Wing loading is basically the relationship between the size of the wing and the rest of the aircraft: the total mass of an airplane divided by the area of the wing. If an airplane has a larger wing area relative to its mass it will have a *low* wing loading. An aircraft with a *high* wing loading has a smaller wing area relative to its mass. The smaller wing bears more of the mass of the plane, so the load the wing must bear is higher.

High wing loading: Faster aircraft typically have higher wing loadings than slower aircraft (think of the wings of a jet, as opposed to the wings on a passenger plane). As the airplane flies faster, it can increase the amount of lift generated by each unit of wing area. Increased wing loading also increases the distance required for takeoff and landing. Higher wing loading will also decrease the maneuverability of the airplane.

DISCUSSION POINT Wing loading is not a concept exclusive to aircraft. The same basic principles apply to winged living organisms. It might be interesting to try calculating and comparing the wing load of an insect or bird.

Low wing loading: Wing loading impacts the stalling speed of an aircraft (when there's an insufficient amount of air traveling under the airplane's wings to keep it up). Larger wings move more air, so an aircraft with a large wing area relative to its mass (*low* wing loading) will have a lower stalling speed. It will also be able to maneuver more easily, and take off and land at a lower speed.

In the activity, students will calculate the wing loading of an AMA ALPHA by estimating the area of the wing and the mass of the whole aircraft.

The weight of each individual ALPHA will vary slightly, as the density and weight of the balsa stick will not be constant (it is a natural material). This means that each student or group will not necessarily have the same answer. Don't forget to remind your students what units you'd like them to use for their measurements!

If you have scales available, then each aircraft can be weighed individually for the most accurate result. If you do not have access to scales, you can have each student or group use a generic **estimated average weight for the AMA ALPHA: about 0.6 oz (or 17 grams)**. This includes the rubber motor, as it is part of the total weight in flight.

Sample results SI: 17 grams (weight)/107.7 cm2 (area) = .158

US: 0.6 oz (weight)/42.39 in2 = .014

For the wing loading activity, each pair or group of students will need:

- an assembled AMA ALPHA
- A ruler or measuring tape
- A pencil or pen
- Student handout
- A sensitive scale (optional)