Ground Crew Manual

December 2020

1 Introduction and Getting Started

This manual covers the things you need to know to be an effective member of a ground crew. There are other rules and procedures that you must know as a member of CCSC. These are detailed in the CCSC Uniform Operating Procedures. Obtain a copy of this document from the crew chief and become familiar with its contents. After introducing you to the flow of a day, each section will detail the procedures for safe and efficient execution of crew duties

Each flight day has a general flow. Some procedures, such as ground glider handling, are used during multiple phases. The flow of the day is as follows:

1. Arrival at the club
2. Preparing the mobile flightline office
3. Preflighting the golf carts
4. Opening the hangar
5. Moving the gliders out of the hangar
6. Conducting glider line checks
7. Moving gliders to the flightline
8. Conducting flight operations
9. Returning gliders to the hangar
10. Refueling golf carts and cleaning up.

Figure 1: CCSC Overview

1.1 When You Get Here

Park in the member/guest parking areas outside of the field. Private cars are not allowed on the field or at the flight line unless they are towing a glider. See Figure 1 for an overview of the CCSC field.

On some mornings, especially during cooler seasons and when the potential for flight operations are questionable, crews gather in the clubhouse. Generally, as soon as a minimum number of members are present (including someone with sufficient experience to direct

activities) crews will begin preparing for the day. Look for a crew chief, or the member directing activities and anticipate the day when that member might be you!

1.2 Member Identification

Member name tags are provided to identify the club members and to indicate what level of proficiency a member has achieved. There will be cases where you will need to know a member's level before allowing members to perform certain actions. The level is indicated by the color of the name tag:

- Yellow is a student pilot
- Blue is a private pilot
- Gold is a commercial pilot who may fly guests
- Silver is an instructor pilot

1.3 Guests and Pets

If you bring a guest, stay with them until you are sure they are aware of how to safely move around the field and that they are aware of the dangers of an active runway. If guests include children, make sure that they are always accompanied by an adult. The airfield is a great family environment, but there are significant hazards that require diligent supervision.

Frequently, non-members will show up at the glider port. Some are interested in guest rides, some are interested in joining the club, and some are simply curious. We need to make sure guests are welcome and that their questions are answered, but first we need to make sure they spend their time at the field in a safe fashion. If a guest is interested in a flight, bring them to the attention of the crew chief who will schedule guest rides. Answer any questions you can and find a more experienced member to address any questions you cannot answer.

There are many members of the club that you may not recognize by sight – greeting any unrecognized individual as if they were a guest will make new folks feel much more welcome and meeting a previously unknown member will help you get to know the club better!

Finally, all dogs must be on a leash regardless of how well trained/behaved they may be. Unleashed dogs will not be tolerated.

1.4 General Precautions and Safety on the Field

There is a lot going on during a busy weekend at the field. There are guests who do not know how to behave on the field, there are high powered towplanes taking off and landing, nearly silent gliders making landings, retrievals taking place, and generally a lot going on in an environment that has the potential for disaster. It is your responsibility as a member of a ground crew to pay close attention and take action whenever you see a situation that could become hazardous. At a minimum, let someone else know that something doesn’t seem right!

Some of the basic rules are:

- Be alert for moving aircraft and vehicles
- Only enter the runway during flight operations if necessary for ground operations or with coordination of the crew chief.

- Before entering or crossing the runway for any reason, ensure the pattern is safe and aircraft are not preparing to takeoff or land.
- Unless you are actively moving a glider or a plane, ALWAYS use the pedestrian lane.
- When entering or leaving the east end of the field, watch for towplanes. Remember, they have 200 feet of rope dangling from their tail (with a nasty metal ring on the end).
- Landing planes have the right of way over everything. Always stay aware of traffic in the pattern. Ground operations must proceed predictably to an aircraft preparing to land.
- If you must cross a runway while moving a glider, make sure all traffic in the pattern is sufficiently far away to allow you to easily clear the field. Remember, on calm days, the towplanes may land in the opposite direction as the glider.
- When you approach a running towplane, always stay behind the wing. Stay well clear of the prop; it is the most dangerous thing on the field.
- When starting a towplane, the pilot will announce "Clear props!" Make sure you stay clear of the front of the towplane when you hear this announcement. Even if you are not near the towplane, you can watch for others that may be in a hazard area and alert them and the tow pilot of hazards.

2 Preparing for the Day

The ground crew should be at the field and ready to begin operations at 9:30. There are several tasks that must be completed before members begin arriving for flying.

2.1 Preparing the Flight Line Office

We have a mobile flight line office that contains many of the items that are needed for the day's operations. It must be towed to the flight line by the crew chief or a crew member appointed by the crew chief. Make sure it has the following supplies:

- Member flight cards (white)
- Guest flight cards (yellow)
- At least 3 tow rope adapters (see section 1.6.1)
- At least 4 tow ropes
- Water jug/water bottles/ice
- Sign up board and marking pen
- Ballast for the Schweitzers, the Grob, and the ASK-21s (if missing, they may have been left in the gliders)
- Student progress books
- Miscellaneous seat cushions
- Several hooks for handling the tow ropes
- Handheld radio
- Canopy/Tent

2.2 Setting up for Flight Operations

- Erect the tent as instructed by the crew chief. Even on mild days, the availability of shade can make the day much more comfortable for crew, pilots, and guests.
- Open the flight office and clean the sign-up board.
- Set out the appropriate flight cards.
- Set out the water jug, making sure that there are plenty of cups available.
- Set out the garbage can.
- Unreel and inspect a tow rope for each towplane. Make sure Schweizer adapters are available. See "Tow Ropes".

2.3 Opening the Hangar

All the club gliders that will be used during the day must be removed from the hangar and towed to the flight line.

A surprising amount of damage is done to the gliders while they are being moved about in the hangar (this damage is often referred to as hangar rash.) All operations in a hangar

require at least two and sometimes three people. It does NOT require three chiefs! Make sure one person is directing the operation.

Opening the hangar doors goes best when there are three people helping. When opening the doors:

1. Make sure all door retaining bars are lifted and placed in the unlocked position. Remove the retaining hook where the doors come together.
2. Unlatch and open the swinging sections of the door (next to each side wall). Secure this section to the sliding door with its hook.
3. Unlatch the door sections to allow them to be moved separately back along each side. Watch carefully to make sure the door does not hit any glider wings.
4. Push the door section from the handle at its middle.
5. Secure the door sections with their retaining bars when fully open.

2.4 Moving the Gliders from the Hangar

Gliders must be safely removed from the hangar, put in position for tow, and retrieved after a landing. Proper handling will protect the glider and minimize the effort of moving the glider. The following principles apply whenever moving a glider, whether in the hangar or on the

Always close and latch the canopy when moving a glider or when a glider is unattended.

flightline.

- Always use a minimum of two people to move a glider.
- Do not push on any movable control surface: aileron, elevator, rudder, flap, trim tab, or dive brakes.
- Do not push on the canopy
- Do not push on the wing tips except to rotate the glider. Make sure the tail is lifted if the glider does not have a swiveling tail wheel or is not equipped with a tail dolly.
- Do not open the canopy using the small vent window as this is the most common place for cracks to start. Generally you can reach inside and pull the canopy up using the latch or canopy frame.
- When in doubt, ask – particularly with gliders you have not handled before.
- Many gliders have small metal tubes that protrude from various surfaces on the glider. These are part of the pitot static system and are easily damaged. Several of the glider's avionics will not function if the tubes are damaged.

Gliders may safely be pushed from:

- The wing root (where the wing meets the fuselage).
- The wing struts (on SGS 2-33).
- The shoulder harness may be used to pull the glider (preferred on most fiberglass gliders).

If the glider has a fixed tail wheel or skid, raise the tail wheel before rotating. It is generally safe to push down on the outer end of the nose to lift the tail. The SGS 2-33 is equipped with an extensible grip in the nose for just this purpose.

Casters are provided for moving gliders around in the hangar. These can greatly ease aircraft movement but can cause damage if not used properly. For best safety, roll gliders onto the casters with the open side of the caster facing OPPOSITE the direction you intend to move the glider. Do NOT install retaining pins. They have been shown to increase the likelihood of damaging the belly of the glider and don't reliably prevent the glider from rolling off.

When moving gliders on casters, ensure you have enough people to watch all potential hazards – wingtips, tail surfaces, etc. Again, ONE person should be directing the operation! Follow all previous guidance on where to (and NOT to!) push on the gliders.

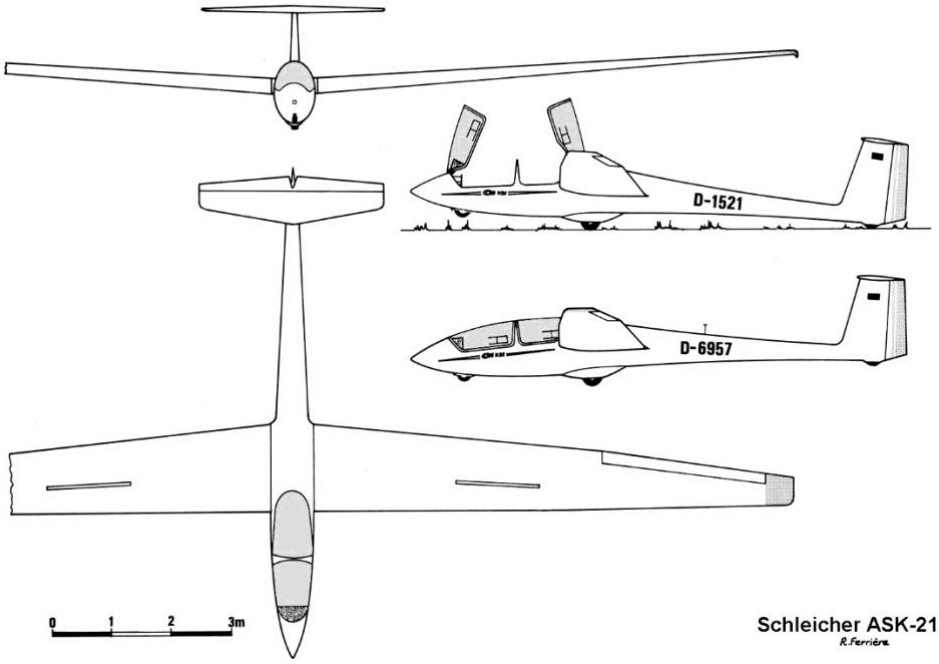
Once all hazards have been cleared, the glider main wheel should be moved to the centerline of the hangar and the dolly removed. At this point, if the glider is moved directly along the centerline, there should be adequate clearance between wings and the hangar doors. Moving a glider out of the hangar requires AT LEAST two people, but three is preferred.

Move the glider out of the hangar into a position that allows clearance for moving/positioning other gliders and movement of towplanes while line inspections are conducted, the topic of the next section.

3 Glider Line Inspection

All club gliders should receive a line inspection before they are moved to the flight line. This prevents gliders from being towed unnecessarily to the flight line. You will work with an experienced crew member to learn the proper line inspection procedures. If you are a student pilot, your instructor will also cover pre-flight inspections.

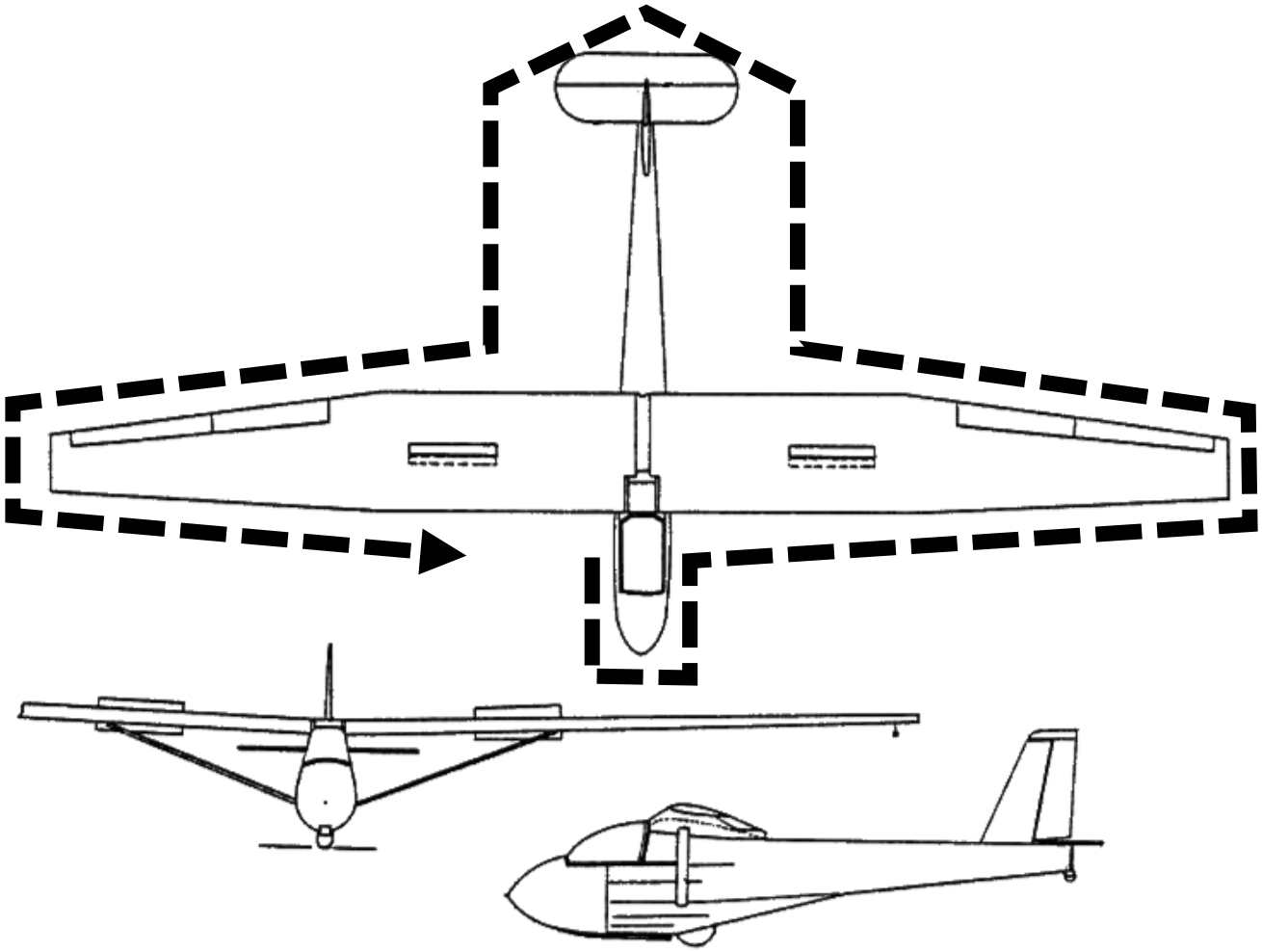
3.1 General Glider Line Inspections



Item	Inspection
Canopy	Check for cracks that have not been stop drilled; check the hinge and latch mechanisms.
Cockpit	Check seat belts, control stick, rudder pedals, dive brake mechanism, trim mechanism, overall condition of the instruments.
Wing Surfaces	Check for dents, cracks, broken/missing rivets.
Ailerons	Check for free movement; inspect any exposed mechanical components.
Dive Brakes	Check for free movement; inspect any exposed mechanical components.
Flaps	Check for free movement; inspect any exposed mechanical components.
Fuselage	Check for any damage.
Rudder	Check for free movement; inspect any exposed mechanical components
Elevators	Check for free movement; inspect of any exposed mechanical components
Tires and Wheels	Check for proper pressure, damage to the rubber, any unusual conditions

3.2 Schweizer 2-33 Line Inspection

This line inspection proceeds around the glider in a systematic fashion. The line inspection



should always be done in the same order to ensure that nothing is missed.

Item	Inspection
The Glider	Stand in front of the glider and look over the entire aircraft for anything that just looks wrong
Canopy	Look to see if someone has "red tagged" the glider; check for cracks; check latches, hinges, and canopy release.
Instruments	Adjust altimeter to field elevation (940')
Stick	Check for correct aileron and elevator movement; smoothness of control stick
Rudder pedals	Check for correct rudder movement; smoothness of pedals
Dive brake	Check for smooth operation; leave open

Item	Inspection
Seats	Check for damage and make sure the seat back is properly secured
Belts	Check attachment point; check for abnormal wear; check buckle operations
Nose	Check covering for tears; check pitot tube for blockage; check yaw strings
Tow hook	Check latch return spring; make sure hook moves freely
Skid	Check for loose rivets; check for missing or loose rubber bumpers
Main Wheel	Check pressure; look for abnormal wear
Right Strut	Check bottom and top attachment bolts; should have at least one thread showing and either "nylock" style lock nut or a castle nut with cotter pin.
Right Leading Edge	Check for dents, loose rivets
Right spoiler, front	Check connections on operating mechanism
Right wing wheel	Check for cracks in wheel and bracket; check attachment
Right wing	Sight the wing checking for damage, loose rivets; shake the wing slightly up and down for looseness
Right aileron	Check hinge; check for smooth movement; check for skin damage
Right spoiler, rear	Check hinges and operating mechanism
Fuselage skin, right	Check for tears and cracks
Horizontal Stabilizer	Check for dents and loose rivets
Stabilizer struts	Check this strut carefully! If it fails, you crash.
Elevator	Check for smooth movement; raise tail and check elevator actuator and actuator attachments
Rudder	Check for smooth movement, obstructions between rudder and vertical stabilizer; move rudder to full left and fright stops
Vertical stabilizer	Check, for damaged skin
Rear wheel	Check axle and axle nut, check for damage
Fuselage skin, left	Check for tears and cracks
Left spoiler, rear	Check hinges and operating mechanism
Left aileron	Check hinges; check for smooth movement; check for skin damage
Left wing	Sight the wing checking for damage, loose rivets; shake the wing slightly up and down for looseness
Left wing wheel	Check for cracks in wheel and bracket; check attachment
Left spoiler, front	Check connections on operating mechanism
Left leading edge	Check for dents, loose rivets

Item	Inspection
Left strut	Check bottom and top attachment bolts

3.3 Positive Control Check

There have been an unfortunate number of injuries and fatalities due to improper connection of controls. These tragedies (they are not accidents) are completely preventable by executing a simple five-minute positive control check. During a control check you are looking for two things: that the controls are actually hooked up AND that the controls move in the proper direction.

DO NOT disturb a pilot making a positive control check or performing any other preflight check list. Disturbing a pilot making preflight checks is a major cause of improperly performed preflight checks. Avoid the temptation to ask questions or otherwise distract the pilot. If you feel you have an issue that must be raised, wait until after the check is complete.

During a positive control check the pilot will move the controls and the assistant will verify that the control surfaces move positively in the proper direction. The following controls are checked:

The ailerons: the assistant grips the aileron with both hands, with one extended hand on the top of the aileron and one extended hand on the bottom of the aileron. The place you grip on the aileron will vary but normally it is at the aileron hinge or at the fattest part of the aileron. The pilot will indicate the proper location. The pilot will move the stick and tell you that the aileron should move up or down. Provide resistance against the movement and verify that the aileron actually moved in the correct direction. The pilot will then move the aileron the other direction and the same check is made.

The flaps: there are several different types of flaps, but generally you are checking to make sure the flaps move in or out; the pilot will give you instructions.

Dive brakes: There are two general types of dive brakes: ones that rotate on hinges away from the wing surface and ones that extend up perpendicular to the wing surface. On the first type, hold your hands over the closed dive brake (generally at the center) while the pilot attempts to open them. After this check, the pilot will open the dive brakes and you will hold the dive brake near the hinge and resist while the pilot attempts to close them. (be careful – Schweizer dive brakes bite!)

On the perpendicular dive brakes, place your hands over the center of the closed dive brake and resist while the pilot attempts to open them. The pilot will fully open the dive brakes. You then grip a structural surface (not the top covering of the dive brake) and resist while the pilot attempts to close them.

The rudder: Hold the rudder (generally near the center) on each side with the flat of your hand. The pilot will move the rudder pedals to the side and tell you that the rudder should move right or left. Resist the movement and make sure that the movement is in the right direction. The pilot will then attempt to move the rudder in the opposite direction.

The elevator: Hold the elevator (generally near the center) on each side with the flat of your hand. The pilot will move the stick forward or backwards and the elevator should move up or down. Resist the movement and make sure that the movement is in the right direction. The

pilot will then attempt to move the elevator in the opposite direction.

4 Ground Operations Basics

4.1 Ground Crew Signals

Hand signals are the primary means to communicate between the glider pilots, launch crew members, and towplane pilots during the hookup and launch process. The standard signals are used during various phases of operations and are illustrated below.

Glider Flying Handbook, Federal Aeronautics Administration, 2013.

Figure 2: Ground Crew Hand Signals

4.2 Towing Gliders with Golf Carts

Gliders are moved to/from the hangar and from the retrieval point with a golf cart or with the Kubota.

- You must be a club member and at least 12 years old to drive a golf cart.
  - Use the same common sense used as when operating any vehicle.
  - Adult guardians of youth and family club members are expected to ensure children under their supervision are trained and mature enough to operate a golf cart.
- Use the designated retrieval lanes shown in Figure 1.
- Turn the cart off and set the parking brake when not in use.
- When putting carts away, make sure the cart is set to charge if electric or filled with gas.

When towing a glider

- Pay attention to the wing walker and do not attempt to move the glider until they indicate they are ready.
- Watch the wing walker as you tow and drive at a comfortable speed for the walker.
- Remember, landing planes have right of way over all traffic and takeoffs have priority

Watch carefully for landing traffic and be careful to never interfere with a landing or takeoff

over all ground traffic.

- On gliders with fixed tail wheels, do not turn in tight circles as this puts unwanted stress on the glider. Turn in broad circles and have someone manually rotate the glider if a tight turn is required. Use the tail dollies on the 2-33s when possible.
- When you are finished with a tow, do not drive away until the person releasing the rope has verified that the rope is fully released
- All tow vehicles are equipped with rope reels. It is a best practice for the driver to ensure that the rope is wound on the reel and the end is secured or clear of the vehicle.

4.3 Tow Ropes and Hooking Up

Tow ropes are rather simple looking, however, keeping them in good condition is critical to safe glider operations

4.3.1 Tow Rope Ends and Adapters

Tow ropes have a two-inch ring at one end. This ring attaches to the towplane hook. The

other end has a pair of rings that are used for European built gliders which are referred to as Tost or European-style rings. For Schweitzer gliders, an adapter line with a two-inch ring must

Figure 3: Tow Ring Styles

be attached to the larger of the two Tost rings.

4.3.2 Inspecting a Tow Rope

Tow ropes should be inspected before use. You will be given instruction in inspecting a tow rope. Start by looking carefully at the loop of rope that secures the tow rings. Pull the loop away from the ring so you can see all around the rope. If there are too many broken strands, the rope should be cut and the ring reattached. Also look to see if the rope has "melted". On hot, turbulent days the friction of the rope against the ring can actually melt the polypropylene rope. Reattach the ring if you see this condition. If you have not been taught the proper way to splice ropes, ask an experienced crew member.

Next, stretch the entire length of rope out on the ground. As you unwind the rope, look carefully for any sign of damage or for any knots. DO NOT use ropes with knots; their strength is reduced by as much as half by a tight knot. If a knot is so tight it cannot be removed, cut the rope and remove the rings. When the rope is fully unwound, examine the other tow ring.

With the rope stretched out on the ground, pace it out (count the number of steps it takes to go from one end of the rope to the other). Walking naturally, most people will cover about three feet with each step. Do not use a rope that is shorter than 180 feet. If the rope is too short, remove both tow rings and put the rope back on a spool.

If the rope is bad, make sure you advise the crew chief. If the rope is good, leave it in large loose loops on the ground; do not pile the rope up.

Note: Many glider operations use a heavier rope and an adapter that serves as a weak link. At CCSC we use rope that is sized to provide the proper breaking strength and we do not use

a weak link. There are a couple of gliders that are too heavy for our standard ropes and the pilot will provide you with a special rope that bust be attached for the tow and then removed before the next tow of a normal glider.

4.3.3 Hooking Up to the Towplane

If the towplane is running, make sure the pilot is aware that you are attaching a rope.

- Push the release forward. This can be done at the hook; you do not need to use the release in the towplane.
- Put the tow rope ring in the hook. Make sure the ring is positioned properly at the back of the hook so the hook closes completely. Release the hook latch back until it fully engages the hook.
- Test the connection by pulling on the tow rope.
- Notify the tow pilot if you see any questionable condition of the tow hook.
- Ask the tow pilot if the release needs to be tested.

4.3.4 Hooking Up a Schweizer Glider

The pilot should be FAA current, CCSC current, and have a logbook endorsement for the

Do not hook up a glider until the pilot has inspected the tow ring and adapter

Do not hook up a glider unless a pilot is at the controls

glider. Do not hook up a glider until the pilot has inspected the tow ring and adapter.

1. The Schweizer tow hooks are located under the nose just ahead of the skid. Locate the hook and make sure it moves freely. The hook may jam in the forward position during the release and you will need to push down on it to free it.
2. Place the Schweizer ring over the hook.
3. Give the "open release" signal (open hand with fingers spread apart).
4. Move the hook to the closed position and align the square end of the hook with square hole on the latch.
5. Give the pilot the closed release signal (a closed fist).
6. Make sure the square peg is fully inserted in the square hole.
7. Pull on the rope to ensure that the tow ring is properly latched and moves freely in

the tow hook.

8. Check the release if it is the first flight of the day or if the pilot requests a release check. To test the release, pull gently on the rope while the pilot pulls the release.

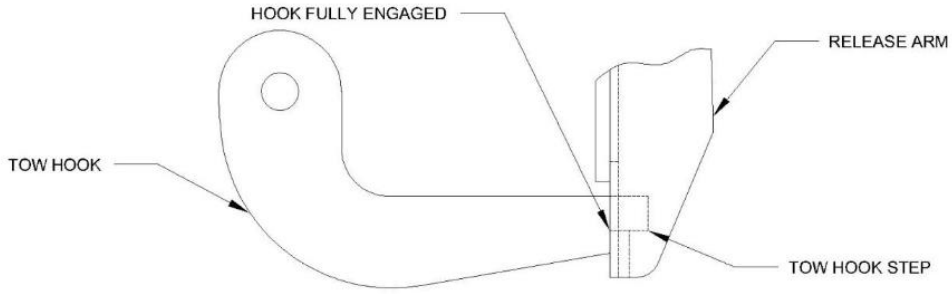


Figure 4: Proper Schweitzer Release Engagement

4.3.5 Hooking Up a European Glider

The pilot should be FAA and CCSC current and have a logbook endorsement for the glider.

Tow hooks on European gliders have three typical positions: at the end of the nose, under the nose but well forward of the main wheel, and just in front of the main wheel (referred to as a

Do not hook up a glider until the pilot has inspected the tow ring and adapter

Do not hook up a glider unless a pilot is at the controls

Center-of-Gravity (CG) hook). All three positions are hooked up the same way.

1. Locate the tow hook and give the pilot the "open release" signal. On most gliders, you will not actually be able to see the release open as it is well recessed into the glider.
2. Insert the small round ring as far into the tow hook cavity as possible. Generally, most of the round ring will be in the cavity. If the ring does not go in far enough, turn it 90 degrees and push. If it still does not go in, ask the pilot to make sure the latch is fully released.
3. Give the pilot the "close release" signal.
4. Pull on the rope to ensure that it is properly latched.

5. Check the release if it is the first tow of the day or if the pilot requests a release check. To test the release, pull gently on the rope while the pilot pulls the release.

5 Flight Operations

Remember, the pilot (no matter how cantankerous) has the final say in all phases of the launch: If the pilot does not like the glider position, move it; if the pilot does not like the rope or adapter, replace it. The only time the pilot does not have the final say is in the decision to actually launch the glider. The glider pilots have a lousy view of air traffic behind them and should tell you only that they are ready to launch, not to begin the launch. Do not begin the launch until both you and the glider pilot are ready. Do not raise the wing until you are ready to launch; this is the signal to everyone on the field and in the air that the towplane and glider are beginning the takeoff.

In response to multiple ground and flight incidents causing damage to aircraft and potential for catastrophic accidents, preflight procedures and checklists are being standardized. The following procedure is aligned with crew and pilot checklists but provides amplification on various steps. As of February 2020, losses have been only monetary. While these losses are an impact to the club, it is imperative that our standards of operation be improved to avoid the potential for more significant accidents, injury, or loss of life!

5.1 Checklist Use

While the following sections provide amplification to hookup and launch procedures, CCSC has implemented checklists for both ground and flight crews to improve attention to safety-critical actions. The checklists are printed, laminated, and in the side pocket of each glider. All members will use these checklists in club aircraft operation.

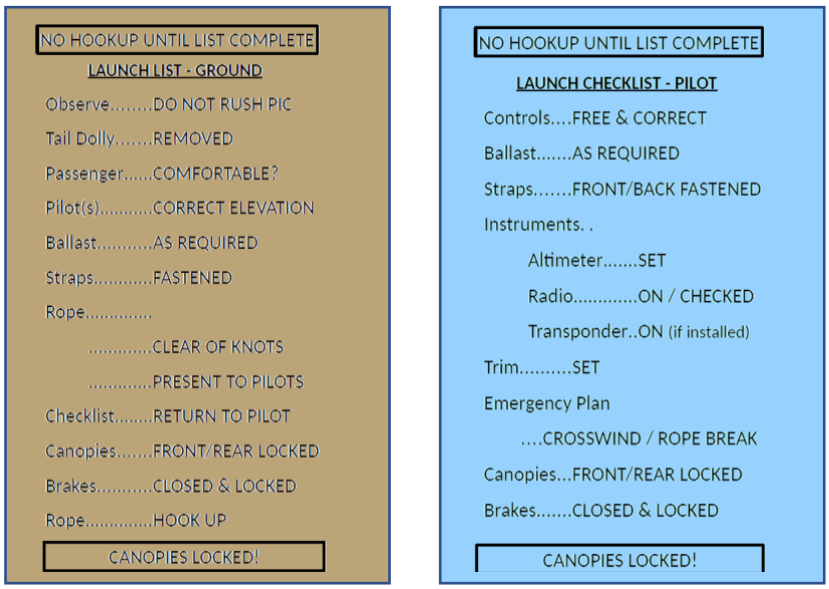


Figure 5: Ground Crew and Pilot Checklists

The card should be passed back to the pilot immediately before hooking up the towrope. On glass ships, the card can be passed through the window. On 2-33s it can be slipped between the canopy and fuselage rail.

5.2 Staging and Preflight

1. Stage the glider at a position acceptable to the pilot.
2. Ensure any tail dollies have been removed.
3. Ask the pilot if he/she has done a positive control check and assist if the answer is no. (see "Positive Control Check")
4. Verbally and visually confirm proper altimeter setting.
5. Identify ballast installation and verbally confirm the loading with the pilot or instructor.
6. Assist the pilot and passenger with seat belts and any other help they might need.
7. Stand in front of the glider and hold the flight card up to indicate to the tow pilot that the glider is ready for hook-up.

5.3 Hookup and Pre-Launch

1. When the towplane has moved to the glider and turned with the propeller facing away from you, take the flight card to the tow pilot.
   - Approach the towplane from behind the wing.
   - Relay any instructions the glider pilot or instructor may have asked you to convey to the tow pilot.
2. Using a tow rope hook, grab the tow rope, move away from the towplane towards

Do not pull the tow rope – let the tow plane take up slack

Always use a hook; do not let the rope run through your hands or around your back

   the glider and give the tow pilot the signal to take up slack.
3. Watch carefully for any knots that may have formed during the last flight (the hook will help-you will feel any knots). Remove any loose knots. If a tight knot has formed, the rope may need to be replaced – check with the crew chief.
4. When most of the slack has been removed from the tow rope, raise both hands above your head to signal the tow pilot to stop. Make sure there is enough rope to easily make a connection to the glider (note that some private gliders have center—of-gravity hooks that are well back on the glider).
5. Make sure the tow ring matches the glider: the two inch round "American" ring for Schweizer or the oval "European" Tost ring for all other gliders (see "Tow Rope Ends

and Adapters" on page 15). Add or remove the adapter rope as necessary.

6. Show the rope to the glider pilot for approval. The pilot has the final word on the acceptability of the rope.
7. When the glider pilot is ready for hook up, give the "open release" signal to the pilot, insert the tow ring and give the "close release" signal to the pilot. Pull on the tow rope to make sure the hook has engaged properly. See "Tow Ropes and Hooking Up" on page 15.
8. Ask if the pilot wants to perform a release check. If one is requested, pull on the rope while the pilot pulls the release. Reattach the rope.
9. While you are preparing the glider for launch, be alert for items the pilot may have missed: Is the canopy properly closed? Is the tail dolly removed?

5.4 Launch

1. Move to the side of the glider where you will be running the wing (generally the up-wind side).
2. Give the towplane the signal to take up the remaining slack.
3. Raise your arms to signal the towplane to stop and leave them raised until you are ready to launch the glider.
   - Do not stand in front of the glider when it is hooked up and the towplane is moving. The tow pilot's view to the rear is poor and your signal may be missed or misunderstood. A glider wing to the back of the neck is not pleasant.
4. Begin scanning the pattern and waiting for the glider pilot to give you the thumbs up signal.
   - Leave your arms up and do not raise the wing until the glider pilot has given the thumbs up signal and you are sure there are no gliders or towplanes that will need to land before you have completed the launch. When in doubt, wait. Ask the crew chief if you are really not sure.
5. When both you and the pilot are ready (Thumbs Up signal), lower your arms, raise the wing, and give the tow pilot the "begin takeoff" signal.
6. Grip the wing lightly and run with the wing until the glider controls have become effective and the glider pilot can prevent a dropping wing.
   - Let the wing fly out of your hand. Do not help it along by pushing up on the wing. If there is a crosswind, hold the wing slightly low to make it easier to control when the glider pilot takes over. Do not hold a wing back for any reason as this may cause a dangerous ground loop. Do not hold the front of the wing: if you trip you will drag the wing back and down causing a dangerous ground loop. Also, do not hold the front of a winglet. Think about what would happen if you trip or fall and make sure you can release the wing without causing it to rotate. Do not hold any movable control surface.

5.5 Retrieving a Glider

It may seem that once a glider has landed, all is well and safely done. However, we must remember that the stationary glider is now competing for space that another glider may need to land. While we are pulling a glider back to the flight line, there will also be planes wanting to land, with the pilots making landing decisions based on how they think the glider retrieval will be handled. Thus, it is important that we handle the retrieval in as consistent manner as possible. Some things to remember:

- See section "Handling a Glider" for details on proper glider handling
- During the entire retrieval process, do not stop scanning for traffic.
- When taking the retrieval vehicle out to a glider, stay as far to the edge of the runways as possible.
- Do not drive retrieval vehicles under low-flying planes.
- Give absolute right of way to landing planes
- Do not confuse planes in the air by making sudden changes in direction or pulling gliders into unexpected areas. If in doubt about where to go, stop and ask the wing runner to lower the wing. This signals pilots in the air that you are not going to move.
- On planes without tail dollies or swiveling tail wheels, DO NOT make sharp turns. Turn in wide arcs.

When you first begin retrieving aircraft, the crew chief will signal you when to begin. As you become more familiar with the operations, you will initiate retrieval on your own.

1. Drive the retrieval vehicle safely to the stationary glider. If the glider needs a tail dolly, make sure you take it with you. Get in the habit of reading the tail letters of the gliders as they land so you know which tail dolly to take.
2. If required, assist the pilots in attaching the tail dolly and turning the glider in the direction of the retrieval.
3. Drive the retrieval vehicle to the front of the glider so the trope can be attached to the tow hook. Assist the pilot as necessary.
4. Take the slack out of the rope and wait for the wing runner to give the signal to begin the retrieval. Start slowly; try to avoid jerking the glider. Scan for traffic.
    - If at any time an aircraft is landing or departing, stop the retrieval.
    - The wing runner will lower the wing that is closest to the landing or takeoff lane.
5. Drive at a speed that is comfortable for the wing runner. Look back to the wing runner regularly to see that they are comfortable with the retrieval.
6. Drive as directly as possible to a designated retrieval lane as shown in Figure 6. Continuously scan for traffic.
7. Look to the crew chief for directions on where to park the glider.
8. When the glider is at the final position, wait for the wing runner to indicate the rope is properly released and then drive safely to the ground operations area.

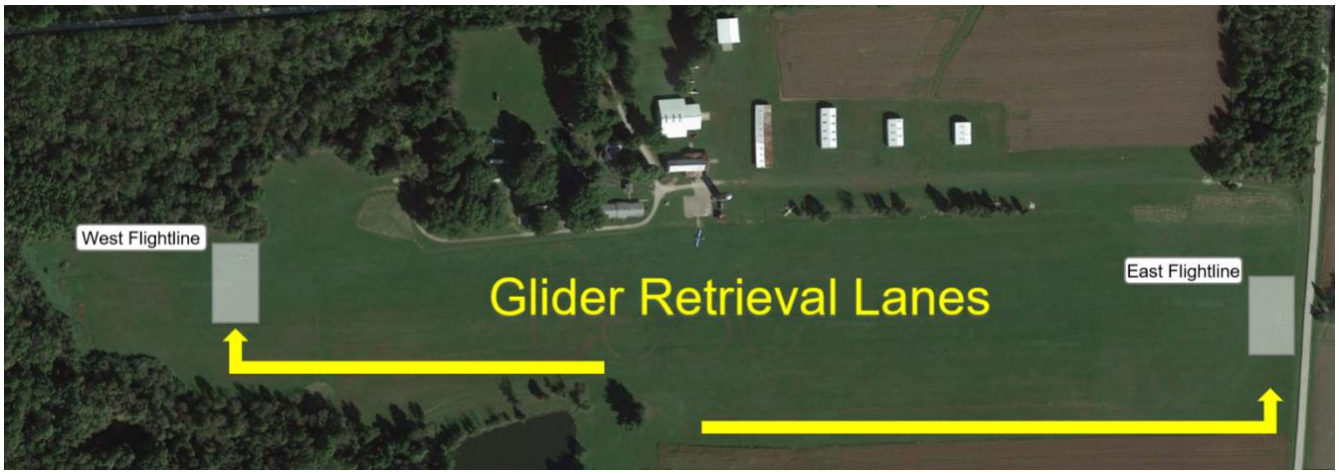


Figure 6: Glider Retrieval Lanes

6 Shutting down

At the end of the day, the crew chief will tell you when to begin shutting down operations.

6.1 Returning Gliders to the hangar

Putting the gliders back in the hangar is an event that is part Keystone cops and part minor miracle. The whole affair goes better when:

- An experienced person leads the operation.
- Everyone remembers that there is more than one way to put the gliders away.
- The leader of the operation gives instructions and pays attention to the assistants' feedback.
- Assistants keep the leader aware of the glider's position.
- Assistants give instructions when asked and try to keep it to themselves unless a plane is in danger of being damaged

6.2 Returning Towplanes to the Hangar

The tow pilots will need help with the towplanes. Follow their instructions. Do not attempt to put a towplane away without a tow pilot.

6.3 Miscellaneous Items

Return the following items to the flight office:

- Adapters
- Tow ropes (after being inspected and wound on their reels)
- Hooks
- Flight cards and sign-up board
- Cushions, chairs, water jug

The crew chief will return the flight office to the barn.

Check fuel levels in the golf carts, and if low refuel them. Put away the golf carts and, if electric, connect them to the charger. The Kubota is stored in the towplane hangar. If all of the towplanes are not yet put away, park the Kubota next to the hangar out of the line of any aircraft. The Kubota key is kept in the towplane book. Pick up any trash and empty the flight office trash can into the dumpster.