Cypress Soaring

Flight Training Workbook

Basic Training to Solo

by Art Wallace, CFIG

Cypress Soaring

Rev. 7/22

Ground Instruction Assignments

Your ground instruction is based on the FAA publication, ***Glider Flying Handbook*** (GFH). You can find a link to this manual on the Resources page of the Cypress Soaring website. You will also find links to the Krosno POH and Preflight Checklist on the website Resources page..
You will also need to refer to the *FAA 14 CFR,* ***Federal Aviation Regulations*** (FARs) and the ***Aeronautical Information Manual*** (AIM). Find these on www.faa.gov.

Assignments:

Student's Name _____ Completed

1. Take the Soaring Safety Foundation (SSF) Wing Runner Course online
   http://www.soaringsafety.org/school/wingrunner/toc.htm ☐
2. Read Chapter 2, GFH, Components and Systems
   Take test 1, Components and Systems, page 31 ☐
3. Read the Krosno Pilot Operating Handbook (POH)
   Take test 2, Krosno POH, page 32 ☐
4. Read Chapter 4, GFH, Flight Instruments
   Take test 3, Flight Instruments, page 33 ☐
5. Read Chapter 3, GFH, Aerodynamics of Flight
   Take test 4, Aerodynamics, page 34 ☐
6. Read Chapter 5, GFH, pages 10 through 14, Weight and Balance
   Review Krosno Weight and Balance information in the Krosno POH
   Take test 4, Weight and Balance, page 35 ☐
7. Read Chapter 6, GFH, Preflight and Ground Operations
   Take test 6, Flight Maneuvers, page 36 ☐
8. Read Chapter 7, GFH, Launch and Recovery Procedures and Flight Maneuvers
   Take Test 7, Launch and Recovery Procedures and Flight Maneuvers, page 37 ☐
9. Read Chapter 9, GFH, Soaring Weather
   Take test 8, Soaring Weather, page 38 ☐
10. Read Chapter 10, GFH, Soaring Techniques
    Take test 9, Soaring Techniques, page 39 ☐
11. Read page 25, Flight Training Workbook, FARs
    Take test 10, FARs, page 40 ☐
12. Read the Hemet Airport Operating Manual
13. Read pages 23-29, Flight Training Workbook, CFR Part 41, 61, and 91

Flight Training Workbook Tests

	Completed
1. Takeoff Techniques, page. 41	☐
2. Landings, page. 42	☐
3. Slips and Crosswind Landings, page. 43	☐
4. Slack Rope recovery, page 44	☐
5. Forward Stalls, page 45	☐
6. Turning Stalls, page 46	☐
7. Rope Break Procedures, page. 47	☐
8. Spins and Spiral Dives, page. 48	☐
9. Pre-Solo Written Test, pages 49-51	☐

Following are the basic elements of your flight training. These are the things you will need to learn before you achieve your first solo flight. With every flight your instructor will emphasize safety.

1. **Preflight and ground handling**
   - Checklists
   - Moving gliders
   - Standard American Glider Signals
2. **Launch procedures**
   - Weak links
   - Checklist
   - Takeoff
3. **Aerotow**
   - Tow position
   - Wake turbulence
   - Boxing the wake
   - Slack rope on tow
   - Rope breaks
   - Release
4. **Free flight**
   - Straight glides
   - Pitch/airspeed control
   - Shallow turns
   - Coordination
   - Clearing turns
   - Medium and steep bank turns
   - Stall recognition and recovery
5. **Landing**
   - Checklist
   - Approach speed
   - Divebrakes
   - Landing pattern
   - Lookdown angles
   - Aim point
   - Ground effect
   - Flare
   - Touchdown and rollout
6. **A little more to learn**
   - Thermaling
   - Speeds to fly
   - Glide ratio
   - Slips
   - Spins and spiral dives
   - Rope breaks
   - Krosno data
7. **FAA Regulations**

Cypress Soaring
Glider Solo Course Flight Training

by Art Wallace, CFIG

During the course of many days you will learn the art and science of flight. It may take anywhere from 30 to 50 flights to become proficient enough to solo. In addition to flight training, you must also complete ground training that teaches you the fundamentals of the aircraft you will fly, aerodynamics, flight operations, weather, regulations, and safety.

The ground training in this workbook can be done at your own pace. Start with Assignment #1 and work your way down, taking the quizzes as you go. If you have a question, don't hesitate to ask your instructor.

Your flight training will consist of learning and acquiring skills. As you progress, you will apply the learned skills to new elements and phases of your flying. These are the building blocks you will use to accomplish each new skill. For example, at first you will fly high in the air, practicing your coordination skills. That is, moving your hand on the stick in coordination with your feet movements on the rudder pedals. Soon you will make precise, coordinated turns. Later, those skills will be applied to flying the landing pattern, and on takeoff, to keep the glider on the centerline of the runway.

When your flying skills and aeronautical knowledge are sufficient, you will apply to the FAA for your Student Pilot Certificate, take the pre-solo written test, and then, SOLO!

Before your first lesson Take the Soaring Safety Foundation Wing Runner Course.

Your First Flight Lesson

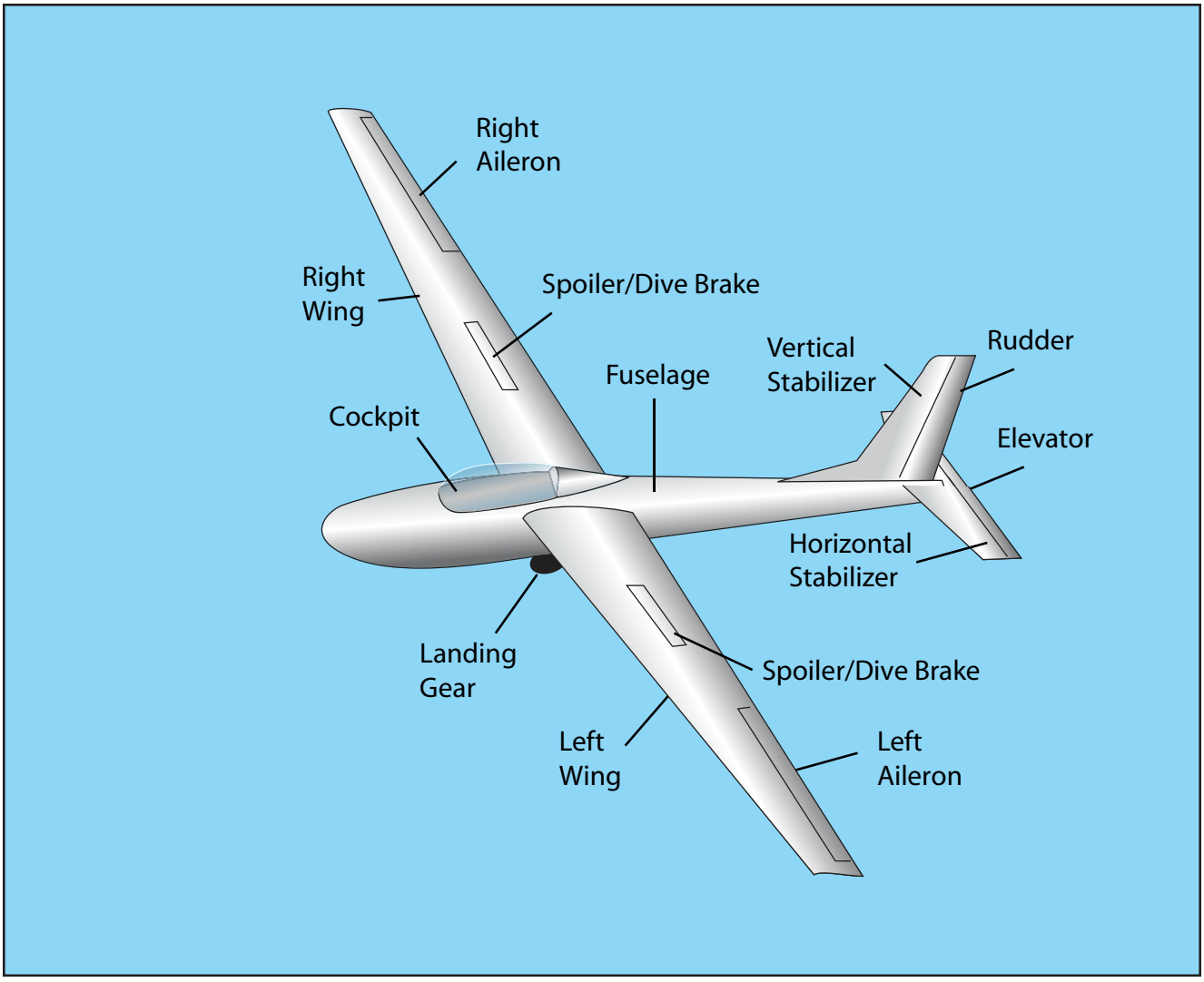
Learning the basics and getting comfortable in a new environment

If you have any questions about your first Ground Instruction assignment, now is the time to ask your instructor to discuss what you have read. Don't hesitate to ask questions.

For your first few flights, your instructor will assist you and he will do most of the flying especially during the takeoff and landing phases.

Before you and your instructor move the glider to its starting point your instructor will show you how to get in and how to fasten the safety belt. He will explain the controls and the instruments. Then the glider will be moved to the launch line on the runway, and the instructor will guide you through the pre-takeoff checklist. Once each item on the checklist has been completed, the towrope will be attached and the towplane will move forward, taking up the slack in the rope. Finally, the rope will be tight, and the wingman will call out "pattern clear." The instructor will give the wingman a thumbs up, the wingman will lift the wing, and your instructor will “wig-wag” the rudder as a signal that the glider is ready to go. The instructor will also announce on the radio to the tow pilot that he is ready for takeoff. The wingman will also swing his arm in a circle to tell the tow pilot to start the takeoff. And off you go! On your first flight(s), you will become accustomed to moving the flight controls and observing how the glider reacts to your inputs. After your flight, your instructor will review the main points of the lesson and answer your questions. Before you go, your instructor will enter your first flight in your log book.

Glider Components



Fuselage – Cockpit, wings and empennage attached, landing gear

Cockpit – Instruments: altimeter, airspeed, variometer (vertical speed),

Compass, radio (if installed)
Control stick
Rudder pedals
Divebrake lever (spoiler control)
Tow release – Red (US), Yellow (non-US)
Flap lever (if applicable)
Elevator trim
Wheel brake
Undercarriage retraction lever (if applicable)

Wing – Develops lift, ailerons, spoilers, flaps

Empennage – Vertical and horizontal stabilizers, rudder, elevator

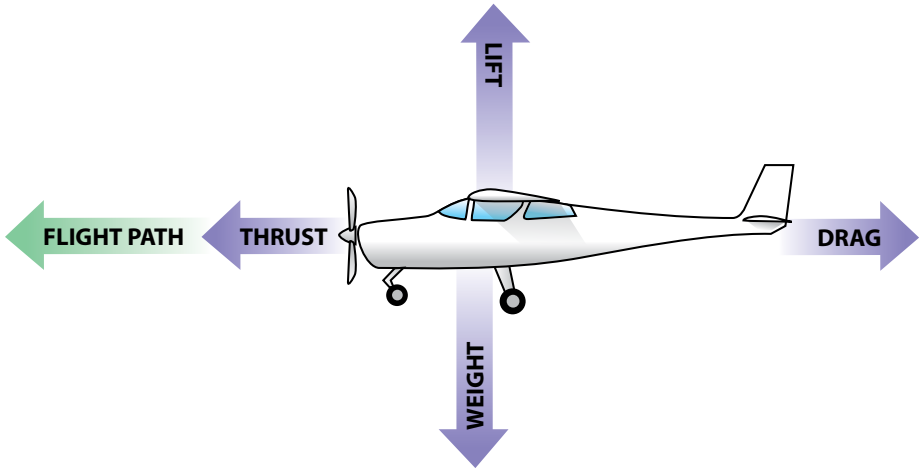
The Four Forces Acting Upon An Aircraft

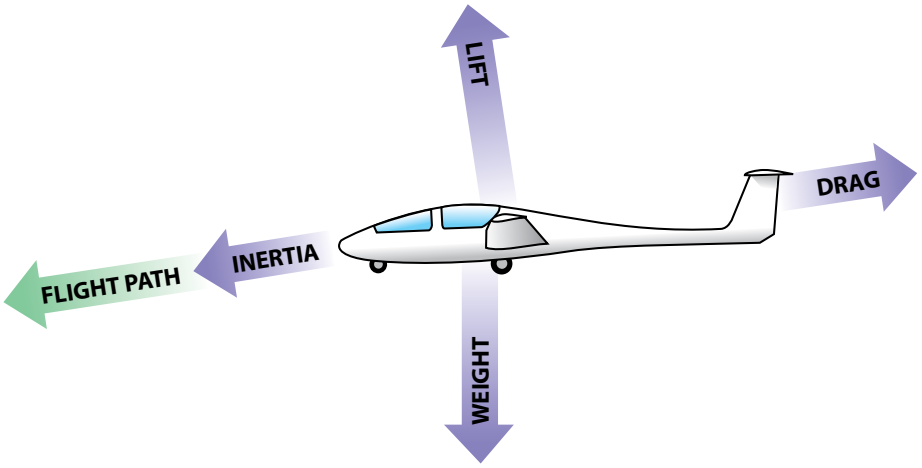
1. Lift- generated by the wing. It hold the airplane up.

2. Weight / gravity- gravity pulls the aircraft toward the earth.

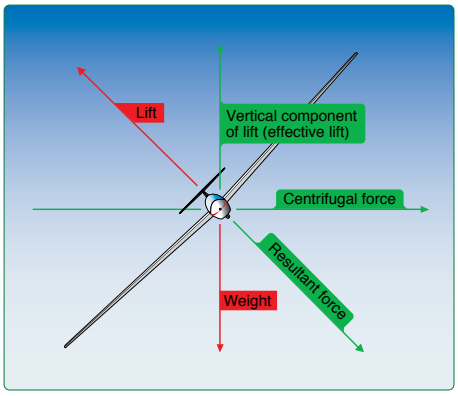
3. Drag- the resistance created by the airflow against the aircraft structure. Also a byproduct of lift.

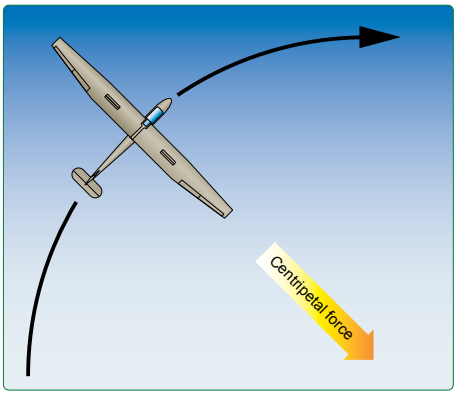
4. Thrust / inertia- forward motion created by a propeller or jet. Inertia created as a vector of lift and gravity pulls the aircraft forward.



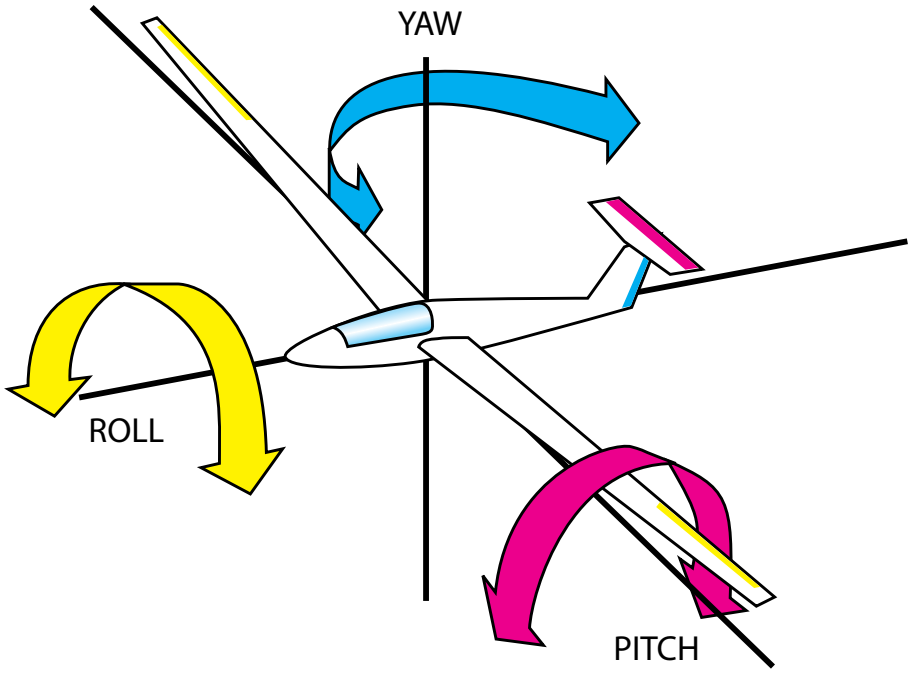


Unlike a boat, the rudder does not make the aircraft turn. Note that when the glider is banked, some of the lift on the wings is also tilted in the direction of the bank angle. This inclined component of lift is what makes the glider (or airplane) turn.





How A Sailplane Is Controlled



Sailplanes are controlled by a "stick" and rudder pedals. The pilot moves these controls, which in turn move the aircraft ailerons, rudder and elevator.

PITCH: Moving the stick forward lowers the nose of the aircraft. Speed increases.

Moving the stick backward raises the nose of the aircraft. Speed decreases.

ROLL: Move the stick right or left and the aircraft banks to the right or left.

YAW: Move the rudder pedals right or left and the aircraft yaws right or left.

The rudder does not turn the glider. To make a turn you use both stick and rudder pedals at the same time. Right pedal, right stick, left pedal, left stick.

1. Preflight and Ground Handling

Preflight Checklists

Cypress Soaring has a preflight checklist for every glider. These checklists can be found in the storage boxes near the glider it is associated with. Sometime during your first two or three training days you will be asked to arrive at the airport early so that you can do the preflight on the glider. Your instructor will walk you through each item on the preflight checklist, and he will show you on the glider what you are supposed to see or do for each item. Once the checklist is complete, you will sign and date the checklist to show that the glider has been preflighted on that day and who did it.

Moving Gliders

After a glider has been preflighted, or at any time during the day when a glider needs to be moved, you may be asked to help.

If you are doing the preflight on the glider, you will also probably need to remove each of the gust locks, and untie the ropes or chains that hold down the wings, tail, and nose of the aircraft. Your instructor will help and he will show you how to do this.

If you are moving the glider, there are some places on the aircraft that are fragile. Do not apply pressure or push on these places.

Do not push on the trailing edge of the wings, ailerons or tail surfaces. Do not press on any fabric surfaces.

Do not pull forward or backward on the wingtips to try to move or turn the glider.

Do not push on the canopy and be careful to not scratch the surface of the plastic. Do not leave the canopy open, unattended, and do not allow the canopy to slam closed. Do not lift on the canopy window rails. Do not use a dirty towel to clean the canopy. Be gentle with this very expensive, very fragile piece of plastic. Your instructor will show you the correct way to clean and handle this part of the aircraft.

You can push at the wing root on the metal surfaces over the wing spar.

You can pull the glider with a tow rope attached to the tow release.

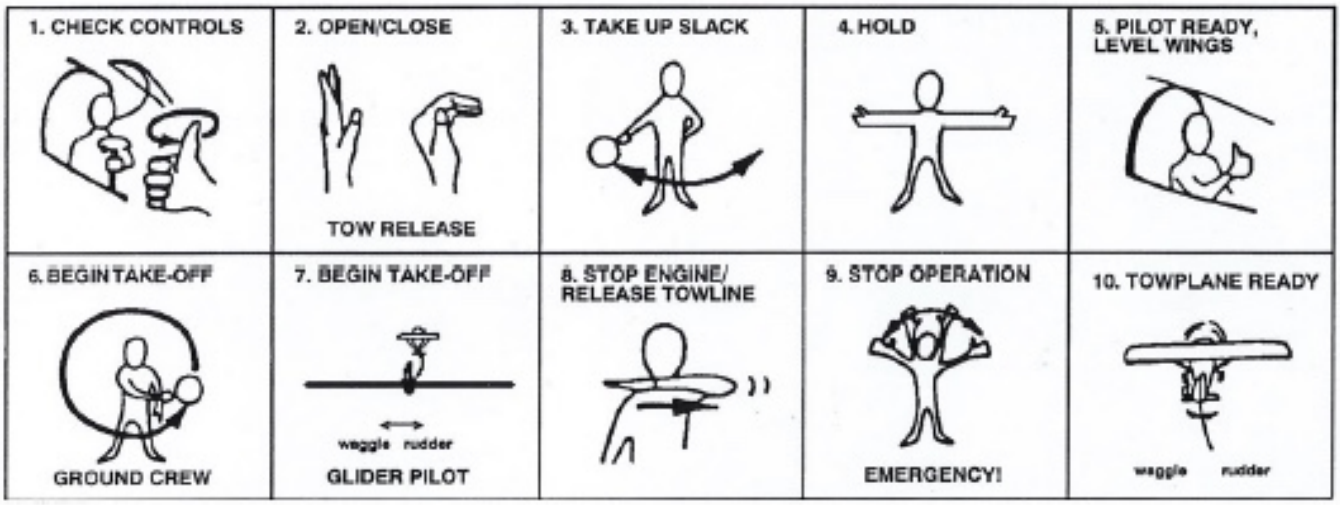
Never move a glider by yourself. Always have at least one or two more people to help you. One or two to push and at least one to walk a wingtip.

Never leave a glider untied and unattended. Wind can blow it around.

Standard American Launch and Airborne Signals

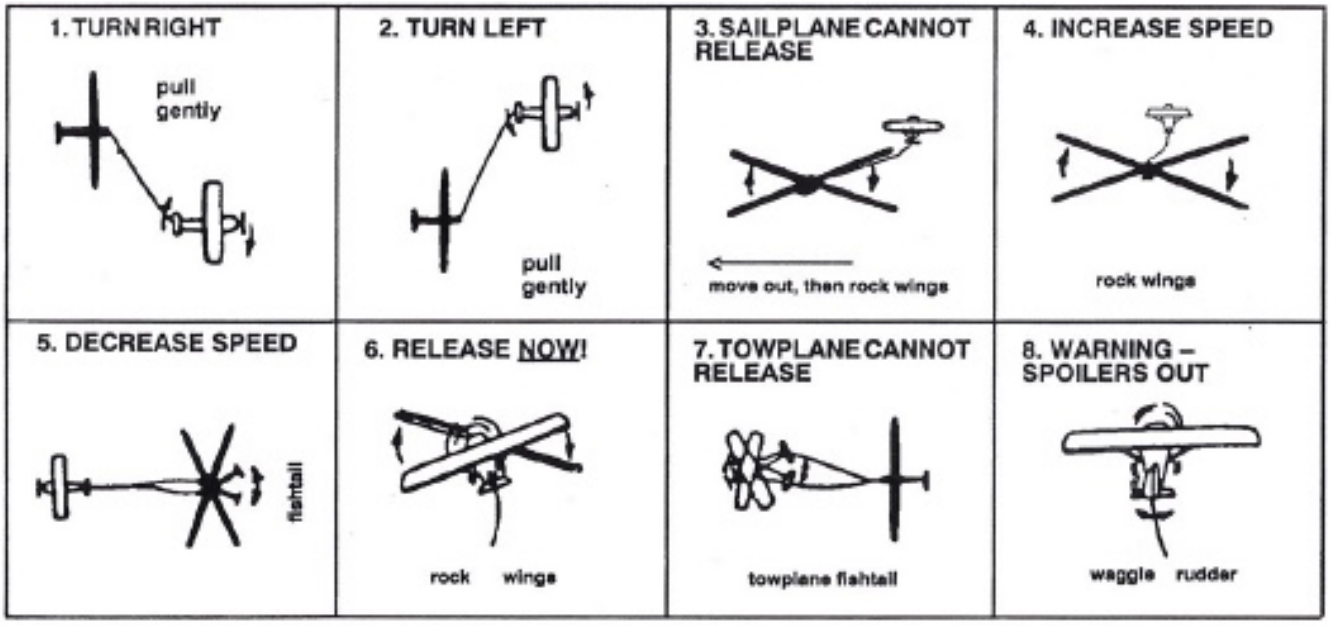
Depicted below are the standard American launch and airborne signals to be used for communication between the pilot and wing runner, and the glider pilot and tow pilot in flight. You will need to know all of these signals, and know when and how to use them.

SOARING GROUND SIGNALS



The standard American Soaring Ground signals. You may also find it useful to view animations of these signals by viewing the **Online Wing Runner Course**.

SOARING AIRBORNE SIGNALS



2. Launch

Weak Links

Cypress Soaring has several gliders. We use weak links in order to allow for different minimum and maximum rope breaking strengths for each glider. These are a short length of rope that has a ring on one end and a loop on the other. The loop connects to the tow rope and the ring attaches to the glider. We have two different types of weak links. One link uses a 1/4" dia. rope. The other uses a 3/8" dia. rope. The heavier rope is used for the heavier gliders. These ropes have different types of rings.

The Tost ring is used on the Krosno, and most of our other gliders. It is actually a ring set, with two rings. The round, end ring is about an inch in diameter, and it is attached to the Tost tow release on the glider.

The Schweizer ring is a single ring, used on our Schweizer glider. It has a diameter of about 2 1/2."

Your instructor will show you how to attach the weak link to the tow rope and hook the ring to the glider. This is one of the tasks you would do as a wing runner.

Checklist

Our gliders all have two checklists in the cockpit. One is for takeoff and the other is for landing. Never hook up the glider to the tow plane for takeoff until you have completed each item on the checklist and are ready to fly. This is the pre-takeoff checklist. You should memorize it, but most importantly, remember to USE a checklist. Your instructor will assist you with how to use the checklist.

C Controls
B Ballast
S Straps
I Instruments
T Trim
C Canopy
D Divebrakes
W Wind
E Emergency

Takeoff

For your first few flights, your instructor will handle the controls during the takeoff and the landing. Gradually he (or she) will give you more responsibility for controlling the glider during these critical phases. At first your instructor will ask you to follow on the controls. Don't override him but feel what he is doing. Soon he will allow you to do the takeoff with his assistance. Then, after a few flights, you will be doing it yourself. Your instructor will always be there to monitor and assist you.

After you have completed the checklist and closed and locked the canopy, your wing runner will do his part to get you launched. He will signal the tow plane to take up slack in the rope, check the landing pattern, lift the wing and signal the tow plane for launch. Wings level. Signal the tow plane by wagging the rudder, and radio, announcement, then the tow plane will begin to accelerate down the runway while you use rudder to keep the glider in the center of the runway and ailerons to keep the wings level. Then, you lift off. You're flying!

If the wind directions during your takeoff is crosswind to the runway, begin by slightly lowering the upwind wing. Once you lift off, and before the tow plane lifts off, allow the glider to "crab" into the wind. The nose will point somewhat toward the crosswind as the towplane lifts off the runway.

3. Aerotow

Tow Position

Every glider and every tow plane is flying in formation while the glider is being towed. As you accelerate down the runway, you will likely lift off first. You must keep the glider from rising too high by using a little forward pressure on the control stick. Keep the glider at 3-5 ft. above the runway while the towplane is still on the ground. After the towplane lifts off, you follow him and as he rises up, you rise up. When he begins a turn, you wait just a moment, then you match the towplane bank angle and follow it in the turn. When the towplane levels out, you do the same. Watch the towplane and stay directly behind and slightly above. Do not lose sight of the towplane. Remember, you are flying in formation.

Release

Usually it will be up to you to release the glider from the towplane once you reach your intended altitude. A little before you reach your altitude, clear the area around the glider. Make sure there is no other aircraft nearby. Then, pull the release. Make sure the rope has released, watch it go away from you. Then in a few seconds, begin a level turn to the right as the towplane turns to the left and descends. Make your turn about 30 degrees, then turn back. Keep an eye on the towplane the entire time. Watch him until he is well away from you and there is no danger of a collision.

Wake Turbulence

There is a turbulent wake below and behind the tow plane. In the normal high tow position, you will be following the towplane slightly above this wake.

Boxing The Wake

As you become more accustomed to flying on tow (probably 6-10 flights), your instructor will introduce the wake turbulence, and how to fly through it and around it. This is called "boxing the wake." Your instructor will demonstrate this maneuver, and you will follow by doing exactly as he demonstrated. It will take a few tries. This is to teach you how to put the glider back in position behind the towplane at times when you get out of position. You will practice this maneuver often.

Slack Rope On Tow

Sometimes on tow, you get slack in the rope. This is not normally a serious situation unless the slack gets so far back that it risks catching a wing. Usually if you stay in position the slack will come out naturally. You could also yaw the nose of the glider away from the slack to take out slack. It may be necessary to lower the nose slightly just when the rope comes tight to minimize the "rubber band" effect. Again, your instructor will be there to demonstrate and to help you.

Rope Breaks

Although not frequent, rope breaks can happen at any time. You will practice simulated rope breaks. These simulations will come a little later in your flight training. Probably a few flights before you are ready to solo. Of course, the most critical times are when you and the tow plane are close to the ground. If you are at an altitude of 500 ft. or above, simply bring the rope with you and land back on the runway. Release the rope right before touchdown. At 200 ft. you should be able to make a 180-240 degree turn and go back to the runway for a downwind landing. Your instructor will teach you how to execute this simulated emergency and will coach you every step of the way.

4. Freeflight

This is the phase of flight where you will first begin to acquire the skills necessary to fly, soar, maneuver the glider, takeoff, stay on tow, and land. This is where your fundamentals begin.

Straight Glides

This is easier than you think. You will learn this on your first or second flight. The key is to let the glider do the work. Don't try to "steer" the glider, just let it fly. In fact, your instructor will demonstrate how well the glider can fly without any control input from the pilot. He, along with you, will take his hands and feet off the controls. See how the glider simply glides straight? He will ask you to take control again, and do nothing! See how the glider flies straight? In a few flights your instructor will ask you to pick a prominent point far in the distance and point the nose of the glider at that point. You will glide straight to it without swaying or fishtailing. Later this skill will help you learn to fly straight, parallel legs of the landing pattern.

Pitch/Airspeed Control

The speed at which the glider flies through the air is called airspeed. Seems logical. Eventually you will hear other terms related to different types of speed associated with flight. The flight control stick in your hand will control the airspeed of the glider. Push forward on the stick, the glider will speed up. Pull back on the stick, the glider will slow down. This is called pitch control. The nose of the glider "pitches" up or down. Speeding up or slowing down must be done using gentle, small motions of the stick. Otherwise, large inputs from the stick result in dives, climbs, or even stalls. It won't take long for you to learn this skill.

Shallow Turns

During your first few flights you will practice shallow turns to the right and to the left. You will use the stick and rudder pedals to "coordinate" your turns. You will bank the glider using the stick and the rudder pedals to help the glider fly coordinated. Bank into the turns, then use opposite control inputs to bank back to level the wings. Banking the wings is how and why aircraft make turns. It's not the rudder, like a boat. The rudder causes the fuselage of the glider to "yaw" in the direction of the turn. More on this in a minute.

Coordination

You have already seen the word "coordination. " Throughout your flight training you will often hear that word from your instructor. It is important to fly the glider in a coordinated manner so that it flies most efficiently and safely. You will be asked to apply equal amounts of rudder pedal pressure and stick pressure. That is, move the stick half way, move the rudder pedals half way also. Etc. On almost all gliders there is a very simple instrument that tells us how well coordinated we are flying. It's called a yaw string. The object is to keep the yaw string pointed straight back at your forehead. If it veers right or left, the glider is not flying efficiently. This applies to straight glides as well as turns.

Clearing Turns

From the start, as you are learning how to control the glider, your instructor will be looking outside. He will be watching for other aircraft, near and far. Soon though, he will start asking you to do the same. Watch for traffic. Every time before you start a turn or change of direction you must look in the direction of your intended turn. Take time to actually see, and look back as far as you can. Like changing lanes in a car, only in three dimensions rather than two.

Medium And Steep Bank Turns

As your become more skilled and more comfortable making shallow banked turns, your instructor will begin to ask you to make the banks a little steeper. He may assist you in doing this at first. You may start with 30 degree bank turns, then 45 degrees as you gain experience and skill. There are a few more aerodynamic complications added to your efforts to coordinate these steeper bank turns. You will experience a more pronounced aileron drag and overbanking tendency that you don't experience in shallow turns.

Aileron drag...you will experience this as you begin to bank and as your bank angles become steeper. The aileron on the high wing deflects downward, increasing angle of attack and lifting the wing up. But, this also increases the drag on that wing which makes it tend to swing rearward. You have to compensate for this by applying a little more rudder pedal toward the turn. Watch the yaw string.

Overbanking tendency...once your bank angle increases to about 45 degrees or more, you will find that the glider will continue to bank without your additional input. So, you will need to begin to add a little opposite stick away from the direction of the turn in order to arrest the tendency of the glider to overbank. Overbanking happens because the higher, outside wing in a steep turn is flying faster than the lower inside wing. This creates more lift on the higher wing, therefore causing it to rise more than the lower wing.

Stall Recognition And Recovery

Your instructor will start to discuss stalls fairly early in your flight training, and you will continue to practice stall recognition, entry, and recovery throughout your flight training. Practicing stalls at higher altitudes is safe. However, an inadvertent stall close to the ground can be fatal. That's why your instructor will emphasize vigilence of minimum airspeed and coordination during your flight. Basically, a stall occurs when the wing of the glider exceeds it's critical angle of attack. An aircraft can stall at any airspeed. You must read more about this in the Glider Flying Handbook. You must learn to recognize the signs of an impending stall and correct the condition immediately.
There are six signs of a stall. Memorize this:

1. Excessive back stick
2. Nose high attitude
3. Slowing airspeed
4. Quietness
5. Mushy controls
6. Buffet

Your instructor will demonstrate how the impending stall occurs. He will also demonstrate how to recover from the stall once it develops completely. You will practice this many times. You will practice straight ahead stalls, and then stalls that occur during a turn. Your instructor will emphasize the importance of immediate recovery from a stalled condition. Note that at any time you recognize any one of the signs, you can react to correct the condition and prevent the stall from occurring.

Spins

Read more about spins and spiral dives in the Glider Flying Handbook, Chapter 8, pages 15-17.

Spins occur as a result of flying in an uncooridinated manner. This is most likely to occur during the landing pattern, especially the turn from base to final. During the turn the low wing inside the turn stalls more deeply than the higher wing outside the turn. This causes what is called auto rotation. The low wing suddenly drops, and the high wing rotates further up and around. This rotation increases, causing the spin. It is important to know that if you fly coordinated, with the nose of the glider below the horizon during all turns, you cannot spin. If you do begin to recognize the development of a spin, you must:

1. Apply full opposite rudder pedal to the direction of the spin, until the rotation stops. During this time, do not release the back pressure you have on the stick.

2. Once the rotation has stopped, neutralize the rudder pedals and release the back pressure on the stick. The glider will begin to dive and increase airspeed.

3. Very gently pull back on the stick in order to pull out of the dive. Be patient and do not pull hard on the stick. Keep the wings level.

4. Once you are no longer diving, stabilize your flight to straight and level.

Spiral Dives

Spiral dives, unlike spins, do not usually occur because of uncoordinated flight. Spiral dives usually occur during steep banked turns when the nose of the glider is allowed to drop, increasing airspeed. This results in a spiraling dive, where airspeed increases very quickly. It is important to recover immediately from a spiral dive in order to avoid exceeding the maximum allowable airspeed of the glider.

To recover from a spiral dive, you must:

1. Roll the wings to level, coordinating with stick and rudder pedals.

2. Gently apply back pressure on the stick to recover from the dive.

3. Once you are no longer diving, stabilize your flight to straight and level.

5. Landing

Pre-landing Checklist

It is critical that before every landing, you must complete a pre-landing checklist. During your first few flights, your instructor will begin to introduce the approach to landing. He will probably have you fly to the Initial Point (IP). That is the location over the ground that you will begin the entry leg of the pattern. It is a good idea to complete the checklist right before you enter the landing pattern. Trying to complete the checklist during the landing pattern could be distracting. The checklist is used to ensure that there is no other traffic nearby, no obstacles on the ground, wind direction, adjust trim and airspeed to the correct approach speed, and check divebrakes for proper operation.

Here is the pre-landing checklist:

T Traffic

O Obstacles

W Wind

A Airspeed/Trim

R Retractable Landing Gear

D Divebrakes

Memorize this checklist. Your instructor will assist you throughout the checklist procedure.

Approach speed

During the pre-landing checklist, you will determine or at least estimate the velocity of the wind. A normal no-wind approach speed would be never less than 50 knots in the Krosno. However, you would also add about 1/2 the wind velocity to that minimum speed. So, if the wind were at 15 knots, you might add about 8 knots to your airspeed for a total of 58 knots; your approach speed. You might need to adjust this speed later in the pattern if your estimate was a little off.

Divebrakes

You may have noticed on your first flights with your instructor that he uses the divebrakes during the landing. Divebrakes, or spoilers as they are sometimes called, disturb some of the airflow over the wings. This causes the glider to lose some lift and increase sink. The more you open the dive-brakes, the more the glider will increase sink rate. This is how you are able to lower your altitude and bring the glider through the pattern and down onto the runway.

5. Landing (cont.)

Landing pattern

During your first few flights, your instructor will gradually introduce the landing pattern. He will coach you through the various legs of the pattern, even though at that point you won't know exactly why he is telling where to fly and where to turn. The landing pattern begins at the Initial Point (IP) which for Hemet runway 22 (glider runway) is 2500 ft. agl, and over Hwy. 79 and the acqueduct. This is about half a mile from the auto mall. From the IP, you enter a 45 degree (to the runway) entry leg, then a downwind leg parallel to the runway, then a base leg and a turn to final approach to a landing. After a few more flights, you will begin to understand how and why the landing pattern is necessary, and how to do it properly. During this time your instructor will manage the radio calls. Eventually you will take on this task, too. You can find a page on radio procedures in the Hemet Operating Manual.

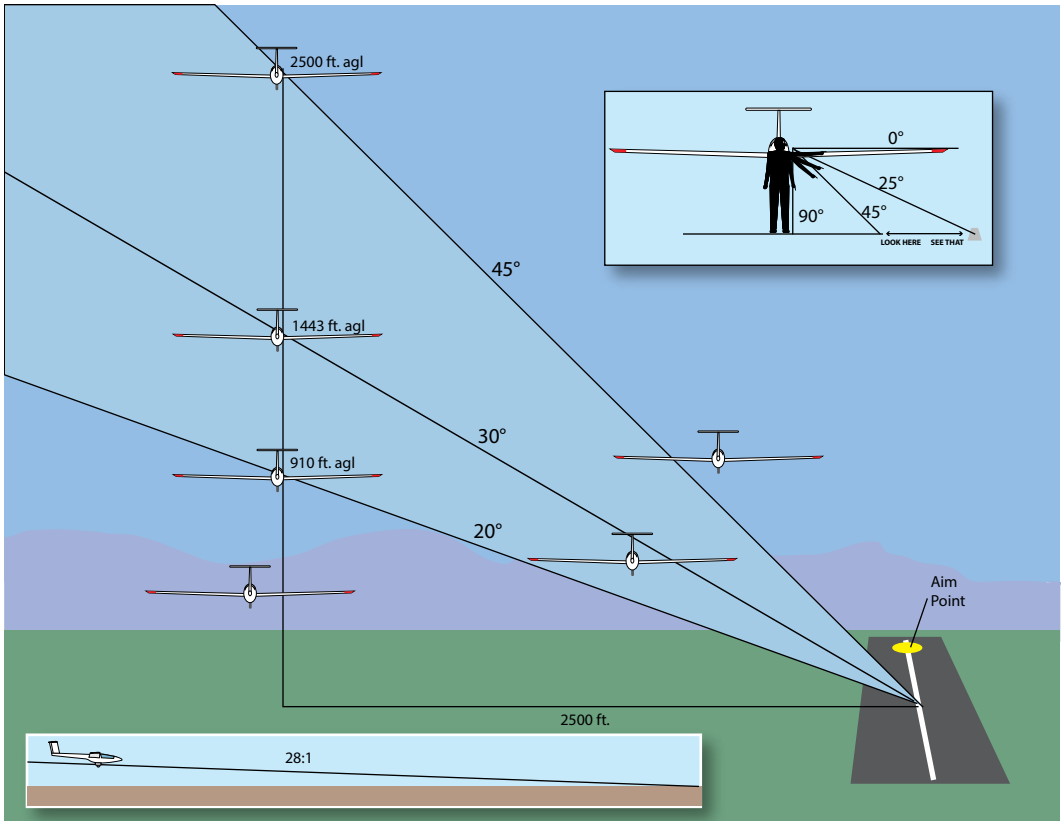
As you begin to take on more responsibility for flying the landing pattern, you will learn to continually judge your altitude and distance from the runway. During the downwind, base leg, and final approach leg, you will learn to ask yourself "Am I high, am I low, or am I good." Whatever your answer, you will learn to immediately make the correct adjustments so that the result will always be "good." You will continue to use this method throughout the rest of your flying career.

Lookdown angles

As you begin to practice landing the glider, you will immediately find that during that process there's a lot going on, seemingly all at once. In addition to using the radio during the approach phase of the landing, you need to constantly monitor airspeed, altitude, distance from the runway, sink rate, and your proximity to the runway and then determine the place where you want to touch down.

One of the more difficult tasks in this process is how to determine your position relative to the runway. Instruments can't provide that information. We use a method call TLAR (That Looks About Right). Yes, it's all about looking down at the runway. Problem is, simply looking at the runway doesn't seem to tell you much when you are first learning. So, there is a way to help you understand how to make sense out of looking down at the runway. It's called Lookdown Angle. Unless you are pretty good at geometry, it can be a bit of a challenge to determine the angle you are looking down. A good lookdown angle for a landing approach is about 20 to 30 degrees. However, it is not so easy to guess what that looks like. So, as you look out toward the runway, imagine your level wing is at 0 degrees. Then imagine a line straight down through the seat of the glider. That 's 90 degrees. Now imagine a line halfway between the two. That would be an angle of 45 degrees. A little high, but still within the glide slope for a landing. As you fly along the pattern ask yourself, am I high, Low, Good. If you're high, add divebrakes. If you are low, retract divebrakes or move closer to the runway. If you are good, keep doing what you are doing.

Ask your instructor to demonstrate this on the ground. Draw a line in the dirt representing the runway. Stand beside this line, hold your arm straight out. Then straight down. Then half the distance between those. That is a 45 degree angle. Hold that angle and move out so that you are pointing at the line in the dirt. That is your lookdown angle. You will become used to using an angle somewhat less than 45 degrees, but by that time, it will all become second nature.



5. Landing (cont.)

Aim Point

As you begin to master the landing pattern, you will also need to be able to determine where exactly you will touch down on the ground. But first, you need to determine whether you will make it to the runway or land short, in the dirt...or land a long way down the runway. That is where the Aim Point comes in. You will need to pick a spot near the approach end of the runway. This could be the numbers painted on the runway, or anything else you can watch as you descend toward it. The object is to keep this spot, your "Aim Point" in a stationary position in your field of view. That is, in the same spot on your canopy. If your aim point rises in your field of view, it means you will end up short of the aim point; and short of the runway. To correct this, you should slowly begin to close your divebrakes until the aim point is once again stationary. If your aim point lowers in your field of view, it means you will overshoot the aim point and end up much further down the runway. In order to correct this, you must steadily open your divebrakes until the aim point once again is stationary in your field of view. If the aim point remains stationary, you are on the right approach angle. Indeed, if you did nothing you would actually smash into the aim point. But we won't let that happen.

Flare (Round Out)

From the time you first entered the landing pattern you have been descending. Now on final approach, your aim point is coming closer and you are getting near the ground. At that point, about 5 feet above the ground, you begin to slowly pressure the stick back. The nose will rise slightly, and you will no longer be descending the way you were before. You may need to apply additional divebrakes at this point. You might also notice that the glider is beginning to float above the ground. You feel what is called Ground Effect.

Ground Effect

Ground effect is an aerodynamic phenomena that occurs as the wings of an aircraft get low enough to the ground to slightly compress the air below the wing and create a cushion. More so, the airflow over and around the wings creates a downwash that causes drag. This downwash gets disturbed near the ground, thereby reducing the drag. Thus, you float further than you expected. Especially if you are flying too fast!

Touchdown And Rollout

At this point you are floating down the runway, about 2 or 3 feet off the ground. You want to touch the wheel down, but do not try to force it down. Be very gentle. As you float along, watch the end of the runway, not directly in front of the glider. Very gradually, pressure the stick back and apply divebrakes very slightly. Not fully open. The glider will begin to slow, and settle. Before you know it, the wheel will touch the runway.

It's not over yet. At this point you are still moving at about 40 miles per hour. You need to keep flying. Keep the wings level and do not let a wingtip dip to the ground. Continue to steer the glider with rudder pedals. As the glider slows more, roll to the right and off the runway. The skid will begin to drag on the ground. Leave the divebrake, and reach down to the wheel brake handle and apply brakes. Keep the wings level! When you come to a complete stop, one wing or other will fall to the ground. Guide it if you can. Once you open the canopy, you won't believe you did all this. You are a pilot!

6. A Little More To Learn

In the previous 5 chapters you have learned the basics of takeoff, free flight, and landing. Along with those basics, there are some additional things you need to learn about.

Thermalling

Soon enough you and your instructor will get the opportunity to soar. Although not common, it is possible to experience a little motion sickness from all the circling. It is most likely that you will get accustomed to circling the glider and motion sickness will no longer be a problem.
Once you have had the opportunity to soar in a sailplane, you will be in love. Quickly you will discover that soaring in a thermal is more art than science. The best soaring pilots do this instinctively. They feel it in their bones, and the seat of their pants. With some time and practice, you will too. Rather than go into the details of how to enter and exit thermals, Read Chapter 10, Soaring Techniques, of the Glider Flying Handbook.

Speeds to fly

This too involves a little art, but mostly science. Math to be exact. According to MacCready theory, there is one specific speed to fly for each specific set of circumstances. This speed will give you the flattest glide angle to get the most distance over the ground. As a general rule, we can use "rules of thumb" to approximate the correct speeds to use in lift, sink, headwind, and tailwind.

Speed to fly in a headwind

When flying against the wind, your ground speed is less than your air speed by the speed of the wind. As a general rule, you can add 1/2 the velocity of the headwind to your best L/D (glide) speed. For example, the wind speed is 20 knots. Half the wind speed is 10 knots. Add this to your best L/D speed of 49 knots. This means speeding up to 59 knots. Hard to do, when you know this will make you descend faster, but you will find that this will move you over the ground more quickly and further than if you did not speed up.

Speed to fly in sink

When flying in sinking air, your ground speed is not reduced, but your descent is increased. The more time you spend flying in sinking air, the more altitude you lose for a given amount of time and the less distance you will be able to cover. So, as a good rule of thumb, add 5 knots of airspeed to your best L/D (glide) speed, for each 100 ft. per minute more than your normal sink rate of about 200 ft. per minute at 49 knots. For example, you are flying along at your best L/D speed (49 kts.), and you fly into some sinking air. You notice that your variometer is no longer pointing down at about 200 ft. per minute, but now shows 400 ft. per minute. That is an additional 200 ft. per minute of sinking air. So, it is best to speed up 5 knots per extra 100 ft. down, or a total of 10 kts. additional speed. This will get you through the sinking air in the most efficient way, with the least altitude lost.

Speed to fly in lift

When you encounter rising air, lift, you usually want to circle and climb in the rising air. Sometimes, though, when the lift is not as strong as you expect, and you are trying to cover distance, you might decide to not stop and circle. In that case, you can slow up to minimum sink speed. You will take advantage of the rising air while only losing a minimal amount of time and distance because of the slower airspeed.

Speed to fly in a tailwind

There is a little difference of opinion when flying in a tailwind. Some say fly at minimum sink speed. Others, best L/D. It seems like the reasonable compromise is to fly at a speed between minimum sink and best L/D speeds.

Glide ratio

It is important to know the proper speeds to fly when you are faced with sink, headwind, or tailwind. The discussion on the previous page gives examples of how the environment you're flying in affects the performance of the glider.

Many pilots have flight computers that make these calculations about speeds to fly unnecessary, because the computer, with some basic data input, can make the calculations for you. However, as a student, we expect you to be able to make these calculations without the aid of flight computers. You never know when the battery or the electronics might fail.
Doing calculations in the cockpit is not aways easy to do. So, you might use a couple rules of thumb.

Some basic data (Krosno): Glide ratio: 27:1

Glide ratio is the relationship of distance traveled per measure of altitude. Best L/D, or Lift over Drag, is a function of the particular wing design of your glider. It is a fixed number. This should not be confused with glide slope. This is an angle from your glider, sloping downward toward the ground as you move forward. For example, at best L/D your glider has the minimum amount of slope toward the ground; the greatest distance forward. But if you open the divebrakes, you begin to sink more, thereby increasing your glide slope. A steeper angle between the glider and a point on the ground. Since the Krosno has a variometer which measures lift and sink in knots, and an airspeed indicator measuring airspeed in knots, you can divide the rate of sink into the airspeed and the result will be the current glide ratio. This does not take into account affects of headwind or tailwind. For example, if the vario shows 2 kts. down, and the airspeed indicator shows 48 kts. airspeed, the glide ratio is 24:1 through the air.
You can also use rules of thumb to make rough estimations of how far you can travel at best L/D per 1,000 ft. of altitude. For example:
27/1 is the same as 27,000 ft. traveled per 1,000 ft. of altitude. Or, about 4.5 nautical miles per 1,000 ft. (or about 5 statute miles per 1,000 ft.) Using those estimates, you can adjust the ratio up or down depending upon tailwind or headwind.
These examples of estimations are not perfectly accurate, but flying a glider in the atmosphere is not a perfect calculation, either. The atmosphere is dynamic, always changing, so soaring is as much art as it is science.

Slips

There will be times when a slip is useful. This is a flight maneuver that requires you to cross control the stick and rudder inputs. One way or another, you lower one wing. Sometimes this is to counteract a crosswind when you are on final approach. This is called a side slip. Sometimes it is used to create more drag by turning the fuselage into the oncoming direction of the glider. This is called a forward slip. You might use a forward slip if you are too high on final approach and you need to lose more altitude. Your instructor will demonstrate these maneuvers and coach you through them.

Spins and Spiral Dives

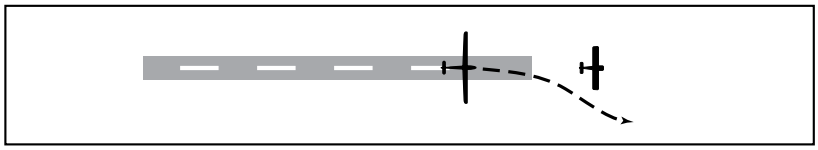
We do not normally demonstrate or teach spins and spiral dives to pre-solo students. These are more advanced maneuvers that we teach student pilots as they prepare to take their practical test for a private pilot certificate. The FAA does not require pilots to get spin training, but they must receive ground instruction in the conditions by which spins and spiral dives occur, and how to recover from each of these. However, your instructor may demonstrate a turning stall condition in which a spin is imminent. There is a direct correlation between the stall and how it could develop into a spin.

More About Rope Breaks

Rope breaks were discussed earlier in Chapter 3. It is a subject that deserves more attention to detail. In general there are standard procedures for rope breaks through the sport of soaring. These apply at most every glider port you might go to. However, each airport is at least slightly different in layout and the types of operations that are conducted there. At Hemet-Ryan Airport, we have parallel runways and specific procedures as it relates to rope breaks, either simulated or actual. On your pre-takeoff checklist the last two items are Wind, and Emergency. These relate directly to what you should do if the rope breaks during the first 500 ft. of the aerotow. As you lift off the runway on takeoff, you will begin to announce what you will do if the rope breaks.

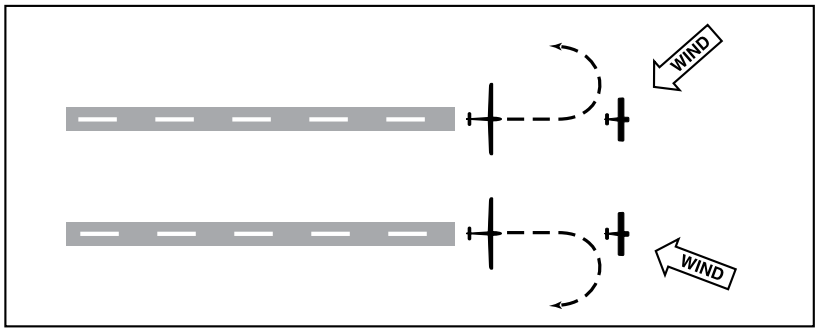
- On the runway or 10-20 ft. agl you will go straight or move to the right and stop as soon as possible.
- At about 20 ft. to 75 ft. you will veer to the right, open divebrakes and land in the field before the road.
- From about 75 ft. to 180 ft. agl you will overfly the road and land in the field to the right.
- At about 200 ft. agl, you can make a 180 degree turn to the right. You will continue the turn, line up with the runway, and make a downwind landing.
- Above 200-500 ft. you can make a right turn and a downwind landing.
- Above 500 ft. you can make an abbreviated landing pattern.

1. Land straight or veer to the right.



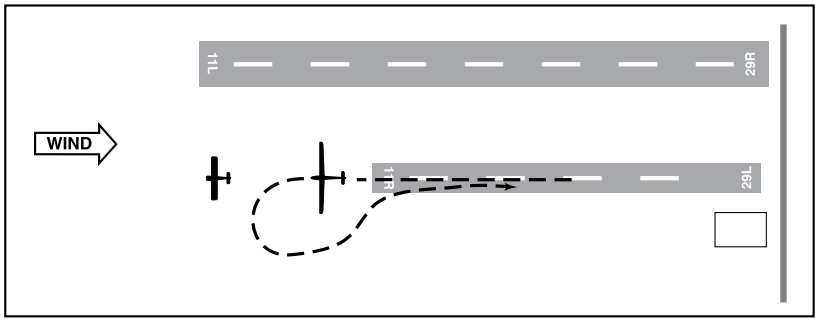
2. At 200 ft., turn left if the crosswind is strong. Otherwise always turn right, away from runway 23

3. You might also be able to turn left if you and the towplane have drifted far enough to the right. That would put you in alignment with the runway.



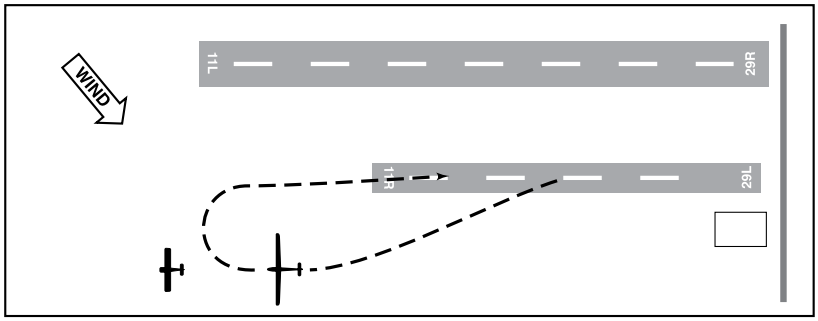
IMPORTANT
Expect the rope to break.

Aways remember, when the rope breaks, first apply forward pressure on the stick to lower the nose of the glider. Don't dive. Maintain 60-65 knots airspeed.



Make coordinated, medium bank (30-45 degrees) turns. Maintain your airspeed! Stay coordinated!

Once you've made your turn back, look for the end of the runway. No, not the power runway, the glider runway. Fly toward it, line up and prepare to land downwind.



A Message to Student Pilots from Cypress Soaring

Welcome! We're pleased you have chosen Cypress Soaring for your flight training We ask that you please read and understand these simple rules. They have proven effective in ensuring your safety.

1. Please read and follow the Flight Rules and Standard Operating Procedures for Cypress Soaring. Some of our rules are more strict than the FARs. All these rules were created to improve safety and provide a means for everyone to get an equal opportunity to utilize the club's equipment.

2. Your Flight Instructor must list the model of sailplane you will solo in your logbook.

3. Cypress Soaring requires that you check in with a Cypress Instructor or other Club authorized instructor, each day before soloing. Make sure they understand you are a STUDENT PILOT and that you are asking permission to SOLO.

4. The FARs require that you have a 90 day sign-off entered in your logbook for continued solo. There is no penalty for exceeding 90 days, but you must fly dual again before you may solo.

5. Additionally, Cypress Soaring requires that a dual flight be completed before soloing again, if you have not flown in the previous 30 days.

6. No slack line recoveries, spins, or simulated rope breaks may be practiced intentionally except with an instructor.

7. You must stay within 5 statute miles of the airport from which you took off. You must remain within final glide distance from the airport at all times, with enough altitude to return to the I.P. at a minimum altitude of 1,000 ft. agl.

8. We expect you to fly a full 1000 foot agl pattern from the published initial point, at not less than best L/D speed.

9. REMEMBER, A TOWPLANE OR SAILPLANE MAY BE LANDING BEHIND YOU. LEAVE AN OPEN LANDING AREA AND DO NOT CUT IN FRONT OF ANOTHER AIRCRAFT.

10. You are responsible for the safe tie down of your aircraft after your flight. Chains on each wing and at the nose and tail, along with gust locks installed, will make your glider secure.

There is one more very important thing you need to know

Throughout your training you have learned how to operate a glider in flight, and how to manage it on the ground. You have learned about a variety of subjects that you must know in order to fly safely and efficiently. But, all along during your flight training, your instructors will have been teaching you something that at first you may not be aware of. Judgement. Learning good judgement is as important as learning how to operate the aircraft, or what the FARs or club rules require.

Read Chapter 13, Human Factors, *FAA Glider Flying Handbook*.

We, as humans, bring our own biases to everything we do. It is important to understand how our mind works, especially in times of urgency. When you are flying you are in an abnormal environment for humans. It can be stressful. It is important to understand and recognize dangerous attitudes. Understand the types of human errors, or poor judgements that can lead to disaster. Understand how fatigue and dehydration can degrade your performance and your thinking; and your judgement. Even physical discomfort can lead to diminished capacity. Pay close attention to the message of good Aeronautical Decision Making (ADM). Fly for fun but always be safe. Please be responsible.

6. 14 CFR Federal Aviation Regulations

(Condensed for Student Glider Pilots)

PART 43 - MAINTENANCE

43.3 Persons authorized to perform . . . . preventive maintenance . . .
(g) The holder of a pilot certificate may perform preventive maintenance on any aircraft owned or operated by him that is not used in air carrier service.
(NOTE: This provision does not include the holder of a Student Pilot Certificate. See 43.7(f))
43.7 Persons authorized to approve aircraft . . . for return to service . . .
(f) A person holding at least a private pilot certificate may approve an aircraft for return to service after performing preventive maintenance under the provisions of 43.3(g).

PART 61 - CERTIFICATION: PILOTS

61.3 Requirements for certificates. . . .
(a) Pilot certificate. A person may not act as pilot in command . . . of a civil aircraft . . . unless that person
1) Has a valid pilot certificate. . .in that persons physical possession...
(2) Has a photo identification that is in that persons physical possession...

61.51 Pilot logbooks.
(a) Each person must document and record the following time...: (1) Training and aeronautical experience used to meet the requirements for a certificate, rating, or flight review... (2) The aeronautical experience required for meeting the recent flight experience requirements of this part.
(d) Logging of solo flight time...a pilot may log as solo flight time only that flight time when the pilot is the sole occupant of the aircraft.
61.83 Eligibility requirements for student pilots.
To be eligible for a student pilot certificate, an applicant must:
(b) Be at least 14 years of age for the operation of a glider. . .
61.87 Solo requirements for student pilots.

(a) General.
A student pilot may not operate an aircraft in solo flight unless that student has met the requirements of this section. The term "solo flight", as used in this subpart, means that flight time during which the student pilot is the sole occupant of the aircraft...

(b) Aeronautical knowledge.
A student pilot must demonstrate satisfactory aeronautical knowledge on a knowledge test that meets the requirements of this paragraph:
(1) The test must address the student pilot's knowledge of—
(i) Applicable sections of parts 61 and 91 of this chapter;
(ii) Airspace rules and procedures for the airport where the solo flight will be performed; and
(iii) Flight characteristics and operational limitations for the make and model of aircraft to be flown.
(2) The student's authorized instructor must—
(i) Administer the test; and
(ii) At the conclusion of the test, review all incorrect answers with the student before authorizing that student to conduct a solo flight.

(c) Pre-solo flight training.

Prior to conducting a solo flight, a student pilot must have:

(1) Received and logged flight training for the maneuvers and procedures of this section that are appropriate to the make and model of aircraft to be flown; and

(2) Demonstrated satisfactory proficiency and safety, as judged by an authorized instructor, on the maneuvers and procedures required by this section in the make and model of aircraft or similar make and model of aircraft to be flown.

(i) Maneuvers and procedures for pre-solo flight training in a glider. A student pilot who is receiving training for a glider rating or privileges must receive and log flight training for the following maneuvers and procedures:

(1) Proper flight preparation procedures, including preflight planning, preparation, aircraft systems, and, if appropriate, powerplant operations;

(2) Taxiing or surface operations, including runups, if applicable;

(3) Launches, including normal and crosswind;

(4) Straight and level flight, and turns in both directions, if applicable;

(5) Airport traffic patterns, including entry procedures;

(6) Collision avoidance, windshear avoidance, and wake turbulence avoidance;

(7) Descents with and without turns using high and low drag configurations;

(8) Flight at various airspeeds;

(9) Emergency procedures and equipment malfunctions;

(10) Ground reference maneuvers, if applicable;

(11) Inspection of towline rigging and review of signals and release procedures, if applicable;

(12) Aerotow, ground tow, or self-launch procedures;

(13) Procedures for disassembly and assembly of the glider;

(14) Stall entry, stall, and stall recovery;

(15) Straight glides, turns, and spirals;

(16) Landings, including normal and crosswind;

(17) Slips to a landing;

(18) Procedures and techniques for thermalling; and

(19) Emergency operations, including towline break procedures.

(n) Limitations on student pilots operating an aircraft in solo flight. A student pilot may not operate an aircraft in solo flight unless that student pilot has received:

(1) An endorsement from an authorized instructor on his or her student pilot certificate for the specific make and model aircraft to be flown; and

(2) An endorsement in the student's logbook for the specific make and model aircraft to be flown by an authorized instructor, who gave the training within the 90 days preceding the date of the flight.

61.89 General Limitations

(a) A student pilot may not act as pilot in command of an aircraft:

(1) That is carrying a passenger;

(2) That is carrying property for compensation or hire;

(3) For compensation or hire;

(4) In furtherance of a business;

(6) With a flight or surface visibility of less than 3 statute miles during daylight hours...

(7) When the flight cannot be made with visual reference to the surface; or

(8) In a manner contrary to any limitations placed in the pilot's logbook by an authorized instructor.

Part 91–General Operating And Flight Rules

Subpart A–General

91.3 Responsibility and authority of the pilot in command

(a) The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft.

(b) In an emergency requiring immediate action, the pilot in command may deviate from any rule of this subpart or of Subpart B to the extent required to meet the emergency.

91.7 Civil aircraft airworthiness

(a) No person may operate a civil aircraft unless it is in an airworthy condition.

(b) The pilot in command of a civil aircraft is responsible for determining whether that aircraft is in condition for safe flight.

91.9 Civil aircraft flight manual, marking, and placard requirements

(a) . . . no person may operate a civil aircraft without complying with the operating limitations specified in the approved . . Flight Manual, markings and placards . . .

(b) No person may operate a U.S. registered civil aircraft-

(2) For which a . . . Flight Manual is not required . . . , unless there is available in the aircraft . . . approved . . . markings and placards.

91.17 Alcohol or drugs

(a) No person may act or attempt to act as a crew member of a civil aircraft:

(1) Within 8 hours after the consumption of any alcoholic beverage;

(2) While under the influence of alcohol;

(3) While using any drug that affects the person's faculties in any way contrary to safety;

(4) While having an alcohol concentration of 0.04 or greater in a blood or breath specimen.

Subpart B–Flight Rules (General)

91.105 Flight crew members at stations

(a) During takeoff and landing, and while enroute, each required flight crew member shall–

(2) Keep the safety belt fastened . . . .

91.113 Right of way rules

(b) General . . . . vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft . . .

(c) In distress. An aircraft in distress has the right of way over all other traffic.

(d) Converging. When aircraft of the same category are converging at approximately the same altitude (except head-on, or nearly so) the aircraft to the other's right has the right of way. If the aircraft are of different categories:

(1) A balloon has the right of way over any other category of aircraft;

(2) A glider has the right-of-way over an airship, powered parachute, weight-shift-control aircraft, airplane, or rotorcraft.

(e) Approaching head-on. When aircraft are approaching each other head-on, or nearly so, each pilot of each aircraft shall alter course to the right.

(g) Landing. Aircraft, while on final approach to land, or while landing, shall have the right of way over other aircraft . . .

PART 91 - Continued

91.119 Minimum safe altitudes: General.

Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:

(b) Over congested areas. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1000 feet above the highest obstacle within a horizontal radius of 2000 feet of the aircraft.

(c) Over other than congested areas. An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

91.125 ATC light signals.

ATC light signals have the meaning shown in the following table:

Color and type of signal	**Meaning with respect to aircraft on the surface**	**Meaning with respect to aircraft in flight**
Steady green	Cleared for takeoff	Cleared to land
Flashing green	Cleared to taxi	Return for landing
Steady red and continue circling.	Stop	Give way to other aircraft
Flashing red	Taxi clear of runway in use	Airport unsafe—do not land
Flashing white	Return to starting point	Not applicable
Alternating red and green	Exercise extreme caution	Exercise extreme caution

91.129 Operations in Class D airspace.

(c) Communications . . . Each person must establish two-way radio communications with the ATC facility...providing air traffic services prior to entering that airspace and thereafter maintain those communications while within that airspace.

91.l55 Basic VFR weather minimums

(a) . . . no person may operate an aircraft under VFR when the flight visibility is less, or at a distance from clouds that is less, than that prescribed for the corresponding altitude in the following table:

VISUAL FLIGHT RULES

Altitude	**Flight Visibility**	**Distance From Clouds**
1200 feet or less above the surface (regardless of MSL altitude) Within controlled airspace	3 statute miles	{500 feet below {1000 feet above {2000 feet horizontal
Outside controlled airspace	1 statute mile	Clear of clouds
More than 1200 feet above the surface but less than 10000 feet MSL Within controlled airspace	3 statute miles	{500 feet below {1000 feet above {2000 feet horizontal
Outside controlled airspace	1 statute mile	{500 feet below {1000 feet above {2000 feet horizontal
More than 1200 feet above the surface and at or above 10000 feet MSL	5 statute miles	{1000 feet below {1000 feet above {1 mile horizontal

Subpart C—Certificate Requirements

91.203 Civil aircraft: certifications required

(a) . . . no person may operate a civil aircraft unless it has within it the following:
(1) An appropriate and current airworthiness certificate. . .
(2) An effective U.S. registration certificate . . .

91.211 Supplemental oxygen

(a) General. No person may operate a civil aircraft of U.S. registry-
(1) At cabin pressure altitudes above 12,500 feet (MSL) up to and including 14,000 feet (MSL), unless the required minimum flight crew is provided with and uses supplemental oxygen for that part of the flight at those altitudes that is of more than 30 minutes duration;

(2) At cabin pressure altitudes above 14,000 feet (MSL), unless the required minimum flight crew is provided with and uses supplemental oxygen during the entire flight time at those altitudes;

(3) At cabin pressure altitudes above 15,000 feet (MSL), unless each occupant of the aircraft is provided with supplemental oxygen.

91.215 ATC transponder and altitude reporting equipment and use.

(b) (4) All aircraft in all airspace above the ceiling and within the lateral boundaries of a Class B or Class C airspace area designated for an airport upward to 10,000 feet MSL...

Subpart D–Special Flight Operations

91.303 Aerobatic flight

No person may operate an aircraft in acrobatic flight–
(a) Over any congested area of a city, town, or settlement;
(b) Over an open air assembly of persons;
(c) Within the lateral boundaries of the surface areas of Class B, Class C, Class D, or Class E airspace designated for an airport;
(d) Within 4 nautical miles of the center line of any Federal airway;
(e) Below an altitude of 1,500 feet above the surface; or
(f) When flight visibility is less than 3 statute miles.

For the purposes of this section, aerobatic flight means an intentional maneuver involving an abrupt change in an aircraft's attitude, an abnormal attitude, or abnormal acceleration, not necessary for normal flight.

91.307 Parachutes and parachuting

(a) No pilot of a civil aircraft may allow a parachute that is available for emergency use to be carried in that aircraft unless it is an approved type and has been packed by a certificated and appropriately rated parachute rigger—

(1) Within the preceding 180 days...

(c) Unless each occupant of the aircraft is wearing an approved parachute, no pilot of a civil aircraft, carrying any person (other than a crew member) may execute any intentional maneuver that exceeds–

(1) A bank of 60 degrees relative to the horizon; or
(2) A nose-up or nose-down attitude of 30 degrees relative to the horizon.

91.309 Towing: gliders...

(a) No person may operate a civil aircraft towing a glider...unless–

(3) The towline used has breaking strength not less than 80 percent of the maximum certificated operating weight of the glider...and not more than twice this operating weight. However, the towline used may have a breaking strength more than twice the maximum certificated operating weight of the glider...if—

(i) A safety link is installed at the point of attachment of the towline to the glider...with a breaking strength not less than 80 percent of the maximum certificated operating weight of the glider...and not greater than twice this operating weight;

(5) The pilots of the towing aircraft and the glider...have agreed upon a general course of action including takeoff and release signals, airspeeds, and emergency procedures for each pilot.

Subpart E–Maintenance

91.409 Inspections

(a)...no person may operate an aircraft unless, within the preceding 12 calendar months, it has had-

(1) An annual inspection in accordance with Part 43 of this chapter and has been approved for return to service by a person authorized by 43.7 of this chapter;

(b) . . . . no person may operate an aircraft carrying any person (other than a crew member) for hire, and no person may give flight instruction for hire in an aircraft which that person provides, unless within the preceding 100 hours of time in service it has received an annual or 100-hour inspection and been approved for return to service...

49CFR Part 830–National Transportation Safety Board Rules

Subpart A–General

830.2 Definitions

As used in this part the following words or phrases are defined as follows:

Aircraft Accident means an occurrence associated with the operation of an aircraft . . . in which any person suffers death or serious injury . . . or the aircraft receives substantial damage.

Incident means an occurrence other than an accident . . . which affects or could affect the safety of operations.

830.5 Immediate notification

The operator of any civil aircraft...shall immediately...notify the nearest National Transportation Safety Board Field Office when:

(a) An aircraft accident or any of the following listed incidents occur:

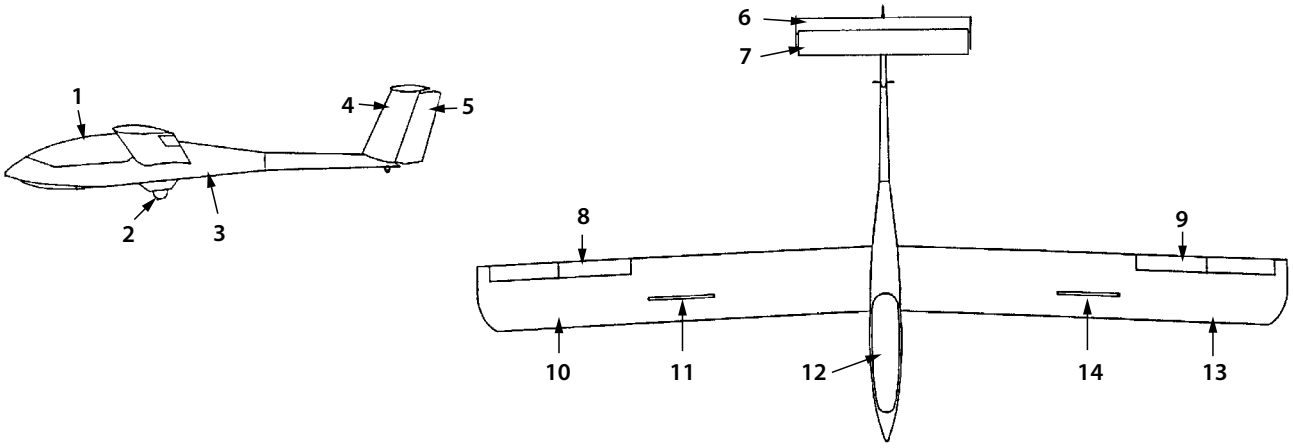
(1) Flight control system malfunction or failure;

(2) Inability of any required flight crew member to perform his normal flight duties as a result of injury or illness;

(5) Aircraft collide in flight;

(6) Damage to property, other than the aircraft, estimated to exceed $25,000 for repair...

Test 1. Components and Systems



Name all the parts of the aircraft shown in the diagram.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____

What do the wings do to make the glider fly? _____

What do these glider components control?

a. Ailerons? _____
b. Elevator? _____
c. Rudder? _____

Test 2. Krosno POH

Krosno

Performance and Limiting Speeds (knots)

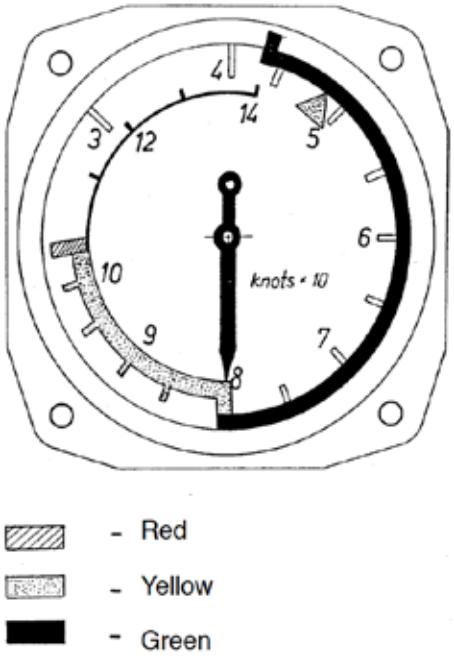
	Solo	Dual
Stall	_____	39
Minimum Sink	_____	45
Best Glide	_____	49
Pattern (min.)	_____	48
	Plus 1/2 wind	Plus 1/2 wind
Maneuvering (Va)	_____	80
Maximum Rough Air (Vra)	_____	80
Never Exceed (Vne)	_____	107
Maximum Aerotow	70	70
Maximum Spoilers Open	107	107
Maximum Crosswind	7.8	7.8
Maximum Tailwind	6	6

Weight and Balance Requirements

Maximum All-up Weight	1190 lbs.
Maximum Crew Weight	397 lbs.
Minimum Front Seat Pilot Weight:	
- Without ballast weights	_____ lbs.
- Additional ballast weights required	_____ lbs.

Ballast weights weigh 10.5 lbs. each. They are installed on the floor in front of the front seat, using the thumb screws to secure them. Pay attention to the shape of each weight because each will fit only in its own specific location.

Test 3. Flight Instruments



Airspeed Indicator

What makes the airspeed indicator work? _____

What does the green arc represent? _____

What does the Yellow arc represent? _____

What does the Red line represent? _____

Wat does the triangle represent? _____

Altimeter

What makes the altimeter work? _____

What is the altimeter indicating? _____

Variometer

What makes the variometer work? _____

What Is the variometer indicating? _____

Yaw String

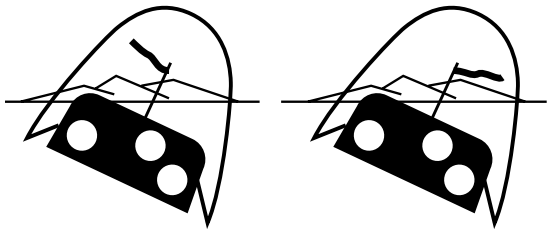
What does the yaw string indicate? _____

When is the yaw string especially important? _____

Test 4. Aerodynamics of Flight

1. Name the three axes of the glider
   a. _____
   b. _____
   c. _____

2. What axis does Roll move about? _____
3. What axis does Pitch move about? _____
4. What axis does Yaw move about? _____
5. The glider fuselage tends to fly streamlined through the relative airflow because of the _____ and is thus stable about the yaw (vertical) axis.
6. What are two major types of drag? _____ , _____,
7. Pitch stability is achieved by a balancing act between the horizontal stabilizer, wing lift, and the aircraft's _____.
8. What is angle of attack? _____
9. What happens when the critical angle of attack is exceeded? _____
10. Pushing on the left rudder pedal will cause the nose of the glider to yaw which way? _____
11. What turns an aircraft? _____
12. In the following drawings, which rudder should be pressed to straighten the yaw string?



_____ _____

13. As you execute a steep banked left turn, what movements do each of the ailerons and the rudder make?

    First _____

    Then _____

Test 5. Weight and Balance

Whether the glider is very simple or very complex, designers and manufacturers provide operating limitations to ensure the safety of flight.

1. Where can weight and balance information for the Krosno be found?

   _____, _____

2. What is Center of Gravity (CG)? _____
3. What is Center of Pressure? _____
4. Where should the Center of Gravity be relative to the Center of Pressure? _____
5. What might happen if the CG is too far forward?

   _____

6. What might happen if the CG is too far aft?

   _____

7. What is the standard formula for calculating CG?

   _____ x_____ = _____

   Total _____ ÷ Total _____ = _____

8. What can you do if you weigh less than the minimum required front seat weight?

   _____

9. From the Krosno POH, what is the empty weight of the glider? _____ lbs.
10. What is the maximum permissable load? _____ lbs.
11. Using the front seat moment/weight chart, and the CG Location graph, determine where your weight and moment are on the graph. Are you within CG limits? _____
12. Can you fly solo from the back seat of the Krosno? _____.

    Why? _____

Test 6. Preflight And Ground Operations

1. While preflighting, you are called away from the glider. What should you do?

   _____.

2. When you are using the cart to tow the glider, how long should the tow rope be?

   _____

3. We have three different types of weak links. Which weak link should be used on the Krosno?

   _____

4. What would distorted hinges on the ailerons or dive brakes indicate? _____
5. What should a student pilot do if evidence of damage or excessive wear is found?

   _____, _____

6. What documents are required in a glider?

   _____, _____ and _____

7. Where can you find the preflight checklist for the Krosno?

   _____

8. When towing the glider with the cart, at least how many people should be at the glider? _____
9. Can you pull on a wingtip if you need to turn the glider? _____
10. Is it ever ok to drag the nose wheel or tail wheel sideways while turning the glider? _____

Test 7. Launch and Recovery Procedures and Flight Maneuvers

1. To save time, is it ok to hook up the glider to the tow rope while the pilot is going through the pre-takeoff checklist? _____
2. If the tow plane is towing you too slow, what signal can you give him? What will that signal mean?

   _____
3. On takeoff, how should you position your controls if you have a left quartering crosswind?

   _____
4. What is one of the most dangerous occurrences during aerotow?

   _____
5. On tow, while turning, what will happen if the glider's bank angle is steeper than the tow plane?

   _____
6. On tow, while turning, what will happen if the glider's bank angle is shallower than the tow plane?

   _____
7. What is the procedure immediately after releasing from tow?

   _____
8. What maximum bank angle should you normally use in the traffic pattern? _____
9. What is the aim point? _____
10. Who decides where the aim point is? _____
11. What is an ideal look down angle to use in the landing pattern? _____
12. What two maneuvers can you employ to counteract a crosswind in the landing pattern?

    _____
13. Name one common error during straight glides. _____
14. Before starting any turn, what must you always do first? _____
15. Which direction does the yaw string point when you are skidding a turn?

    _____
16. Which direction does the yaw string point when you are slipping a turn?

    _____
17. What is minimum controllable airspeed? _____

    _____
18. What is a stall? _____

Test 8. Soaring Weather

1. What is "Standard Atmosphere" at sea level?
   1. Pressure _____
   2. Temperature _____
   3. Where is standard pressure and temperature measured? _____
2. What is the standard temperature lapse rate for stable air? _____
3. What is a thermal? _____
4. What atmospheric conditions are condusive to a thermal? _____

   _____
5. What is a cold front? _____

   Could a cold front be condusive to thermal lift?_____
6. What is a warm front? _____
7. Could a warm front be conducive to thermal lift? _____
8. What is a microburst? _____
9. What hazards exist with thunderstorms?

   _____

   _____

   _____
10. What conditions might you expect from wind blowing over a mountain ridge?

    Upwind of the ridge _____

    Lee side of the ridge _____
11. What is the Elsinore convergence? _____

    _____

Test 9. Soaring Techniques

1. What is the most common form of lift around the Hemet Valley? _____
2. What areas around Hemet might be conducive to forming thermals?

_____ _____ _____

3. How does wind affect a thermal? _____

4. Once you have encountered lift, what must you do before you begin to turn into the thermal?

   _____

5. If you enter a thermal and lose it due to turning the wrong way, what should you do?

   _____

6. If the vario reads 300 fpm up on one side of your circle but only 100 fpm up on the other side, what does this tell you?

   _____

7. What is the procedure for "centering" in a thermal?

   _____

8. If you see another glider circling in a thermal and go over to join it, in which direction should you turn when you enter the thermal?

   _____

9. What is the steepest angle of bank normally used when thermalling? _____
10. What penalty do you pay for using a steep bank? _____
11. Why is it sometimes worthwhile to use a steep bank? _____

Test 10. FARs

1. What endorsements, and limitations do you need in your logbook before your first solo?

   _____

   Limitations _____,_____

2. After you have been flying solo for a while, what additional recurring endorsement do you need?_____

2. What personal documents must you have whenever you solo?

   _____, _____

3. Who must you consult, and get approval from before every solo flight?

   _____

4. Who is the final authority for the operation of an aircraft? _____

5. What are the minimum safe altitudes over congested areas?

   _____ above the _____within a horizontal radius of _____.

7. Is a straight ahead stall and recovery considered aerobatic flight? _____

6. Refer to the VISUAL FLIGHT RULES CHART below. What is the minimum flight visibility when you are at 4,000 ft. msl over Hemet Ryan Airport?

   _____

   b. What are the cloud clearances at that altitude?

   _____, _____, _____

VISUAL FLIGHT RULES

Altitude	**Flight Visibility**	**Distance From Clouds**
1200 feet or less above the surface (regardless of MSL altitude) Within controlled airspace	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
Outside controlled airspace	1 statute mile	Clear of clouds
More than1200 feet above the surface but less than 10,000 feet MSL Within controlled airspace	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
Outside controlled airspace	1 statute mile	500 feet below 1,000 feet above 2,000 feet horizontal
More than 1200 feet above the surface and at or above 10,000 feet MSL	5 statute miles	1,000 feet below 1,000 feet above 1 mile horizontal

Test on Takeoff Techniques

1. When you take off, how high should you be above the runway until the towplane leaves the ground? _____

2. If there is a crosswind, how should you hold your wing?

   _____

3. If the crosswind is from the left, should you be holding left or right rudder? _____

4. If there is a crosswind, which way will the nose of the glider swing after you take off and before the towplane leaves the ground? _____

5. What should you do if the rope breaks while you are rolling down the runway on takeoff?

   _____

6. What dangerous situation could occur if you get too high above the runway while on tow?

   _____

Landings

1. What should you do immediately before entering the landing pattern?

   _____

2. What airspeed should you use during the approach to landing?

   _____

2. How can you judge your position relative to the runway during the downwind leg?

   _____

3. What is a good look down angle to use during the downwind leg of the pattern?

   _____

4. What should you do if you experienced excessive sink during the downwind leg?

   _____

5. What should you do if you encountered lift during the downwind leg?

   _____

6. What bank angle should you use to turn from downwind to base, and base to final?

   _____

7. Upon completion of the turn onto base leg, you realize that you are too high. What will you do?

   _____

8. You are on base leg ready to turn onto final and realize you are too high. What can you do?

   _____

9. There is one type of pattern that should be avoided. What is it? _____

10. On final it is important to maintain a constant _____using _____control, and "freeze" the desired aim point on the windshield using which control? _____

11. What is the "aim point"? _____

Test On Slips And Crosswind Landings

1. What is a "slip"? _____

2. What are the two kinds of slips? _____ and _____
3. What is the difference between the two?

   _____

4. How do you make a glider slip? _____
5. Will your airspeed indication be accurate during a slip? _____
6. How will you determine and control your speed while slipping?

   _____

7. What are the two methods of handling a crosswind approach and landing?

   a. _____

   b. _____

8. What must you do right before your glider touches down in a crosswind?

   _____

Test on Slack Rope Recovery

1. What are two ways a glider pilot can cause slack to form in the tow rope?

   a. _____

   b. _____

2. Can turbulence cause slack? _____ How? _____

4. Can slack rope endanger the glider? _____ How? _____

5. How can the glider pilot prevent the slack from endangering the glider?

   _____

6. What is the first thing to do when you see slack forming in the tow rope?

   _____

7. What should you never allow, or should correct immediately, when there is slack in the tow rope? _____

8. What should you do while the slack is coming out of the rope? _____

9. What will happen when the tow rope comes tight?

   _____

10. What must you do when the tow rope comes tight?

    _____

Forward Stalls

1. Name 6 signs of an impending stall in the order they occur:
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____
   f. _____

2. When the wing stalls, the glider pitches nose down. Why?_____
3. What is the minimum stalling speed of the Krosno? _____
4. What is a secondary stall? When might this stall occur?

   _____

5. What is an accelerated stall? When might this stall occur?

   _____

6. How is a normal recovery made from a forward stall?
   a. _____
   b. _____
   c. _____
7. If a wing starts to "drop" during a forward stall, how should that wing be raised?

   _____

Turning Stalls

1. Why do turning stalls tend to occur close to the ground?

   _____

2. Name the two occasions a turning stall is most likely to happen.

   a. _____

   b. _____

3. Without an abrupt control motion, a turning stall is most easily entered from a

   (check one) ☐ a. shallow turn ☐ b. medium turn ☐ c. steep turn

4. Give a step-by-step recovery procedure from a turning stall.

   a. _____

   b. _____

   c. _____

   d. _____

5. How do you prevent turning stalls close to the ground?

   a. _____

   b. _____

   c. _____

6. What is one control not to use during the first steps of a turning stall recovery?

   _____

   Why? _____

Test On Emergency Rope Break Procedures

1. What is the first thing to do if you have a rope break? _____
2. What is the second? _____
3. What should you think about before every takeoff?

_____

5. Why do we have "wind direction" as part of the pre-takeoff check list?

   _____

6. What altitude (AGL) should you call out after takeoff? _____

8. Hemet-Ryan has a parallel runway. When you are at 200' (AGL) and above, which way should you turn if you have a rope break? _____

9. At Hemet-Ryan, which has a parallel runway, which way should you turn if the towplane drifts far off to the right during climb-out, and there IS a STRONG crosswind from the left?

   _____

Test On Spins And Spiral Dives

1. What must take place before a glider will spin? _____
2. What must you do to stop a spin? _____
3. How does the C.G. position affect spin characteristics?

   _____

5. If the C.G. position is behind the rear limit authorized for the glider, and you spin it, what might occur? _____

6. What are the steps for normal spin recovery:

   1. _____
   2. _____
   3. _____
   4. _____

10. As a student pilot, are you allowed to practice spins? _____

Where would an accidental spin most likely occur? _____

11. From the standpoint of spins, which is more dangerous, a slipping turn or a skidding turn?

    _____

    Why? _____

12. What is the primary indication that you are in a spin or a spiral dive?

    Spin: _____

    Spiral dive: _____

13. What is the spiral dive recovery technique?

    1. _____
    2. _____

14. If a spiral dive is allowed to continue, what is likely to happen?

    _____

Student Pilot Pre-Solo Written Test

Student Name _____ Checked by _____Date _____

1. Fill in the appropriate performance and limiting airspeeds for this glider:

   Solo

Stall Speed (Vs)_____

Minimum Sink Speed _____

Thermalling Speed Range _____

Best Glide (L/D) Speed _____

Minimum Pattern Speed _____

Maneuvering Speed (Va) _____

Max Rough Air Speed (Vb) _____

Redline Speed (Vne) _____

Minimum Front Seat Pilot Wt.

- without ballast _____
- with ballast _____

2. In calm, no wind conditions, at best L/D, approximately how many statute miles can you glide with 1,000 ft. of altitude? _____
3. What do all stalls have in common? _____
4. What do all spins have in common? _____
5. What are the differences between a spin and a spiral dive?

   _____

6. What is the most common type of accident in gliders? _____
7. What great hazard results from flight with less than minimum placarded solo pilot weight?

_____

8. What is the minimum and maximum tow rope strength required for a glider flying at 950 lbs. and with a maximum allowable gross weight of 1040 lbs.

   Min. _____ Max. _____

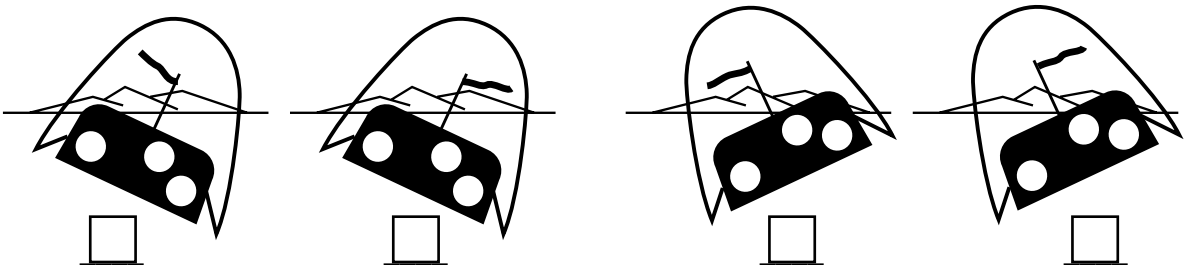
9. When do the F.A.R.s require parachutes?

   _____

10. Is a turning stall maneuver considered aerobatic? _____
11. Do you need a parachute to practice turning stalls? _____

12. Which coordination error should be most carefully avoided?_____
Why? _____

13. Identify the skids in the following pictures by checking the approprate box(s).



14. On a off-field landing, should you make your pattern high, normal, or low? _____

15. In a thermal, who determines which way to circle? _____

16. You are being pulled up into a building cumulus cloud base. How can you make the most effective emergency descent? _____

17. Can you maintain level flight if you cannot see the horizon? _____

18. For soaring and for safety, what is indicated by:

    1. Cumulus clouds? _____
    2. Cumulonimbus clouds? _____
    3. Lenticular clouds? _____
    4. Rotor clouds? _____
    5. Stratus clouds? _____

19. Describe which signal is used air-to-air for the following:

    Glider to towplane:

    Turn right _____

    Speed up _____

    Slow down _____

    Box wake (don't turn) _____

    Release me, I can't release! _____

Towplane to glider:

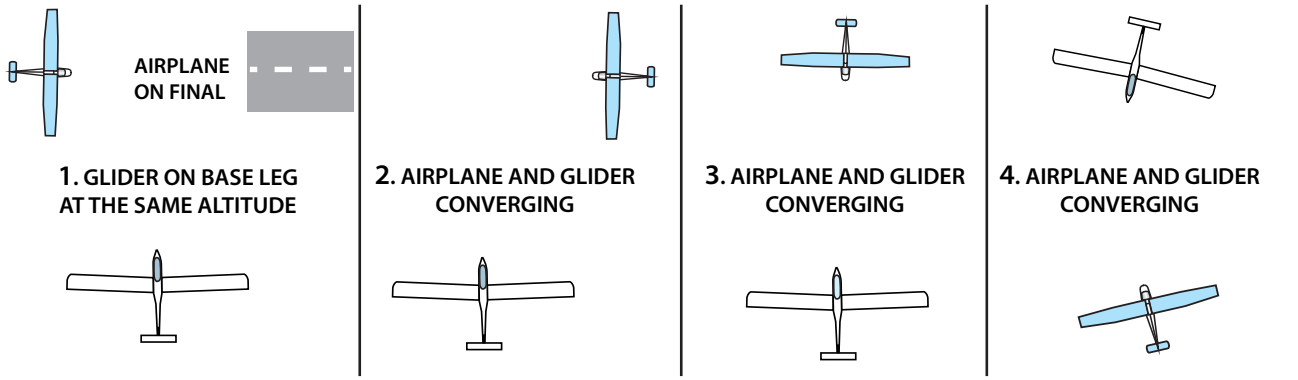
    Get off now! _____

    Check spoilers, check everything! _____

    I can't release! _____

20. Which aircraft has the right of way?

1. _____ 2. _____ 3. _____ 4. _____



What should the glider do?

1. _____ 2. _____ 3. _____ 4. _____

21. We must go on oxygen after 30 minutes between _____ feet and _____feet, and at all times above _____feet.

22. List the emergency frequency _____

and the two glider frequencies _____ , _____

23. What must Student Pilots do to maintain their solo privileges as per FAR 61.87?

_____

24. What else is required by Cypress Soaring?

_____

_____

25. What is the minimum flight visibility in which you may fly as a solo student?

_____

26. What are the cloud clearances you must maintain above 1200 ft. agl and below 10,000 ft. msl?

_____

27. What is the minimum altitude you may legally do a practice stall maneuver?

_____

28. At what altitude MSL should you arrive at the I.P.? _____

29. What should you do if you arrive low at the I.P.? _____

30. As a solo pilot, can you take a passenger for a ride? _____

31. What is the maximum distance you can be away from Hemet-Ryan airport? _____

32. When should you begin your prelanding checklist? _____

Acknowledgements

The *Cypress Soaring Flight Training Workbook* is an accumulation of knowledge gained from other flight instructors who deserve credit for the information and guidance contained in this workbook.

Tom Knauff, CFIG

Mr. Knauff's book *Glider Basics to Solo* was the original book many of us used for flight training and was the textbook reference for the original *Solo Course Workbook*. His concept of TLAR and look-down angles remains the primary method by which we teach judgment in the landing pattern. Tom, along with several other renowned glider flight instructors, contributed to writing the FAA publication, *Glider Flying Handbook*. This is now the primary glider flight training textbook used in the United States, and in this workbook.

Greg Lil, CFIG

Greg was a flight instructor at Sailplane Enterprises, one of the busiest, most successful glider flight training schools in the United States. Greg wrote the original text for the *Solo Course Workbook*, which was used for decades by Sailplane Enterprises, and was later adapted, with their permission, for use by the Cypress Soaring Club.

Chuck Gifford, CFIG

Chuck is the founding member of Cypress Soaring. He is the quintessential aviation teacher, as well as mentor and friend. Much of Chuck's training methods and the information contained in this workbook comes from Chuck Gifford's 50+ years of teaching students to fly.