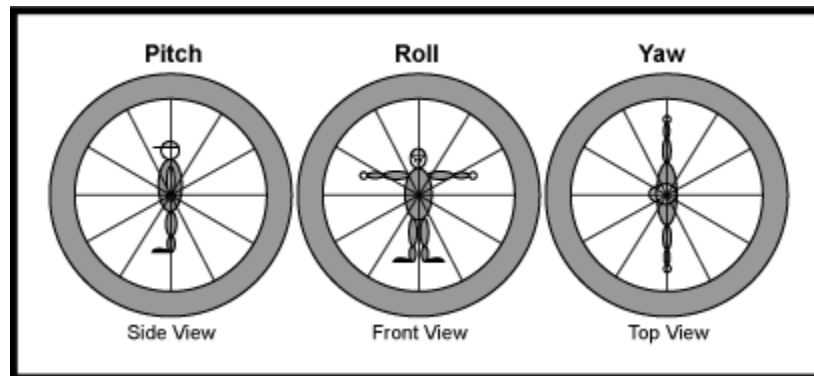


# Clean Up Your Turns

By Brian Germain

“Turn coordination” is a topic that, until recently, has been mostly unapplied to ram-air parachute aerodynamics. In simplest terms, this refers to the degree to which a flight vehicle is aligned to the relative wind during a turn. Another way to look at this is the degree to which a turning aircraft is pointed at the relative wind with regards to the yaw axis.



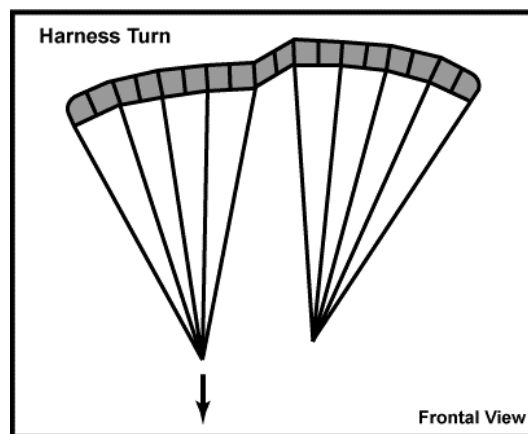
A “clean turn”, from an aerodynamic perspective, is one that keeps the nose of the aircraft pointed at the relative wind throughout the turn. When flying airplanes, this prevents the passengers from spilling their drinks, as well as saving fuel and preserving airspeed. In parachutes however, this aspect of turning has mostly been ignored. As parachutes become faster and faster, the time has come to begin thinking about this aspect of our canopy flight for several very important reasons.

The first has to do with the ability of the pilot to level off at any point during the turn. Lets face it, sometimes the ground creeps up on us. Flying an aerodynamically sound turn increases the likelihood that you will be able to convert your airspeed into lift in a timely manner. If you are sliding sideways through the sky because you are simply jamming a toggle down, you are not prepared to interface with the planet. The relative wind is jumping across the bumps on your parachute, creating turbulent flow, while the suspension line load is getting shifted to one side of your canopy. When you attempt to stab out of an uncoordinated turn, there is a hesitation before the parachute begins to change direction and level off. If the ground gets to you before this happens you may find yourself watching Oprah in your hospital bed for a while (not that I have anything against Oprah).

The second reason for flying a coordinated turn has to do with overall parachute stability. In an uncoordinated turn, the nose of your parachute is not pointed at the oncoming relative wind. It is sliding sideways. This means that the pressure in your wing is being compromised, in addition to the wingtip on the outside of the turn being presented to the relative wind. If you hit turbulence during this kind of “sloppy” turn, you are much more likely to experience a collapse of this side of the parachute. In other words, if you are turning right, your left wing more likely to fold under. Interestingly, when an aggressive, uncoordinated toggle turn is released, the opposite tends to happen. When the right toggle is released, the right wing surges forward as the drag is released and it is presented to the relative wind, opening the door for a collapse on right side of the parachute. Either way, this can result in way too much daytime TV.

There is a fundamental problem with the way in which most of us were taught how to turn our parachutes. They said: “if you want to turn right, pull down the right toggle.” Simply pulling on a toggle increases the drag on the right side of the parachute, retreating that wing tip. At the beginning of the turn, it is purely “yaw” energy. It is like the pilot of an airplane stepping on the rudder pedal. As a discrete action, steering toggles are an incomplete input. We need some “roll” energy.

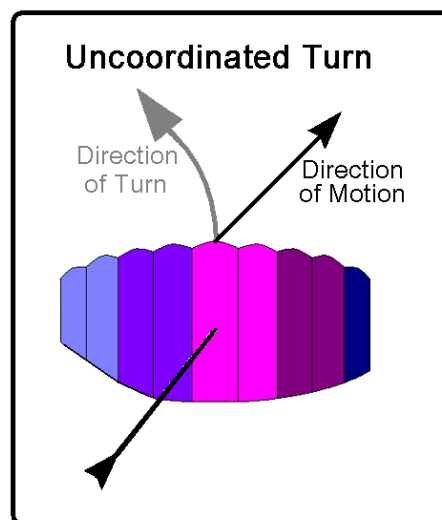
The harness is more than a way to attach the jumper to the parachute. It is also a way to manipulate the canopy itself. If the right leg reaches for the earth as the left hip reaches for the sky, the parachute will turn to the right. It is true that smaller parachutes will respond quicker to such inputs than larger ones, with elliptical canopies responding the quickest, but harness input will have an affect all parachutes. Most importantly, when used at the initiation of a turn, harness steering converts a toggle turn into a coordinated maneuver. This is true if you are under a Lotus 190 or a Samurai 95.



When flying an airplane, all turns begin by initiating roll energy with the ailerons, (rotating the yolk), followed by an application of the rudder to coordinate the turn. The old airplanes had a string on the cowling (hood) to

show the direction of the wind-flow, while newer ones have slip indicators on the instrument panel. If only we had such information while we were flying our canopies. Ah, but we do...

Trailing behind your wing is all the yaw axis coordination data you will ever need. It is called your pilot-chute. If you are flying a coordinated turn, your bridle will remain parallel to the ribs of your canopy throughout the turn. If at any point it goes slack, whips around like a snake or drifts off to one side, you are not flying a clean turn. You are not carving your wing through the sky; you are skidding out of control. The relative wind is not following the valleys of your ribs; it is hopping over the bumps, tumbling into chaos.



Try this on your next jump. Look up at your canopy while you are flying straight and simply yank a steering toggle down to the  $\frac{1}{2}$  brake position. You will immediately see what I am talking about as your pilot-chute swings off to one side. Next, lean in your harness, lifting one leg-strap to yield direct roll axis input. It may turn and it may not, depending on the wing. This is not important. Then, while holding the harness input, pull the steering toggle to turn toward the direction of your harness input. You will notice that the pilot-chute is trailing straight back, even in a sharp turn.

Once you have experienced your first real coordinated parachute turn, it is time to develop new habits. This takes time. I find that when learning a new skill like this, it is best to have a simple way to remember the process. In this case, try using the following sequence for every turn you make: **1) LOOK**, **2) LEAN** and **3) TURN**. This is mnemonic was taught to me by a great paragliding instructor and skydiver, J.C. Brown. Rather than thoughtlessly jamming a toggle down, *look* where you are about to go, *lean* in the harness to establish the roll, and finally, *pull* the toggle down to flow deeper into the maneuver.

When you play with this kind of turn, you will find that the parachute simply feels better; that you feel more in control over the wing. You will also find that you can better bump both brakes down during the turn in order to reduce your decent rate, or even level off completely. While practice is necessary to perfect the technique, all parachute have the ability to transition from a descending turn into a level flight turn, into a soft beautiful landing. If you know how to carve your way out of a low turn, there will never be a reason to hook into the ground, ever.

Although many skydivers still think of their parachute simply as a means to get back down to the ground after a skydive, learning how to use the system the way it was meant to be used will increase the chances that you will get back down to the ground safely. Gravity pulls equally on those who love canopy flight as those who abhor it. From twenty years of teaching parachute flight I have learned this: you can only become great at something that you love. The more you understand, the more you will explore. The more you explore, the more you will feel control. The more in control you feel, the more you will love it. And that, ladies and gentlemen, is what it is all about.

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