U2\_L2\_ALL4 Worksheet

Answer keys (partially adapted from sources found in the Nasa website at the link: https://www.grc.nasa.gov/www/k-12/VirtualAero/BottleRocket/airplane/short.html )

1. How is lift defined?

A [fluid](https://en.wikipedia.org/wiki/Fluid) flowing past the surface of a body exerts a [force](https://en.wikipedia.org/wiki/Force) on it. Lift is the [component](https://en.wikipedia.org/wiki/Vector_(geometric)#Vector_components) of this force that is perpendicular to the oncoming flow direction. Lift conventionally acts in an upward direction in order to counter the force of [gravity](https://en.wikipedia.org/wiki/Gravity), but it can act in any direction at right angles to the flow.

1. How is lift generate over an airfoil?

Lift is due to imbalance of pressure distribution over top and bottom surfaces of airfoil. If pressure on top is lower than pressure on bottom surface, lift is generated.

1. Can there be lift without a fluid?

Lift is a mechanical force. It is generated by the interaction and contact of a solid body with a fluid (liquid or gas). It is not generated by a force field, in the sense of a [gravitational field](https://www.grc.nasa.gov/www/k-12/airplane/wteq.html), or an electromagnetic field, where one object can affect another object without being in physical contact. For lift to be generated, the solid body must be in contact with the fluid: no fluid, no lift.

1. Which factors affect lift?

The size and shape of the wing, the angle at which it meets the oncoming air, the speed at which it moves through the air, the density of the air, all affect the amount of lift a wing creates.

1. Which are the forces transmitted by air to an airfoil?

Lift and drag, caused by air resistance to the airplane. The other two forces acting on an airfoil are thrust, created by a propeller, and gravity force.

\* Why is pressure lower on top surface? There are many explanations for the generation of lift found in physics textbooks and on Web sites. Unfortunately, many of the explanations are incorrect. We will discuss it soon.