

# **Beyond SIV**

## **Maneuvers Syllabus**



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# Preparation & Mindset

## **Maneuvers training is a mentally fatiguing and often stressful activity.**

Even a partial day of maneuvers training can easily be as psychologically demanding as an entire day of cross-country competition flying and warrants taking particular care of your mind and body.

## **Be sure to arrive well-rested.**

This is important especially if crossing multiple time zones. Ensure that you are mentally and physically fit to fly (including not being under the influence of any substances while flying unless otherwise directed by a licensed physician.)

I encourage pilots to limit or even abstain from alcohol during the course, and to prioritize getting a complete night's rest every night.

## **Fear and anxiety are normal aspects of the learning process.**

Much, but not all, of this can be alleviated with proper preparation, including comprehensive briefing and visualization of each maneuver, understanding common mistakes to avoid, and choosing maneuvers appropriate to your progression. You are neither expected nor required to perform anything you are not comfortable with. We will always work together to select the right program for your personality, abilities, and emotional state.

The end goal is that you should expect to feel “amped up”, but not overwhelmed. Typically, the fear and anxiety will lessen as your experience grows, though caution should be exercised in order not to slip into complacency.

## **There is no need to “go for it” or “yolo” in order to progress well in this course.**

This course is specifically designed to give you ample time to work through each maneuver in a methodical way, understanding the nuances of each maneuver rather than merely surviving each one. Students who embrace the process of incremental challenge tend to progress faster, more consistently, and with less psychological stress and fewer adverse events. The goal is to be in a psychological state where you are neither bored nor overwhelmed.

## **Expectations and End Goals**

While it is beneficial to have intentions on what you want to get out of this course, it is also important to not become overly attached to specific milestones or maneuvers (such as your first stall.)

These milestones will occur naturally when you are ready for them, and being overly attached to those specific outcomes may have you miss out on valuable learning opportunities from “lesser” maneuvers, or to feel disappointed if you discover that your progression is not as fast as you expected.

My goal is to help students get to a point where they can confidently perform their maneuvers without instructor supervision, so that the learning process may continue after the conclusion of this course. To this end, it is more important that we drill home a deeper understanding of each maneuver and not worry about simply ticking a box to have “done” a maneuver.

**For all students, both timid and bold, we will move onto new and more challenging maneuvers once you have demonstrated a sufficient understanding and execution of each maneuver.**

Some students will need to be encouraged to perfect their execution before seeking further challenges, while others will need to be encouraged to push their comfort zone in a controlled way to find their confidence. How far we go is entirely up to you, but the goal is to work together to have you progress as much as possible within an acceptable level of risk.

# Reserve Inspection

## **1) Verify suitable attachment of reserve to the harness via soft link, girth hitch, or load-rated mallion**

**A) Soft link** - Verify that the link is doubled-up through both the harness attachment point and the reserve, and that it is closed correctly and the loop is set

**B) Girth hitch** - Dress the hitch and apply tension to fully seat the hitch, optionally and additionally, secure the hitch with tape

**C) Maillon** - Ensure the gate is closed and torqued approximately 1/4 turn past finger-tight. Ensure that both the harness and reserve ends are secured with elastics or tape such that the mallion cannot be cross-loaded

## **2) Unstow reserve from the harness/front container and ensure that:**

**A) The reserve is dry** with no appearance or smell of mold

**B) The bights of line being used to close elastic loops are of appropriate size** (approx 2-3 finger widths) such that they will neither prematurely deploy nor risk entrapment/bag-lock

**C) Appropriate tension on closing loops** . The bight should be tight enough that it cannot be distributed via incidental handling of the reserve, but loose enough that it is not possible to pick the reserve up by the lines. Attempting to pick lift the bag by the lines must result in slipping of the bight so that the weight of the reserve alone is sufficient to disengage the closing loops

**D) Approximately 1-2 meters of free line left un-bundled.** This is to ensure that the closing loops on the deployment bag will remain closed during the initiation of the deployment and not unstow until after the pilot has released the handle during their deployment

**E) \*\*ENSURE NOTHING IS LEFT INSIDE OF THE CLOSING LOOP BIGHTS AND ALL PACKING TOOLS ARE ACCOUNTED FOR ESPECIALLY PULL UP CORDS\*\***

### **3) Reinstall reserve into harness/front container**

Install according to manufacturer specifications. For a standard "mailbox" style reserve compartment ensure:

**A) Reserve is installed with the handle attachment point up** (closest to the seatboard) in order to prevent camming of the reserve

**B) Reserve is installed with handle attachment point on the side closest to the opening of the "mailbox"** to ensure that there is sufficient slack to fully disengage the pins of the handle from the closing loops of the harness container

**C) Close the container and engage the pins into the closing loop** as specified by the manufacturer

**D) \*\*ENSURE ALL PACKING TOOLS ESPECIALLY PULL UP CORDS ARE ACCOUNTED FOR AND NOTHING IS LEFT INSIDE THE CLOSING LOOPS\*\***

# Reserve Deployment Procedure

The student should deploy their reserve if at any time they have lost control of the glider and do not have clarity on what actions they need to take in order to return the glider to controlled flight, and have the confidence that they can accomplish this given the remaining altitude they have to work with, or immediately if instructed to do so, regardless of altitude.

## Examples of situations warranting immediate reserve deployment regardless of altitude:

- **Warning signs of impending and imminent loss of consciousness** (loss of peripheral vision, gray-out)
- **Entanglement with the lines or the glider**
- **Entanglement with another pilot**
- **Uncontrolled auto-rotation** that does not respond to intended input, especially if twisted and/or cravatted
- **Damage to the glider** making a safe landing impossible
- **Loss of control of the glider** where a dry-landing is no longer possible even if control is regained

## STEPS FOR A PROPER RESERVE TOSS:

- 1) **Put both brakes into the non-throwing hand.**
- 2) **Look for the reserve handle.** If unable to visually locate the handle, reach out to your knee and sweep your arm backwards, maintaining contact between your arm and the reserve until the handle is located by feel.
- 3) **Grasp the handle and look out to the horizon**
- 4) **In a single motion, pull the reserve out from the container** (*not upwards*), swing your arm in an arc with your elbow fully straightened and release the handle, allowing the weight of the bag to swing away from you. Prioritize a strong,

hard, deliberate throw in a single motion over a particular direction of throw, though aim for a spot part way between the horizon and your feet if possible.

**5) Grasp the bridle and give it a tug until the reserve inflates.** If a malfunction results, immediately repeat the procedure with the other reserve

**6) Upon inflation of the reserve, disable the glider by taking many brake wraps and stalling the glider. Pull any one or a few lines hand-over hand until you can reach the fabric of the glider and hold it.** If using a steerable reserve, pull the entire glider in and hold between your legs before trying to activate the steering function.

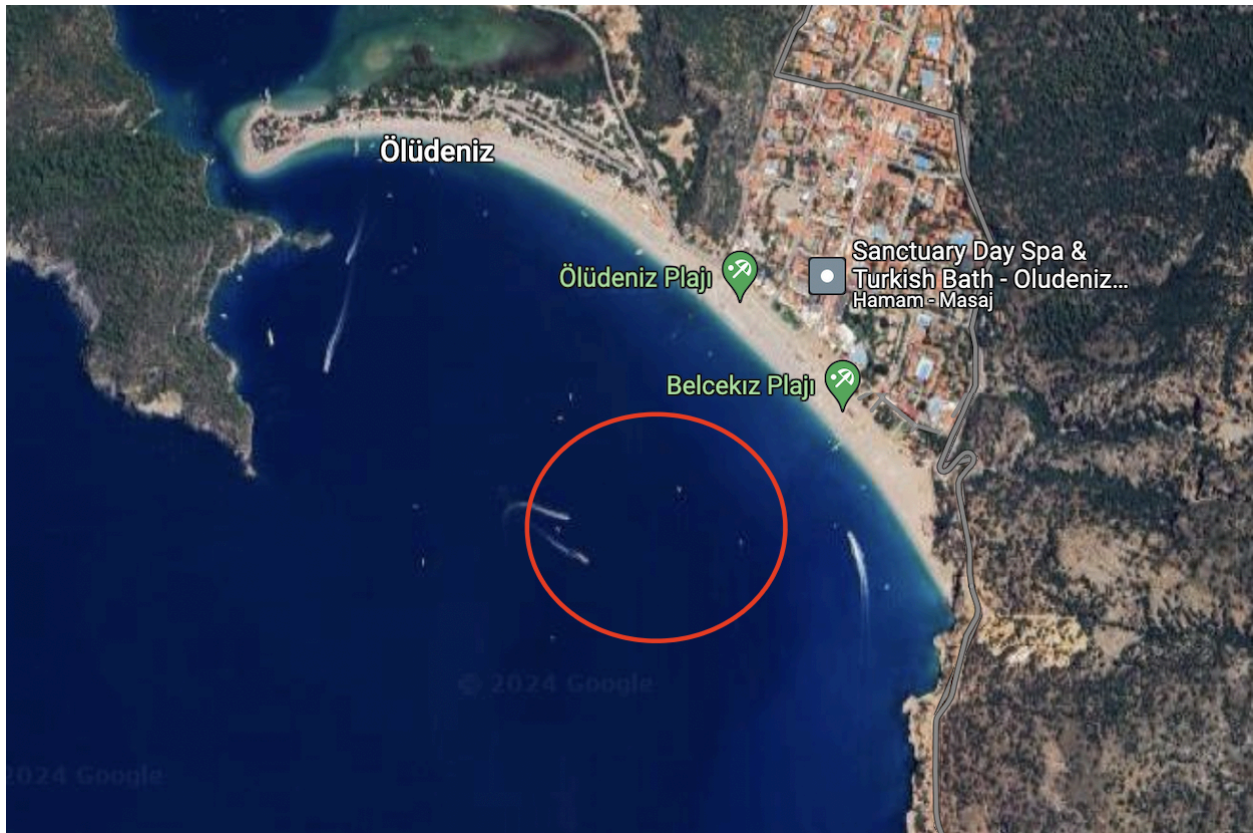
**7) Manually activate the life jacket prior to a water landing,** if time and altitude permits

**8) Immediately prior to water landing, take a full deep breath**

**9) Upon water landing, slip one arm out of a shoulder strap and loosen leg straps so that you can more easily and comfortably float on your back.** Avoid kicking your legs, using only small hand motions to slowly move away from the glider/lines. Stay calm and resist the need to lift your head entirely out of the water - you only need your mouth out of the water.



# The Box, Placement, and Drift



**The maneuvers area, maneuvers box, or “the box” is an imaginary 3-dimensional area pilots perform their maneuvers in, chosen in such a way that in the event of a reserve deployment the pilot will touch down in a safe area.**

**The exact location of the box varies with altitude and wind conditions.**

The box is an approximate cylinder shape, and is increasingly tilted into the wind with increasing wind speed, such that the top of the box is most upwind and the bottom is most downwind.

**You will be assisted in placement within the box for the given conditions,** but should gradually become familiar with estimating your placement as your experience grows.

# Spin Appreciation

## **Purpose**

Spin appreciation allows the pilot to become familiar with the sensations of the onset of a spin and to develop the reflexes to recover before the situation escalates into a more serious flight configuration. Additionally, the pilot also gains familiarity with the full range of possible brake travel.

## **Preparation and Entry**

Take a wrap on both brakes.

Smoothly slow the glider to minimum sink, but not too deep in the brakes.

Look up at the glider with legs tucked under your seat.

In a single committed and powerful motion, apply one brake to 100% and maintain eye contact with the inside wingtip of the glider.

Observe the wingtip deflect, shortly followed by a drop in brake pressure and a yaw-motion with a slipping, “driving on ice” or hydroplaning type sensation.

## **Exit**

As soon as these sensations are detected OR the glider turns a maximum of 45 degrees, release both brakes to fully hands up, pushing your hands upwards all the way to the pulleys. Allow the glider to pitch forward and regain airspeed without applying any brakes. Do not wait for cues from your instructor to exit, as there is significant danger from exiting too late but no danger from exiting too early. If in doubt, exit early and you will simply be prompted to repeat the exercise again and try to exit a little later.

## **Advanced Variations**

As you become familiar with the sensation of spin onset and recovery, you can gradually increase the intensity of this exercise by initially slowing the glider less and allowing it to yaw further, up to a maximum of 180 degrees. Once maximum amplitude has been achieved and you are comfortable with the technique, you can repeat the exercise while looking out at the horizon and NOT at the glider,

gradually working your way up from a 45 degree spin.

### **Dangers and Mistakes**

It is best to apply the brake aggressively when first learning this maneuver. If you apply it progressively, the glider will tend to enter a turn and pick up airspeed prior to the spin, which will make it faster and more dynamic. For this reason, if the glider turns more than 45 degrees the maneuver should be exited even if the onset of spin has not yet occurred. Ensure that when applying the brake it is applied directly downward and not outward in order to achieve the full brake travel.

**The greatest danger of this maneuver is holding the brake for too long and spinning past 180 degrees, where now dynamic shooting requiring an active recovery becomes possible.** It is always best to err on the side of exiting too early and repeating the exercise. Larger amplitude spin appreciations should be worked up to gradually. Apply only small amounts of outside brake during the entry, and never add outside brake once the spin starts as this greatly increases the risk of a full stall. Excessive amounts of outside brake during the entry cause some gliders to have a tendency to resist spinning and enter a full stall instead.

**During the exit it is essential that the brakes are FULLY released, with shoulders shrugged and elbows locked out ensuring NO brake is applied.** Hands should be at the pulleys and the glider must be allowed to dive and recover spontaneously.

### **Takeaways, discussion, and application**

Note that loss of brake pressure can be a sign of impending collapse (low AOA) OR onset of stall (high AOA). Both have unique sensations such as the “driving on ice” feeling vs. a more “explosive” feel of a collapse, though the subtleties often require direct experience to fully appreciate.

Context is essential, particularly how much brake was applied prior to the loss of pressure and how much airspeed you have. It is rare to experience an inside collapse especially while significant brake is already applied.

A common mistake pilots have when the glider begins to turn spontaneously is to add outside brake. If this reaction occurs during the onset of spin, the glider can easily full stall even if only a small amount of outside brake is used.

It is important to develop the reaction to first release the inside brake to prevent a turn, rather than adding additional outside brake.

# Spiral Dive

## **Purpose**

The spiral dive is a useful and effective descent technique, but it is also a common situation to encounter during recovery from a collapse or a cascade incident. Familiarity with the spiral dive is an essential safety skill in order to exit auto-rotation tendencies and to dissipate the energy in a controlled method without inducing further complications

## **Preparation and Entry**

Take a wrap and look over your inside shoulder towards the horizon and apply 100% weightshift, driving your inside hip into the seatboard while lifting your outside hip off. Allow the outside brake to fly at full speed, 0% brake applied while progressively adding inside brake. As the g forces, wind noise, and brake pressure increase, you can continue to add inside brake incrementally. As the spiral dive becomes to develop, the glider will enter your field of view and the wingtip will approach the horizon, at this point fix your gaze on that lower, inside wing tip, and observe the angle of the leading edge relative to the horizon, roughly perpendicular.

## **Exit**

For the first few attempts, stop the spiral dive when the wingtip reaches the horizon and the leading edge is slightly less than 90 degrees relative to the horizon. Do this by coming into contact with the outside brake, and releasing just enough inside brake that the wingtip lifts slightly off the horizon. As the g forces, wind noise, and brake pressure begin to reduce, slowly allow the glider to return back overhead after about half to one full turn. As you gain familiarity with the sensations of the spiral dive and demonstrate a controlled, smooth exit without a tendency to climb out with a large pitch, you can take the spiral dive deeper. Progress gradually, taking the glider a little bit deeper on successive attempts, and becoming familiar with the additional energy during the exit.

## **Deep Spiral**

As the leading edge angle passes about 30-45 degrees above the horizon, the glider will have a tendency to accelerate into the spiral dive. This is because the pendulum stability of your body under the glider no longer fights against the spiral when the glider is in front of you. To offset this, as the spiral dive intensifies you should gradually shift your weight shift towards neutral, and even releasing a bit of inside brake while applying more outside brake. Emphasize precise control of the desired angle of the leading edge above the absolute intensity of the spiral. Only progress deeper in the spiral once you have satisfactory controlled your desired angle and managed the energy of the exit. When exiting a deep spiral, add outside brake and begin to release inside brake until the leading edge approaches 90 degrees, then lean back into the turn a little bit to hold the wingtip on the horizon for about 1 turn, slowly dissipating the extra energy.

## **Dangers and Mistakes**

Care should be taken to not enter the spiral too aggressively, as it is possible to spin the entry. You should feel an increase in brake pressure before adding more brake, and avoid going deeper if the glider is sluggish to react. Heavy inside weight shift will reduce the likelihood of a spin.

The single greatest risk in a spiral dive is g-force induced loss of consciousness. Risk factors include being fatigued, dehydrated, inexperienced, and entering too aggressively. To reduce the likelihood of g-LOC, immediately prior to the entry contract all of the muscles in your feet, calves, legs, and core while making sharp inhalations and forceful exhalations through pursed lips. This technique will increase your blood pressure and oxygen saturation to stave off g-LOC. The initial signs of g-LOC begin with loss of peripheral vision and color saturation in your field of view. If you experience any of these symptoms, immediately exit the spiral. If you cannot exit the spiral, throw your reserve.

Some pilots become disoriented in spirals and forget which way to exit. Avoid approaching nose-down orientations until you have gained more experience from moderate spirals. However, if you do lose orientation, center your weight shift,

apply both brakes moderately and look towards a fixed point on the horizon and track it as the horizon moves by. This will naturally direct your gaze away from the spiral and identify the outside which you should preferentially brake harder.

If you exit the spiral too fast with too much energy, the glider will pitch back as your body climbs. If this happens, allow the glider to fly without applying brakes and be ready to apply them after the glider passes back overhead, stopping the forward dive. Avoid this by making sure to lean back into the spiral a bit during the exit and hold the turn with the wingtip on the horizon

### **Takeaways, Discussion, and Application**

While learning the spiral dive is useful as a descent technique, the most useful takeaway is how to exit in a controlled manner and not be overwhelmed by the sensations. Take note of how you can use your weight shift and both brakes to control the position of the glider. Also notice how the sensation in the brakes change throughout the spiral. As the g-forces increase, your effective wing loading also increases and results in a higher than usual brake pressure. Some pilots are overly-timid with using enough brake on the outside because they are unfamiliar with this increased sensation of brake pressure.

While learning this maneuver, it is more important to focus on control and getting repetitions with the exit, and less important to sustain a deep spiral. Sustaining a deep spiral consumes a large amount of altitude and exposes you to additional risks, and there is more training value in focusing on the mechanics of control and exit. G-force tolerance and endurance can be trained later once mastery of control is achieved.

# Pitch Pendulum

## **Purpose**

The pitch pendulum exposes the pilot to increasingly extreme pitch, both with the glider far behind and far in front of the pilot. This pitch behavior can be used to simulate active piloting techniques such as pitch dampening and surge control. A secondary goal of this exercise is for the pilot to gain a greater awareness and understanding of spatially where the glider is based on the sensations you experience.

## **Preparation and Entry**

Begin from straight and level flight at trim speed (hands up) with a wrap. Quickly, but smoothly and symmetrically apply both brakes to slightly more than minimum sink and hold the brakes at that position. The glider will pitch back, and you should mentally identify the moment at which the pitch reaches a maximum. Continue to hold the brakes as the glider begins to return back overhead. At the moment the glider passes overhead and your body is directly underneath, instantly and completely release the brakes to a fully hands up position and allow it to dive out in front towards the horizon. Observe the glider approach the horizon, momentarily stop relative to it, and then begin to recede, taking note of the moment of reversal. Continue to remain hands up until the glider pitches back and your body once again swings back underneath the glider, with the glider moving from front to back. At the moment the glider is once again directly overhead, begin the same sequence of inputs, braking to about minimum sink and holding to induce a second cycle. Each cycle will be larger than the previous.

## **Exit**

For the first few attempts, simply focus on understanding the timing of braking and releasing with little concern for the amplitude of the pitch. Once a moderate pitch pendulum is built from 2-4 cycles, brake one last time at the same timing when the glider is above you and passing from front to back. During the exit, release the brakes at the moment the glider is furthest behind you, earlier than when building the pitch pendulum. Remain hands up until the glider passes over



head, then apply both brakes a moderate amount, looking for the moment that the glider reaches the furthest point out front and stops moving towards the horizon. At this moment, begin to release the brakes and attempt to return directly to straight and level flight.

Once you understand the rhythm, timing, and the technique for a controlled exit, you can increase the amplitude of the pitch with 1-2 additional cycles or applying slightly more brake. Once you are comfortable with a particular amount of energy and pitch, you can begin to explore releasing the brakes a little bit later during the exit and also applying them later with the glider further pitched forward. With stronger and more extreme shooting, you will need to brake stronger and more precisely. When taken to the limits, it is possible to induce a full front collapse from this maneuver. Attempt to prevent a collapse by watching the glider during the shooting phase and applying brakes to stop the collapse, but if one does occur remain centered in the harness with hands fully up and allow it to recovery spontaneously

### **Dynamic Turn Exit**

Instead of using the brakes to dissipate the pitch pendulum energy, explore converting the extra speed and energy into a banked turn to dissipate it. With the glider pitched out in front and your body beginning to swing back underneath, initiate a moderate turn with heavy weight shift and a little inside brake at or just before the moment your body passes underneath the glider. Hold the wingtip near the horizon for about  $\frac{1}{4}$ - $\frac{1}{2}$  of a turn until the energy begins to dissipate, then return to straight and level flight. It is important to initiate this turn at or before your body passes under the bottom and not once the glider is pitching behind you.

### **Dangers and Mistakes**

The single greatest risk of this maneuver is applying excessive amounts of brake and potentially stalling the glider. Achieving a strong pitch is mostly about using the right timing and does not require excessive brake inputs. Avoid using extreme amounts of brake until you are proficient with full stalls.

The second greatest risk of this maneuver is causing a front collapse. These collapses tend to be relatively benign and reopen quickly, but it is essential to remain hands up due to the increased risk of stall.

When building the pitch pendulums, most pilots tend to apply the brakes too early and also release them too early. This is not dangerous but will limit the intensity of the maneuver.

### **Takeaways, Discussion, and Application**

A great misconception many pilots have is that brakes should be applied whenever the glider is in front of you, and released when behind you. This is an oversimplification, as both the location AND the direction of travel are essential. Recognizing the moment that the glider has ceased approaching the horizon is a critical step, as this marks the point at which brakes should begin being released. Keeping the brakes applied beyond this point risks stalling the glider as it returns overhead.

Playing with the timing of brakes during the exit helps gain appreciation for how different brake inputs can be used to achieve different effects. You can return to straight and level flight by applying a small amount of brake early and gradually, or providing a late, quick, but intense brake input to stop the glider suddenly.

# Big Ear Weightshift Wingovers

## **Prerequisites**

Familiarity with light spirals (wingtip on the horizon, leading edge slightly less than 90 degrees to the horizon), pitch pendulum to dynamic turn

## **Purpose**

Big ear wingovers are a useful training tool to understand the weight shift mechanics for real wingovers. Due to increased wing loading, the glider is more responsive which helps build up the roll oscillations. Because the wingtips are already collapsed and behind the lines, the risk of cravat is significantly reduced relative to true wingovers. And finally, this drill allows for understanding of roll movement without the risk of a mistimed brake input. For pilots interested in progressing into wingovers, this maneuver provides a strong foundation for good weightshift technique, but it exposes all pilots to large roll movements and how to dissipate those movements in a controlled manner.

## **Preparation and Entry**

Pull big ears at the mallions and ensure that your hands remain stationary relative to the risers. Weight shift 100% to one side, e.g. to the right. Ensure that you apply maximum weight shift by driving your right hip into the seat board, picking up your left hip off the seat board, and crunching your abdominals to the side to hold a massive weight shift to the right. On the first cycle you will not swing up very high and will need to quickly shift your weight shift to the left. On each cycle your body will swing higher than the last and will take longer to reach the high point. Maintain the weight shift all the way until the highest point, and only then release the weight shift, instantly shifting to the opposite side (the high side).

## **Exit**

Once moderate roll oscillations are built up, exit by maintaining your weight shift on the low side at the top of the next turn and NOT shifting towards the high side. This will cause the glider to continue to turn as you dive towards the ground. Maintain the weight shift into a banked turn and gradually center your weight shift

to return to straight and level flight. Release the big ears once in straight and level flight

### **Advanced Technique**

Once you have familiarity with controlling and exiting moderate big ear weight shift wingovers, begin to work towards increasing the amplitude through committed and aggressive weight shift. It is possible on most gliders at most wing loadings to get your body significantly above the horizon with good technique. In order to do this, you must maintain aggressive weightshift completely throughout the entire turn. As the turns get larger, the glider will begin to yaw and turn towards the ground as it approaches the highest point, no longer only rolling side to side. This turning towards the ground is desirable and essential for true wing overs, as your heading will change from between 180-270 degrees on every turn. Continue building these turns up with proper timing and weightshift technique until larger turns are no longer possible.

### **Dangers and Mistakes**

The risks of this maneuver are significantly less than a true wingover due removing the potential for a mistimed brake input. Poorly timed weight shift inputs make it difficult to build this maneuver up into amplitudes that are dangerous. However, grossly mistiming the weight shift once the turns become large (body above the horizon) can be dangerous. The greatest risk is changing your mind part way through a turn and weightshifting to the high side too early, but a very late weightshift long after the high point can also be dangerous. If you are unsure or uncommitted to the next turn, simply maintain your weightshift to the low side at the top of the turn and exit as normal

Many pilots struggle to build this maneuver up to significant amplitudes due to using poor weightshift technique or failing to maintain the weight shift throughout the entire turn. You must fight through the g forces to hold the weight shift through the turn which can be somewhat physically demanding.

### **Takeaways, Discussion, and Application**

A common mistake inexperienced pilots make when in extreme roll attitudes is trying to weightshift away from the glider in order to put it back overhead. For example, if the glider is rolled off to your right, the instinctive input is to weightshift left to bring the glider back overhead. However, in practice this only amplifies the pendulum behavior of the glider and causes an even larger oscillation to the left. Counterintuitively, dampening out roll oscillation requires weightshifting TOWARDS the glider (the low side) so that the roll input counteracts the pendulum of your body, and the energy dissipates out similar to a pitch pendulum dynamic turn.

For pilots progressing into wingovers, it is important to begin to spatially understand where the glider is and to begin to see how the motion transitions from roll and into yaw during the dive, and how the heading changes on each turn. Applying these lessons along with the weightshift technique itself will greatly improve your progression and reduce the likelihood of dangerous mistakes.

# Fast Spiral Exit

## **Prerequisites**

Pilot demonstrates comfort with deep spirals with a controlled, non-climbing exit and can perform full-amplitude pitch pendulums

## **Purpose**

The fast spiral exit gives the pilot experience aggressively and decisively counteracting a spiral, and gives them an appreciation for how hard you can apply inputs to exit a spiral immediately. These skills are useful for understanding how to stop an auto rotation, and exposes them to pitch attitudes and surges larger and more extreme than is possible from pitch pendulum alone. This makes for a useful precursor to understanding how to manage the exit from a full stall later, and provides a kinesthetic challenge to properly control the behavior of the glider.

## **Preparation and Entry**

Enter a deep spiral, e.g. to the right, with the leading edge parallel or nearly parallel to the horizon. It is not necessary to generate large amounts of energy for this drill, but a steep angle is necessary in order to achieve a straight and symmetric climb out. Once the leading edge is parallel to the horizon, fully release the inside (right) brake, weight shift fully to the left and apply left brake in an attempt to stop the spiral quickly with the glider still in front of you. As you begin to swing under the glider, continue steering with left brake and left weight shift until the glider is overhead roll-wise. Because of the steering inputs just performed, you will now be centered roll-wise under the glider but have roll momentum to the left that needs to be countered before the climb out. Lean back in towards the spiral (back to the right) and apply a little right brake to counteract this motion, aiming to swing directly through and under the glider into a symmetric and vertical climb. As soon as the climb begins, go hands up and remain centered in the weight shift. Dampen the surge as in the pitch-pendulum drills.

## **Dangers and Mistakes**

If you must err on one side, it is better to not exit the spiral aggressively enough, or to understeer that input a bit. This will cause a more banked climb out with a less dramatic pitch. If you greatly oversteer the spiral exit, it is possible to enter a looping movement. The risk of this can be minimized by ensuring that you no longer apply brakes after swinging through the lowest point pitch-wise. All of your steering inputs should be performed before your body swings under the glider, in an attempt to be as symmetric and straight as possible. Slightly asymmetric climb-outs are not dangerous, but can cause the glider to shoot towards the horizon slightly asymmetrically. If this happens, simply brake the side of the glider which approaches the horizon first and wait for the other side of the glider to catch up before braking it as well.

## **Takeaways, Discussion, and Application**

The most difficult part of this drill is understanding how much steering input to use. Many pilots are surprised at how much they can or have to steer in order to stop the spiral. It is possible to feel so much pressure because the wing loading and airspeed are so high in a spiral, which translates to much higher than normal brake pressure for a given brake travel. The ultimate goal is to understand the concept of “steering for effect”. That is, applying whatever amount and intensity of inputs as required to get the desired effect, in this case terminating the spiral. When encountering auto rotations of different intensities, you will need to steer as hard as it takes to stop it, which is often more than inexperienced pilots expect.

The secondary learning goal for this drill is to begin to anticipate how the glider is about to behave, which will inform piloting exactly the right amount of input to use without overdoing it. This kinesthetic drill begins to develop your relationship to the glider and reacting to it in real time, rather than having reactions built through rote memorization.

# **Collapses**

## **Prerequisites**

Deep spirals

## **Purpose**

This is a confidence drill to learn to believe in the passive recovery characteristics of your glider and training to not overreact.

## **Preparation and Entry**

Stow both brakes, and reach around the outside of your risers to grab your A risers at the mallions with palms facing out and thumbs down. Visually confirm by tracing the lines in your hands up to the glider to verify that you have grabbed the lines on your leading edge and that you have ALL of your A lines including the big ear lines/split As. Tuck your legs under your seat and maintain a neutral weight shift. In a single swift and committed motion, pull both risers into your lap. The moment you feel the glider collapse, release all the lines simultaneously on both sides and wait for the glider to recover. Do not touch the brakes.

## **Asymmetric Collapse**

Grab the right brake with your right hand, stow the left brake, and grab all of your left-side A lines with your left hand as in the previous drill, verifying you grabbed the correct lines. In a single swift and committed motion, pull your left riser into your lap, and release it as soon as you feel the collapse. Remain neutral in your weight shift and hands up and allow the glider to recover. If it shows a tendency to enter a turn, look out to the horizon, weightshift towards the right (flight side) and maintain a straight heading.

Repeat the collapse, this time when it collapses, continue to hold the riser in your lap. As the glider starts to turn, look to a fixed point on the horizon and weight shift away from the collapse. If 100% weight shift is not enough to control and maintain your heading, you may apply a little bit of right brake. Hold a steady heading for a few seconds, then release the riser and allow the glider to recover.

## **Advanced Technique**



Repeat the above drills, but this time first with 50% speedbar applied and then 100%. Ensure that the moment the collapse occurs, release the speedbar completely and instantaneously.

### **Dangers and Mistakes**

The single greatest risk with these maneuvers is inducing a collapse with the incorrect lines or omitting some of the lines, which will cause unpredictable behavior. It is essential that you check and double check that you have grabbed all of the lines, and only the lines, that you intended to.

In the case of a front collapse, the sudden loss of air speed and increase in sink rate initially puts you at a very high angle of attack and leaves you vulnerable to a stall if even a small amount of brake is applied. Go hands up for the recovery and allow the glider to regain airspeed, only braking if the surge is very hard and the glider is far in front towards the horizon.

In the case of inducing a very large and dynamic asymmetric collapse, the glider may turn aggressively and have a tendency to enter a spiral dive, especially if holding the collapse in and you fail to control your heading right away. In the event of beginning to enter a spiral, release the collapse and treat the maneuver the same as you would for exiting a spiral.

### **Takeaways, Discussion, and Application**

The initial goal is to gain trust that your glider will recover from a collapse and that dramatic input is unnecessary and often counter-productive. However, be aware that collapses in the real world often behave significantly different than collapses in the SIV environment due to the differences moving air itself makes. Note that the amount of weight shift you will need to maintain a straight heading depends on the size of the collapse and the ideal response cannot be learned through rote memorization. Instead, you must learn to countersteer “enough” to control your heading and prevent an auto rotation from developing

# **Wingovers**

## **Prerequisites**

Fast spiral exits, max amplitude weight shift wingovers, collapses

## **Purpose**

Wingovers combine all three axes of motion - pitch, yaw, and roll - as well as energy management principles of spirals. This provides a complex challenge to understand spatially where the glider is and where it will go next in the most extreme attitudes. Practicing wingovers will increase your understanding of how the glider behaves throughout a range of orientations and airspeeds, and trains your mind to maintain composure. Additionally, the kinesthetic component towards wingover control helps develop your touch and feel for controlling the glider, as well as both detecting and preventing imminent collapses

## **Preparation and Entry**

Before going directly into full wingovers, build on the big ears weightshift wingovers drill by repeating the same weightshift process. Without big ears, you will need to begin using the outside (high side) brake to prevent a deflation during the climbing phase of the wingover, and release that brake during the diving phase in order to preserve energy. As before, weight shift 100%, shifting at the highest point in the turn and holding your weight shift all the way through the turn. As your body begins to climb towards the horizon and the turns get bigger, you will have to apply more and earlier outside brake to prevent a deflation. Use as much brake as required to find pressure in the glider, which may be well below the carabiner. During the dive and pressure begins to return to the outside brake, release it as much as possible.

Once you are able to build wingovers up to a high amplitude with weightshift only and are able to successfully prevent deflations with the outside brake, you can start using the inside brake to climb higher and turn more. Do not change anything with your weightshift technique, but this time you will add inside brake just before your body passes underneath the glider. This will cause you to climb up higher than before. Shift your weight at the top of the turn, and start to release the brakes

as pressure returns, getting ready to initiate the next turn again before your body passes under the glider.

It is essential that, just as in the big ear weightshift wingover drill, you allow the glider to yaw and turn towards the ground. This achieves three things. First, you will pick up more speed and energy for the next turn which will help keep the lines tensioned and avoid a collapse. Second, you will have more time to complete the turn and swing down under the glider so you will be less rushed switching from side to side. Third, as the glider begins to point towards the ground and the leading edge approaches parallel to the horizon, you will be in a better position to pass directly under the glider and not with it well off to the side. When the glider is rolled off to the side as you pass underneath it pitch-wise, it is out of position to initiate the next turn and can result in a dangerous late turn.

### **Exit**

Just like the big ear weightshift wingovers, hold your weightshift to the low side and exit like a spiral.

### **Dangers and Mistakes**

Wingovers present considerable risks for collapses, very large cravats, and even falling into the lines or the glider itself if mishandled. The primary cause for these mistakes is initiating a turn too late and/or with too little energy. For this reason, a few warning signs must be respected and the maneuver should be terminated if any of them occur

- 1) If you feel late to a turn, meaning that the glider is not overhead roll-wise at the moment you are about to pass under the glider pitch-wise and initiate your turn, abort the turn and exit into a spiral.
- 2) If you take a collapse it will throw off your timing and rob energy from the maneuver. Abort the next turn and start over
- 3) If you feel you have lost the rhythm or experience a turn that feels different than the others, exit and start over
- 4) If you feel the glider go soft at the top of your turn and begin to lose pressure but not collapse, this is a warning sign that you are dangerously low on airspeed and are turning too late or using too little weight shift.

If you do initiate a late turn, it is critical to apply both brakes as soon as possible. This will help prevent a collapse and will pull the glider out from under you.

## **Spin to Backfly**

## **Purpose**

Spin to backfly is effectively a spin appreciation exited as a full stall. This entry is significantly more gentle and less intimidating than a 1-stage stall, and more accurately represents how an inadvertent stall in the wild is likely to occur. Additionally, the familiarity of spin appreciation makes this entry comparatively more familiar as only the exit has changed.

## **Preparation and Entry**

Take a wrap, tuck your legs under your seat, look up and the glider and slow it to about minimum sink. Enter the spin just as in the spin appreciation. This time, allow the glider to spin minimum 180 degrees, then smoothly bring your outside hand down to a few inches below the carabiner, and bring the inside hand up to the same position so that your hands are symmetric and your weight shift is neutral. Resist all urges to actively pilot the glider, focusing entirely on maintaining still and symmetric hands and wait for the glider to settle out. Your instructor will assist you in getting your hands to the ideal backfly position by prompting you to adjust the position of your hands up or down a little bit. Move your hands smoothly and symmetrically a few inches at a time and be patient to give the glider time to stabilize.

The goal is to achieve a stable back fly position, where the glider will look like it has big ears that are facing forwards instead of backwards, due to the relative wind from the trailing edge. If you are a little too deep in the back fly the ears will be pulsing and unstable. If you are too high in the backfly the glider will have a tendency to spontaneously try to start flying again. Aim for about  $\frac{1}{2}$  of the trailing edge open, and the ears about  $\frac{1}{4}$  of the total wing span on each side.

## **Exit**

Once you are in a stable back fly, you will be prompted to exit. Release about half of the brake which have applied. This will cause the ears to begin to open up and the glider to pitch forward. At the moment the glider is out in front and has slowed down, but before it has begun to recede back overhead, release the brakes entirely all the way and allow the glider to pitch forward. You will recognize this timing from your drills with pitch pendulum and fast spiral exits. Be prepared to brake a

surge should one occur, but with good timing and being sure to release the brakes when the glider is in front of you, it is often unnecessary to brake any surge at all.

### **Dangers and Mistakes**

The greatest danger in this maneuver is releasing the brakes when the glider is behind you. It is natural to have a pitch oscillation during the back fly, and you want to avoid going entirely hands up whenever the glider is behind you. Wait for the glider to naturally pitch forward or induce it to pitch forward by releasing 1-2 inches of brakes.

The second greatest mistake is being excessively active and asymmetric with the hands. Experienced pilots often struggle to suppress their instincts for active piloting and searching for brake pressure, but these instincts will betray you in stalled flight. The glider is vastly more reactive in stalled flight, so a few inches of brake travel in backfly will have vastly more effect than in forward flight. Overpiloting stalls is a very easy way to get riser twisted, so the emphasis must be on being smooth, patient, and have good finesse as you learn this maneuver.