

FOUNDATIONS OF FLIGHT

RAM-AIR PARACHUTE ANATOMY—AIRFOIL

Brought to you by Niklas Daniel and Brianne Thompson of AXIS Flight School at Skydive Arizona in Eloy. Images by Bruce Fournier.

The previous article introduced the concept of using a two-dimensional cross-section to view an object's internal structure and looked at a parachute head-on to examine the cells. Here, the vantage point changes to a side view to cover some of the components that make up cells.

Concept:

Airfoil (Lateral Axis View)

Ram-air parachutes have a rounded leading edge, a sharp trailing edge and an asymmetric curvature of upper and lower surfaces (top and bottom skins). In combination, these four sections make up the foil shape of the wing. An airfoil is the cross-sectional shape of a wing as seen from the side. The distance between the top and bottom skins determines how thin or thick a wing's airfoil shape is. Two aerodynamic forces are produced as an airfoil moves through the air: lift and drag. More on that in a future installment.

Equipment:

The area being defined is highlighted in red in each image.

- **Ribs** are the fabric membranes that are oriented vertically and longitudinally, forming the airfoil shape and primary structure of a ram-air parachute. Ribs are strips of fabric that run perpendicularly to and connect the top and bottom skins of the canopy. The ribs that have suspension lines connected to them are called "loaded ribs," while the ones that do not are called "non-loaded ribs." An important aspect of rib construction is the strategic placement of cross-ports. These are small holes or vents in the structural ribs that equalize air pressure between cells.
- **The Leading Edge**, aka the nose, is the foremost surface, the part that first meets the oncoming air (relative wind). The shape of the leading edge is of most importance for developing lift and maintaining stability of the wing. There are no control systems in the front of the wing, and the design does not allow for the manipulation of its shape. The relationship of the A- to B-line lengths are fixed due to the chordwise (front to back) cascaded lines, which help stabilize and control the front of the canopy's aerodynamic shape, even when using front risers.
- **The Trailing Edge**, aka the tail, is located at the rear and is an essential flight control surface. The steering lines are attached here to allow the pilot to change the shape of the trailing edge in order to alter the direction of the departing airflow over the wing. Through active piloting, jumpers can control their wing with precision, deal with turbulence and land softly.
- **The Top and Bottom Skins** are constructed of a flexible material (in modern wings, usually zero-porosity ripstop fabric). Like a windbreaker jacket, air does not flow through the material very easily. This provides the canopy with greater air resistance, which allows for a more efficient way to generate lift.

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.

AXIS

Flight School®



More educational skydiving content, as well as this free article, is available by downloading the AXIS Skydiving app on your smart device.

