern will get the glider back to the runway for a normal landing. At no time is the glider in a position where a normal landing is impossible. It is imperative that everyone and everything on the ground is out of harms way so the pilot need only be concerned with a good landing.

99.9% of the time, the launch will proceed normally. As the glider climbs, the pilot will be applying only slight back pressure on the stick. Near the top of the
launch, the nose attitude will slowly come down to normal glide. During the climb the cable tension will remain roughly equal to the glider's weight. As the glider nears the top, the winch operator will slowly reduce power to maintain the requested glider airspeed until, at a cable angle of 70 degrees to the horizon, he will cut the power sharply.

At the power cut, the cable will sag and the glider will probably “back release” automatically as the pull angle exceeds 70 degrees. Whether it releases automatically or not the pilot, feeling the power cut, will pull the cable release three times to insure a release. The glider will likely be 1500 - 2000 feet above the runway at release.

10. Accommodating Power Traffic
In order to ensure a smooth operation and show courtesy to local power pilots, we will prepare to clear the runway at the first radio call of incoming/outgoing traffic. If communication is established, and both parties agree, the launch can continue. Otherwise, if communication is absent or the launch is minutes away from being ready, we will stand down and clear the runway. If the retrieve vehicle is returning with the rope, it will drop the rope in the grass and drive well clear of the runway to accommodate the traffic.

11. Communications
All communications will be on 123.3 unless otherwise agreed by the entire team. 122.8 will also be monitored by at least the launch captain.