FOUNDATIONS OF FLIGHT
LONG SPOTS—RANGE CIRCLE (WITH WIND)

AXIS Flight School®

Brought to you by Niklas Daniel and Brianne Thompson of AXIS Flight School at Skydive Arizona in Eloy. Images by Niklas Daniel. More skydiving educational content and information about professional coaching services are available at axisflightschool.com.

The August installment of Foundations of Flight described a canopy pilot's energy footprint in a no-wind condition. This installment covers what changes occur to that model as wind is introduced.

NO WIND

The previous article showed a canopy pilot in no wind above the center of the circular base and at the apex of a symmetrical cone. The pilot can reach any location on the surface that is inside the cone's base and cannot reach anything outside it. During the flight, the cone, including its circular base, shrink due to altitude loss. This is due to a parachute having a horizontal and vertical component to its flight.

In the example, the parachute has a true glide of 2.5 to 1 at trim speed, so it will travel 2.5 feet forward for every foot it descends. This is because the wing is generating 2.5 times more lift than drag (lift-to-drag ratio). Picture a skydiver flying their parachute with a level wing (zero degrees bank) on an incline plane toward earth. If you equate this to traveling down a staircase, the treads would be 2 ½ feet deep and the risers 1 foot tall. The flight path is a straight line like a banister. In no wind, a canopy's forward velocity and ground speed are identical, providing us a glimpse of our system's true glide.

WITH WIND

Wind plays an important factor in flight because it modifies a canopy pilot's ground speed and track relative to the earth. Canopy pilots perceive the wind's effect as a shallowing or steepening of the staircase. However, the descent rate remains the same in full flight no matter which direction they are facing.

When wind is present, the canopy can still travel its original distance through the air, but because of the wind's influence, the range circle on the ground shifts in the downwind direction. In other worlds, the shape and size of the energy footprint remains the same (if starting from identical altitudes) regardless of whether there is wind or not. However, a pilot's location within the footprint changes based on the direction and strength of the wind. The distance a canopy pilot can cover decreases in the upwind direction and is increases in the downwind direction.

On a windy day, the cone is oblique, meaning the apex shifts location over its base, making the cone asymmetrical. The stronger the wind, the closer the apex creeps to the edge of the circular base. If the wind is equal to the forward speed of the canopy, the pilot's position is at the edge of the circle because no forward progress over the ground is possible.

Tailwind glide ratio—shallow staircase

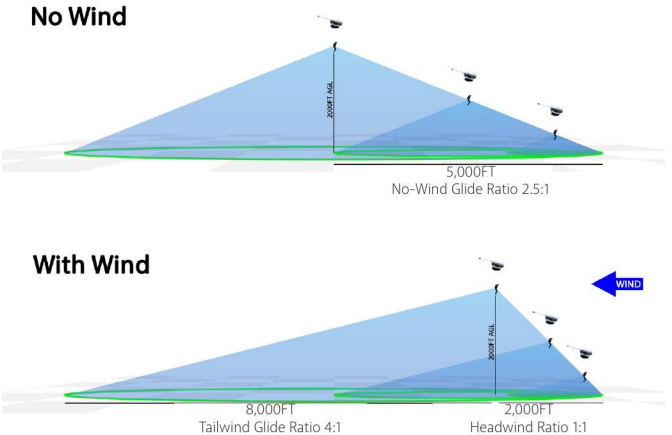
Flying with the wind does not provide the canopy with a boost in lift. At trim speed, a canopy's lift-to-drag ratio remains the same no matter which direction the pilot faces. Rather, the increase in range is a function of increased ground speed which is the result of the pilot flying in a medium that is also moving. While flying with the wind, the canopy pilot covers greater distances over the ground in less time.

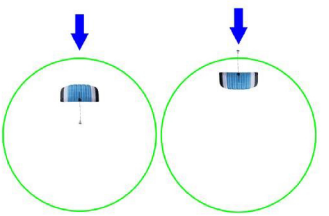
Headwind glide ratio—steep staircase

Flying against the wind does not increase drag. As a pilot flies against a headwind, they experience a slowed ground speed. This is great for soft landings but not for covering distances. The faster a canopy's forward velocity through the air, the greater its chances of combating a headwind.

Canopy pilots must make appropriate adjustments in response to wind. By understanding how wind conditions affect glide ratio, pilots are better prepared to maneuver themselves to land where they desire. However, a canopy's true glide and resulting glide ratio because of wind is only a piece of the puzzle in the bigger picture of making it back to the landing area. Next month's installment will address factors and techniques that can help increase glide potential.

Information about AXIS' coaching and instructional services is available at axisflightschool.com. The authors intend this article to be an educational guideline. It is not a substitute for professional instruction.





When wind is present, a canopy pilot's energy footprint shifts in the downwind direction regardless of heading. The stronger the wind, the greater the shift.

While the ground speed and track varies with heading, the canopy's airspeed and descent rate do not while at trim speed.