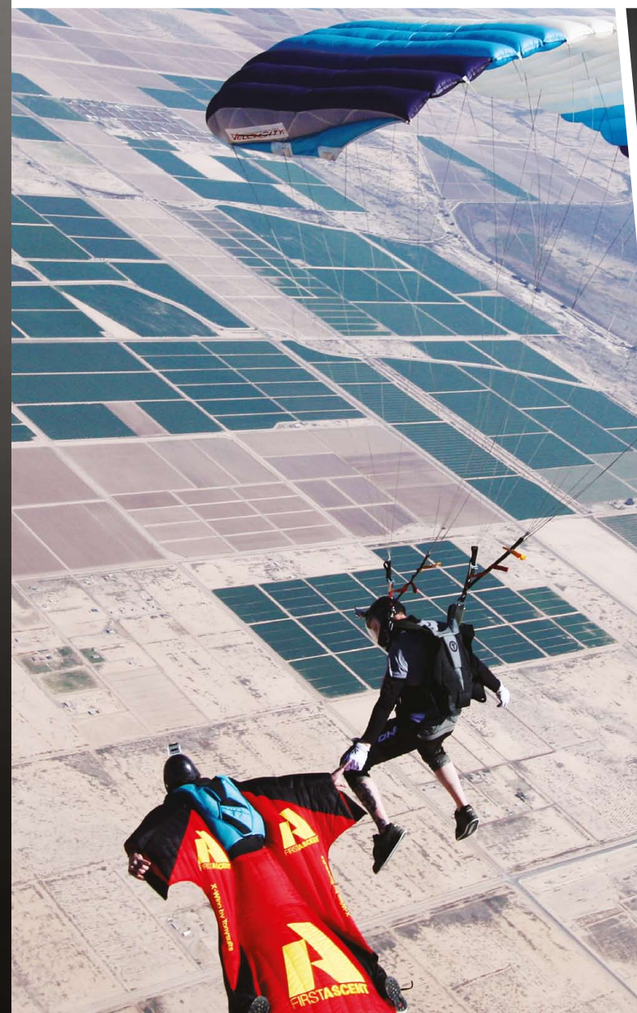
A WING-SUIT FLYING RELATIVE TO A CANOPY IS NOT A NEW CONCEPT; HOWEVER IN THE PAST IT HAS ALWAYS BEEN CONSIDERED A STUNT RATHER THAN A POTENTIAL DISCIPLINE. AS WING-SUIT AND CANOPY TECHNOLOGY CONTINUES TO RAPIDLY IMPROVE, WE CAN ALMOST GUARANTEE THAT MIXED FORMATION FLIGHTS WILL BECOME MORE COMMONPLACE IN THE FUTURE. THEREFORE IT IS IMPERATIVE THAT WE TAKE A CLOSER LOOK AT WHAT MAKES THIS ACTIVITY POSSIBLE AND ADDRESS SOME OF THE POTENTIAL DANGERS ASSOCIATED WITH IT. THIS FORM OF FLIGHT IS VERY NEW AND SAFETY IS OF GREAT CONCERN. BY NO MEANS ARE WE EXPERTS ON THE SUBJECT, BUT WE WOULD LIKE TO SHARE SOME OF THE INFORMATION WE HAVE ACCUMULATED OVER THE LAST YEAR DURING OUR TRAINING CAMPS.

MIXED FORMATION FLIGHTS

XRW

By Niklas Daniel, Barry Holubeck and Will Kitto
Photos by Barry Holubeck and Will Kitto
Diagrams by Niklas Daniel



Planning the Jump & Equipment

A lot of planning and good communication skills are required to make a successful jump. Before any jump is made, have a goal and talk amongst your team about your plans to execute them. Once everyone is comfortable with the plan it is time to consult with the DZ Safety Officer and aircraft pilots. Make them aware of what you are attempting to do. If you are asking for extras on jump run, be as accommodating to the DZ as possible. Consult ahead of time and give them time to think about what you are doing. Have a diagram of what the plane needs to do and show them your flight path.

All of our test flights were completed with Performance Designs Velocity, which were outfitted with experimental trim-tab risers provided by United Parachute Technologies (Vector). These allow the CP to pitch the nose down and lock it into place, thus creating a greater descent rate of approximately 30+ MPH. The most successful jumps were performed with canopies in the 79 to 71 square foot range, with a 3 to 1 wing loading and higher. In some cases it was possible to perform XRW without the trim tabs, however, they have proven to be an effective tool that is transferable to multiple canopies. Given that these trim tabs are still experimental, they are not yet available for purchase from the manufacturer. There are still some issues that need to be worked out before they can are deemed user friendly enough for general use.

The WS should be very experienced and have a high level of respect for attempting to fly next to a canopy. Getting wrapped up in lines or hitting the canopy pilot could easily be fatal. In addition to being a skilled canopy pilot, the participating WS pilot is required to fly a very powerful suit. In our case, we have had lots of success with the Tony Suit X-bird. Pilots should be proficient in efficient flight modes, as well as relative work with other wingsuiters. Having full command of the suit is imperative! This is no time to learn your suit.

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Barry and Will are both accomplished WS pilots and base jumpers. Additionally, they have lots of experience with proximity flying (flying a WS next to mountains). The WS pilot should know the CP procedures by heart in order to better anticipate his movements.

The key element is to become as comfortable with the equipment as possible. Since it is possible to travel vast distances very quickly, the CP should be confident in landing his canopy at high wing loadings in any area. In the event of a malfunction or other unforeseen issue, you will have to be able to act quickly and correct the problem.

An experimenting canopy pilot should perform several practice jumps with trim-tabs at the proper wing loading before attempting to fly with a wingsuit. Drills should include:

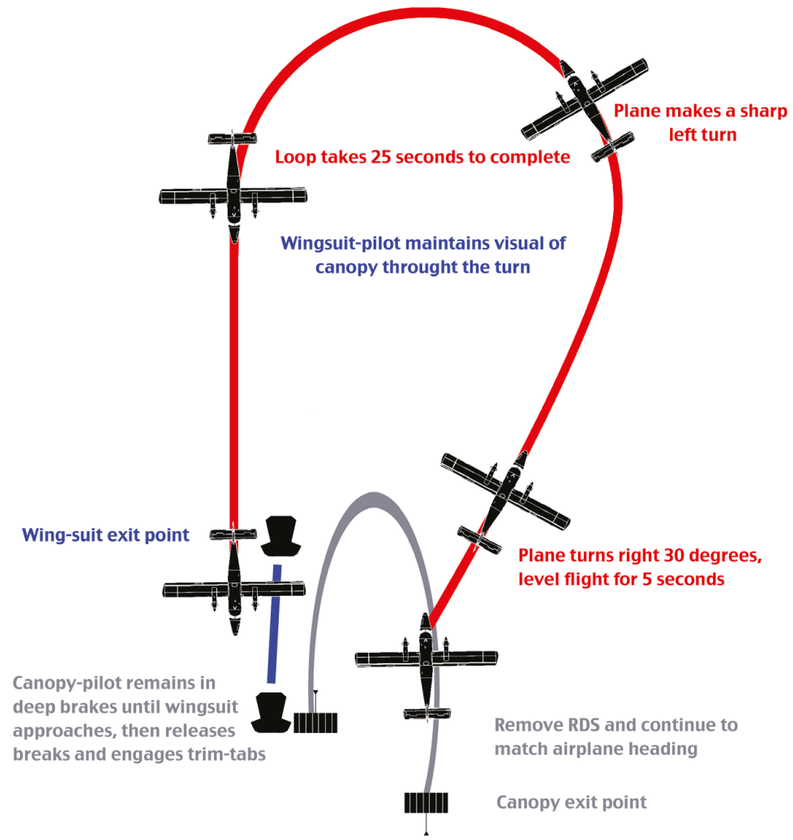
- Stowing the RDS as fast as possible.
- Engaging and disengaging trim-tabs smoothly and on heading.
- Experiment with weight-shift and body positioning with trim tabs engaged.
- Disengaging one trim-tab at a time while maintaining strait and level flight.

Canopy Traps

- Engaging the trim tabs before releasing the brakes – the canopy will fully collapse – may be salvaged by releasing breaks to full flight.
- If you are engaging the trim tabs too far, you may not be able to release them.
- Riser may get twisted through the trim tab mechanism, locking it into place – no release - may be salvaged by re-engaging riser, diving losing lots of altitude very quickly (potential cutaway)
- It is possible for the spring mechanism to break at any time (releasing one riser) – eg: additional weight being suspended during a rodeo dock, or faulty springs – may be salvageable by releasing other riser.
- Under no circumstance should the WS pass in front of the canopy - canopy will fully collapse

Closing Gap

Exit strategy plays a major factor in the success of every flight. In order for the CP and WS to get together and have the most amount of working time, the pilot can assist in this process by flying a teardrop shaped pattern. After the CP has exited, the plane turns 30 degrees to the right and maintaining level flight for five seconds, then sharply turning to the left in order to pass directly over the CP. The entire go around should only take about twenty-five seconds. This gives the CP just enough time to retrieve and stow his RDS, as well as completing a quick canopy check. While the airplane pilot is flying this pattern, the wingsuiter should keep a very close eye on the canopy, while simultaneously communicating with the airplane pilot. In order to conserve altitude and maximise working time, the CP remains in deep brakes while continuously steering towards the airplane throughout the go-around (keeping the airplane at 12 o'clock). Once the plane is positioned above the canopy (within a 45 – 90 degree window), it is the WS turn to exit.



Barry maintains a visual on Nik during the go around.

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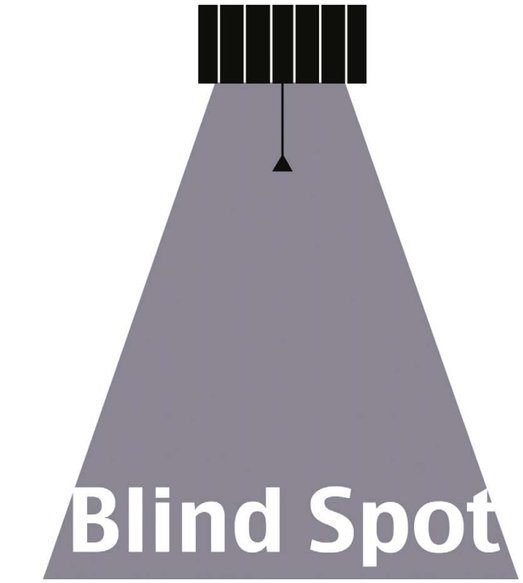
Plan-B

Both canopy pilot and wingsuiter need to have a solo flight plan in case things do not work out as planned. The wingsuit pilot should be prepared to make a solo jump in the events of:

- The canopy experiences a malfunction on deployment.
- Wingsuit looses sight of the canopy during the go around

The CP can see the WS exit the aircraft, however, depending on the approach, there is an obvious blind spot where the CP cannot see (directly behind).



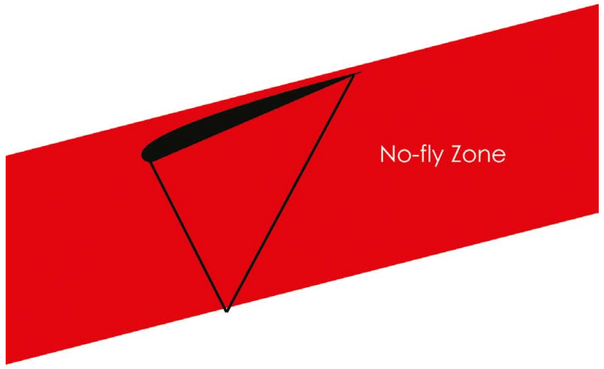
By executing the dive as planned and sticking to a strict angle of approach, the CP will be able to anticipate the approaching WS and enter the full flight mode. Engage the trim tabs early on the first few attempts to give the WS a better look at what glide angel he will have to match. Once you become more proficient with your timing, you will be able to engage the trim tabs at a later time to conserve even more altitude for your combined working time.

By following a stadium style approach, similar to a big way formation jump, it allows the CP to see the inbound WS. Never directly aiming at the canopy, the WS steadily adjusts his glide angle by positioning himself between 45 and 90 degrees above the canopy and aiming to be next to the canopy. If the WS finds himself positioned too steep above the canopy (or perhaps even in front), he can veer off the canopy's heading to increase horizontal separation, then returning to the original heading once the angle is correct; essentially sashaying away from the canopy. The addition of smoke to the canopy pilot's ankle will allow him to be seen a lot easier and gives a great visual glide-slope for the WS.

Relative Work

Staying off the line of flight is imperative. When much of your focus is on flying together, it is easy to neglect this important aspect. In the beginning it is best for the CP to set the base and have the WS take charge of proximity, due to the fact that the closing speeds can be tremendous if both pilots try to close the gap simultaneously.

The wingsuiter's experience will be similar to a regular flocking jump with other wingsuits, however, given that a canopy is involved, we have established some No-fly zones to further the interest of safety.



Before attempting any type of contact, the WS should first focus on matching the canopy's descent rate for several jumps and avoid the no-fly zones. We established these to prevent collisions, wraps and other unforeseen issues. The no-fly zone is located between the top-skin of the canopy and the shoulders of the CP. At no time should the WS fly, or cross, directly in front of the canopy. The WS should be aware of the canopy's burble as well as the burble he creates himself, so as not to fly in a position that could collapse the canopy. The burble produced by the WS is much longer and bigger than you would expect. When flying next to the CP, staying on level or below the shoulder level of the CP will help eliminate the risk of the WS touching the lines of the canopy. Do not attempt to dock on the canopy! The lines will shred through the wingsuit at the slightest touch at these speeds.

The Canopy Pilot's jobs are to monitor heading and altitude. Once the trim tabs are engaged, the canopy's range becomes slightly limited. It is still possible to steer with the harness, rear risers and to move forwards and backwards relative to the WS by changing your body shape. The WS on the other hand has the ability to rise, fall and overtake the canopy at any time. Due to the increased speeds produced by the canopy's new trim, the slightest weight-shift in the CP's harness will result in a heading change. The CP must fly a disciplined and predictable pattern that stays on heading with smooth inputs. This is where turning your head too far in an attempt to look for the WS may be dangerous, as by turning your head you may create an unwanted change in course. Reaching for a grip has the same effect. You may turn into the WS. Once docking becomes a possibility, start with the WS docking on the foot of the canopy pilot. It puts the WS as far away as possible from the canopy.

Break-off

We have been maintaining a "high" break-off altitude of 5,000 feet. Due to the fact that the most common time that the canopy experiences a malfunction has been during the release of the experimental trim tabs. Once the break-off altitude has been reached, the CP should signal by waiving his hands. Even though all jumpers should be altitude aware at all times, the wave-off serves as a reminder to give the CP some extra space before disengaging the trim-tabs. Do not disengage trim tabs with a WS next to the CP! If the release is not smooth and symmetrical it is possible to have a collision.

In the event that a trim-tab should fail, either by releasing, or jamming a front riser, the canopy will abruptly turn and dive. This can cause a serious safety concern, especially if the wingsuiter is close by or even docked. Due to the fact that the canopy looses a lot of altitude, especially when the trim tabs are engaged, you do not have a lot of time to fight a diving malfunction. In order to diminish the risk of malfunctions, we have to visualise every possible outcome and have a backup plan. Make sure to visualise any problems you may encounter with your trim tab system and how you would remedy it.

The WS pilot(s) continue to fly to their designated pull altitude. Depending on the skill level, they can either fly 90degrees away from the canopy (like breaking off from a tracking dive), or fall back and up and shadow the CP's progress.

A New Discipline in the works?

In order to further develop and shape mixed formation flying as a potential discipline we need to collect as much information as possible. Once we find that magic combination of variables to make it all work, the next step is to keep the novelty from fading and take it to the next level. Perhaps one day it will be an international competitive event where a WS and CP turn points with an additional WS team member who provides outside video?

Before you go out and attempt an activity you know nothing or little about, it is wise to seek out information from people who have already gained some experience in the field. There are still a lot of unknowns and safety is of great concern. So please, make sure that you and your partner are qualified and approach this activity with extreme care. Having someone next to you in freefall while being suspended underneath your canopy is a fun experience.

About the Authors

Niklas Daniel, Barry Holubeck, and Will Kitto have been experimenting with mixed formation flights since April 2010. Since then they have tested many different techniques and equipment in an effort to expand this new form of flight.

Niklas Daniel performs a rodeo dock on Will Kitto.