

Flocking Skills

Wingsuit Formation Flying



Photo by Perry Trowbridge

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1. Foreword

The wingsuit formation flying (or flocking) discipline is rapidly growing and this document aims to explain how to plan and fly safe & enjoyable formation flights.

The information contained within this document is by no means the “law” regarding wingsuit formations, with more experience and the passage of time sections of this document may prove to be incomplete or become outdated.

2. Introduction

The rules and execution of a safe wingsuit formation share many obvious similarities with the other skydiving disciplines (such as relative work, free flying and canopy relative work)

The fundamentals for a planning a successful wingsuit formation are:

- A pre-declared base flyer (or point person)
- Careful consideration of the spot and flight pattern
- Attention to brief the exit, formation and break off

The main differences between a wingsuit formation and other types of formation skydiving:

- The formation will obviously cover a significant horizontal distance as well as lasting for longer.
- The burble from a wingsuit is above and behind the flyer. See figure 1. This creates a no fly zone behind each flyer but at the same time makes it possible to stack multiple wingsuits directly on top of each other.
- It is very easy to generate high closing speeds even when flying in the same direction, as shown in figure 2. Make sure you brake your **sideways** velocity early to make a safe controlled approach.

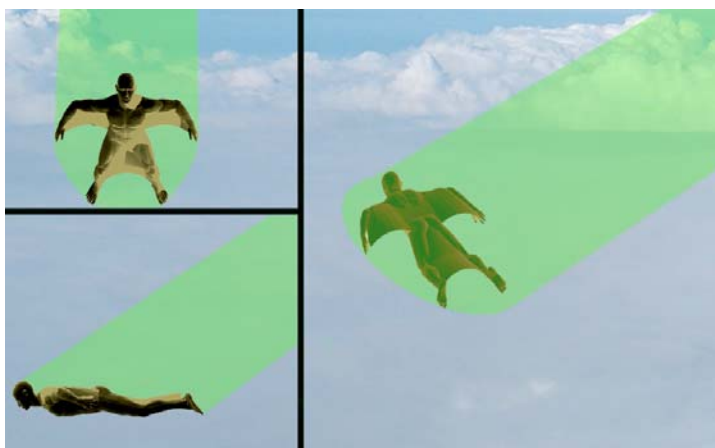


Figure 1: Shows the burble created by the wingsuit



Figure 2: Watch your closing speed!

3. Choosing your flock

When assembling your flock you must consider the compatibility of experience levels, body types and to some extent suit type. If your group contains many low experience flyers it is better to split the flock into 2 smaller groups.

As with all disciplines, gradual progression in group size and complexity is recommended in the interests of safety. It is best to develop your skills during small way flocks and then apply this knowledge to bigger formations.

For large formations, have an experienced base that is stable and builds quickly (as in RW and FF). But bear in mind: **“Bigger is not always better”**. Large formation flocks are great fun but have the downside of being very time demanding and inflexible (i.e. you usually fly one slot from exit to break off). Smaller flocks allow the opportunity to brief more complex and creative flight plans, performing multiple formations in the same flight.

4. Dirt dives

As always the dirt dive is crucial for a successful & safe skydive and should cover the order for boarding the plane, exit, formation, break-off and landing.

Have all the participants come to the dirt dive already kitted up so the flyers can memorize the suit colours that will become their reference points in the formation. Use the mock up (or real aircraft) to go through the exit.

An alternative method for briefing big ways is for the participants to lay their equipment on the ground creating the mock formation, allowing everyone to walk around the flock and see it from all angles.

See Appendix A for some ideas for formation designs

5. Aircraft Procedures: Run in and spot

The best flight pattern for flocking is to exit the aircraft, make a single left turn (for aircraft with left door) and proceed directly downwind to the opening point. This offers more working time to fly together and removes the necessity to navigate the flock back to the opening point. If the wind direction would force an exit in a poor location, the location and distance can be adjusted for safety. Make sure you communicate with the pilots to know when the upper winds have changed direction / strength.

The flight pattern is illustrated in figure 3, the photo shows the Zephyrhills airport and, for this example, a north wind with an exit point 1.5 miles upwind. The aircraft would be flying west and you should be able to see the airport out to the left of the aircraft. Wingsuit flyers exit and turn left, heading directly downwind to the DZ.

Ideally the pilot will drop the other jumpers as usual, then turn off the exit light. The pilot would then manoeuvre to the wingsuit exit point and turn on the exit light, allowing 30 seconds or so before reaching the exit point for flyers to prepare. Remember to look below for other aircraft prior to exiting.

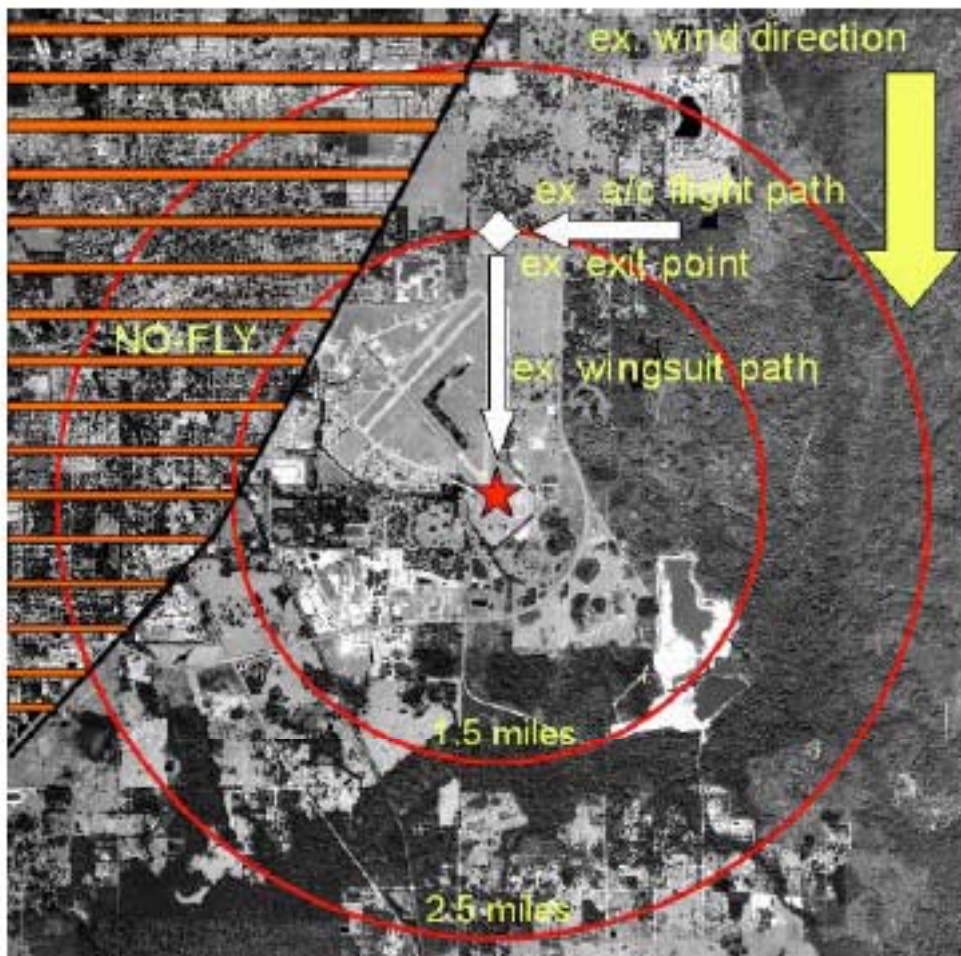


Figure 3: Aerial photo showing the exit point and flight pattern

If there are other wingsuit groups aboard, remember to co-ordinate flight directions and intended opening points.

6. Exits

Large flock exits end up strung out in a diagonal line in the sky. It is better for the lighter flyers to get out first, the base in the middle and the heavier flyers next. The very back of the formation will be last. Since each flyer turns left after exit, the first out will be on the left of the formation. Those after the base will be on the right and in back.

Large flock exits more resemble CReW exits than RW exits. You want to get out as quickly as possible but you don't want to tumble out the door or onto someone else (which will cost you altitude to recover). Follow the person before you, but don't watch them as you exit. Concentrate on getting your head and body into the wind right out the door, then turn and find the formation.

To reduce the horizontal separation on exit it is a good idea to use floaters. For example on a Twin Otter the door is wide enough for 3 wingsuits plus one on the camera step (but check you can reach the handle before boarding!)

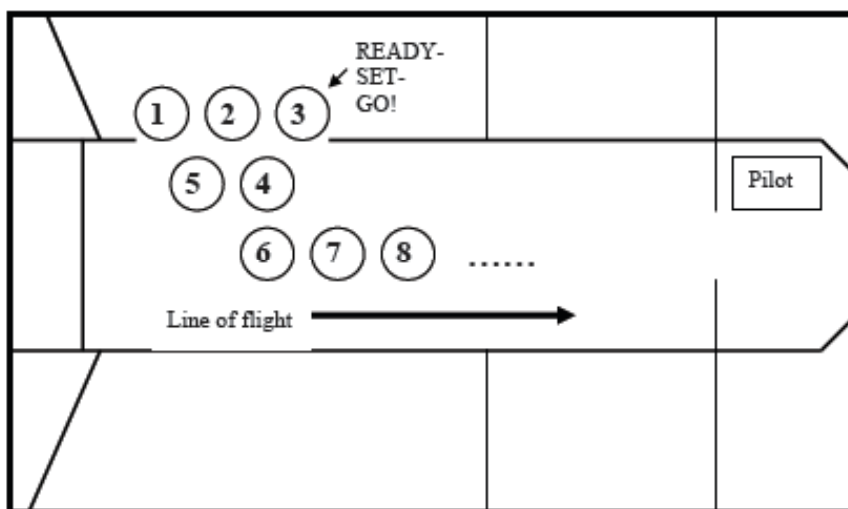


Figure 4a: The Floaters and divers in position

To prevent “bumping” on exit it is wise to stagger the exit of the floaters. The front floater keys the exit after checking everyone is ready. On “**Ready**” the rear floater exits, on “**Set**” the middle floater exits and on “**Go**” the front floater followed by the divers, as shown in figure 4a, 4b and 4c.



Figure 4b: Floaters in position, base at the front



Figure 4c: The staggered exit “ready set go”

The larger the formation, the closer the base will be to the center of the exit order. On a small formation the front float position is usually suitable, but on larger formations the base should be a diver from inside the plane.

For large multi-aircraft formations it can be useful to choose a modular formation design i.e. that is 2 pieces that assemble together. An example would be the “L” formation, the last image in Appendix A. The 5 way vertical stack with the red flyer as base would exit from one aircraft, the 5 way horizontal line with the purple flyer as base would exit from the 2nd aircraft.

The purple flyer acts as a secondary base leading the horizontal tail into position behind the primary base. This method helps reduce the risk of collision while approaching the formation.

7. The job of the base:

- Perform steep exit to reduce the horizontal separation from the divers
- Fly constant steady pace, to weakest flyer, any changes in fall-rate / direction must be gradual
- Follow pre-declared flight path
- Key break off

If the flight pattern requires a turn it is best to perform this a couple of seconds after exit to allow time for the flyers behind you to exit. Once you've made your turn, think about being perfectly still the whole formation depends on you!

The base must set a flight speed that's compatible with all the people and suit combinations. A 90 second fall rate with a slow to moderate forward speed seems to work best, but the body position of the base depends on the individual. The fall rate and forward speed of the base needs to be inside the flight envelopes of all flock participants.

A base who is capable of back flying is very valuable, from this position they can see the entire formation to make fall-rate corrections and have the best position to capture the flight on camera. (Note: this requires a flyer in the formation to give heading corrections to the base). You need to be a **skilled back flyer** before attempting to lead a flock in this manner, practice!

A good exercise on small training flocks to improve performance range is for the base to increase the glide (reduce the fall rate and increase the forward speed) towards the end of the flight– this gives everyone the opportunity to work on his or her range.

8. The job of the flockers:

- Perform clean and stable exit
- Approach the base quickly but keep your head on a swivel looking at the other flyers, keep your distance and stay away from the burbles of the other flyers.
- Changes in fall rate and direction should be gradual to give flyers in your blind spot (above and behind) time to react. **“NO ZOOMIN’ AROUND!!!!”**
- Brake early once close to the base and move into position in a slow and controlled manner
- Flocks tend to “breathe” quite a lot (i.e. distance between flyers increases/ decreases) It is important that all the flock maintain their correct position relative to base flyer **not** to the flyers next to them.

When approaching the formation the same rule applies as for relative work and free fly: **1st Level! Then 2nd Proximity!** As shown in figure 5.

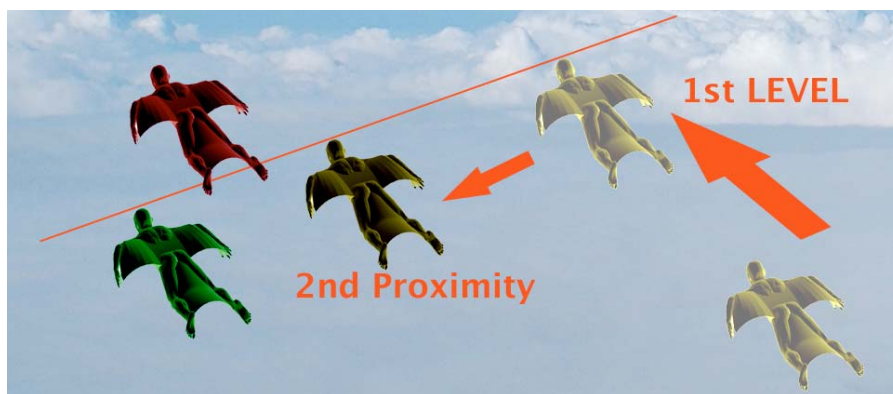


Figure 5: The ideal way to approach your slot

You should avoid approaching your slot vertically, either from above or below, as you will not have a visual on flyers behind / above you. Note: unless the formation design only allows this kind of approach.

This is one reason why pre-defined slot formations are slightly safer, preventing people from racing to the first slots behind the base.

As the burble from each wingsuit is above and behind the flyer, approaching a large formation from this area can be pretty bumpy, try to always approach the base from the side

9. Flying your slot

Once you've reached your position in the formation you need to stay there. That means matching fall rate as well as forward speed. You won't be in your optimum flying position, flocking usually doesn't mean flying at your comfort spot. So use all of your flight surfaces. Sometimes you can use your arm wings to hold position vertically and the legs to gain forward speed, but usually it's a combination of both.

- To drop down vertically - arch
- To rise up vertically – de-arch
- To accelerate forwards – point your toes, lock out your knees
- To decelerate – relax your legs and drop your knees slightly, you can also try and increase the curvature of your arm wings

Another option to move up or down vertically is by changing the surface area exposed to the airflow by opening or closing your arm and leg wings.

When you're adjusting your arm wings to increase fall rate, don't let them lift up behind you. Keep them on level with your body, but pull them in. This will help keep you from rocking around.

Most importantly, don't fly "rigid". If you fly with your arms and/or legs in a rigid position it will be difficult for you to stay in place. Think about being relaxed. Everyone moves around slightly; as you get better, the "box" you move in gets smaller. Leave the person in front and beside you a "box" to fly in. Don't follow them as they move in the box; stay positioned on the box itself.

Your best reference is the base, although as things progress you'll see that the entire front of the formation effectively becomes the base.

In the dirt dive you need to pick those reference points that will keep you correctly positioned in all 3 dimensions. Look around you in the dirt dive for those points you can see without swivelling your head around too much. Swivelling your head will make your body move around.

To help maintain your relative position in the formation use “site lines” i.e. look at the flyers next to you and across the formation towards the base and draw an imaginary straight line to check you are in the slot, as shown in figure 6b. Figure 6b shows what happens when a flyer gets out of position. The flyer has dropped back from the base and is not level with the other flyer in the second row. This small error is then amplified as it travels back through the formation. Staying in the right position is tricky and requires practice and most of all concentration.

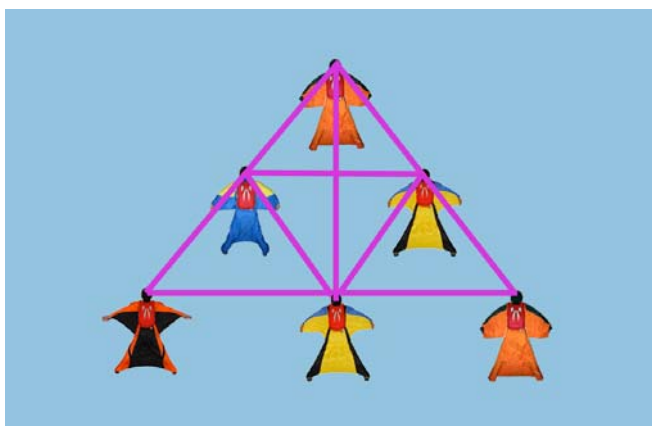


Figure 6a: “Site lines”

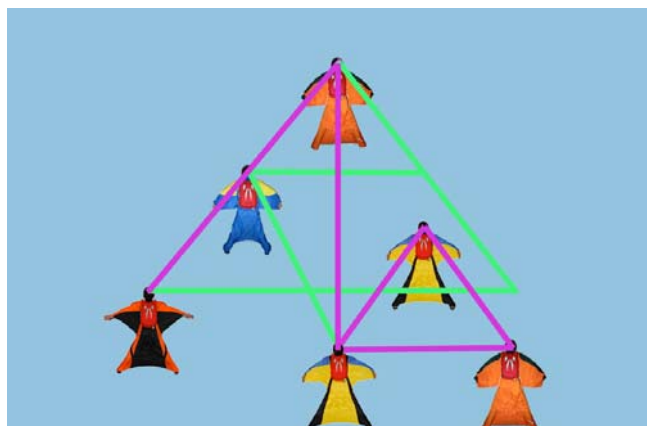


Figure 6b: Flyer out of position

Try to minimise the number of times you look at your altimeter. The base will key the break-off and an audible altimeter can give you piece of mind. Looking at your altimeter can cause you to bobble around and spoil the formation.

10. Break-Off

At the break off altitude the base will wave off by kicking their legs, all the flyers must fly away from the centre of the formation, those at the front continue straight, those at the back should turn 180 degrees and those at the sides should turn off at 90 degrees, as shown in figure 7a and 7b below

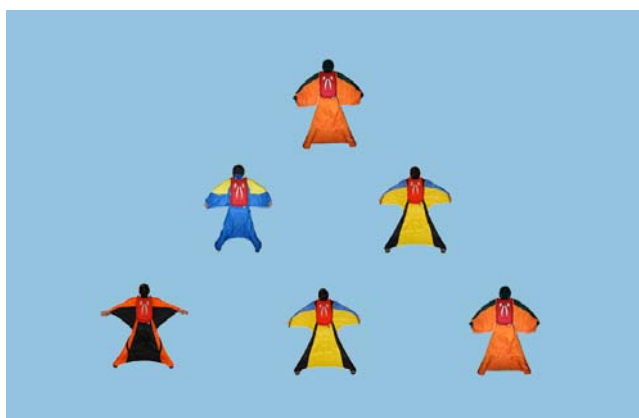


Figure 7a: The formation prior to break off

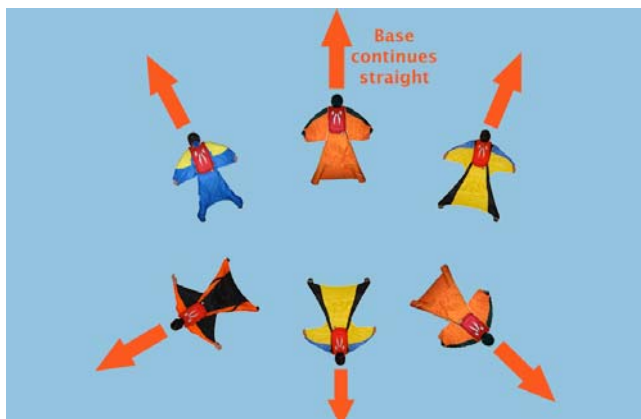


Figure 7b: The separation direction

Each flyer must check their airspace and wave off prior to deployment. Remember not to max out immediately after break-off, as there may be people directly above you, instead gradual accelerate away from the formation.

The distance between flyers that can be achieved before deployment is amazing! **BUT MAKE SURE YOU WAVE OFF BEFORE PULLING!** Waving off is not optional!

11. Landing

For big way formations don't forget to cover landing patterns and "no wind" drills as there will be many canopies landing at the same time.

12. De-brief!

After landing the whole flock should debrief the flight watching the external video (if available). Then you need to pack, manifest and brief for the next flight!

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When performance matters...

Appendix A: Formation design- A few ideas, but your imagination is the limit!



Horizontal Line



Classic 'V' Formation



Wedge



Arrow



Vertical Stack



Horizontal Diamond



Vertical diamond



'L' – vertical stack, with horizontal "tail"

End