

# Bernoullis principle essay sample



**ASSIGN  
BUSTER**

\* Vacuum- A space entirely devoid of matter.

\* Vacuums don't exist in the Earth's atmosphere as air molecules are constantly bouncing off each-other. If a vacuum ever existed in the atmosphere it would be filled very quickly because there would be no resistance against the excited air molecules. \* This phenomenon is the driving principle behind airplane wings. As wind blows over the wing (see picture below) there is a pressure differential between the top and the bottom of the wing. This is because the top of a wing is curved and the bottom is flat. \* The air molecules traveling over the top, or the curved surface of the wing, have to move faster to reach the end of the airplane wing as they are traveling a longer distance and must reach the end of the wing at the same time as the molecules going under the wing to avoid a vacuum. \* Since the molecules on the top of the wing are moving faster than those on the bottom, there is less pressure on the top of the wing than on the bottom, allowing the airplane to rise up.

\* Bernoulli's principle in Sailing

\* Sailboats rely on the same principles as airplanes to move forward. \* As wind travels over the sail the air molecules on the outside of the sail must move faster just like in an airplane wing. This is why the sail "fills" and bulges outward. \* There is less pressure and resistance on the back side of the sail creating lift. \* With Bernoulli's principle sails were able to create lift and sail not just downwind, but in every direction in relation to the wind's direction except directly into the wind.

\* The keel

\* The sail alone cannot pull a boat upwind. A keel, or centerboard (see

picture 2) is necessary. Keels were originally thought to prevent sailboats from slipping sideways and to keep them pointed in the right direction.

However it is now known that keels create lift just as sails do through the same principles except in the water.

\* The draft

\* One of the most important variables in sail design is the draft, or how “deep” the sail is. Some sails are made with a deeper draft and some are made with a shallower one. \* Changing the draft of a sail changes the apparent wind angle at which the wind enters the sail. The flatter the sail is (see the red sail below) the smaller the entry angel of the wind and therefore the closer the boat can go to the wind. The deeper the sail is, the greater the entry angel (see the blue sail) and the greater the angle the boat must sail at to the wind in order to maintain lift.

\* Deep Draft vs. Shallow Draft

\* While a deeper sail must sail at a poorer angle, it allows the boat to move faster as air molecules have more distance to travel, so they build more momentum, therefore creating more lift. \* The purpose of my experiment was to test whether a deep draft, or a shallow draft would be more efficient.