



*“On earth there is nothing great but man;
In man there is nothing great but mind”*

- Hamilton

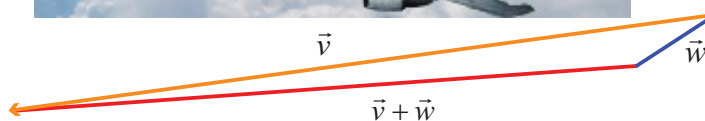
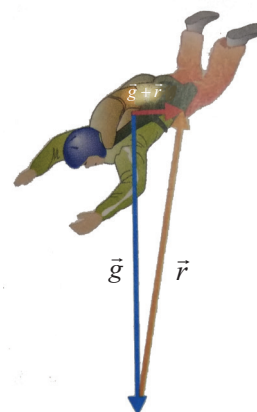
8.1 Introduction



A **pilot constructing a flight plan** has to be concerned about the plane's course, heading, air speed, and ground speed. In order for the plane to proceed directly toward its destination, it must head into the wind at an angle such that the wind is exactly counteracted. If available, a navigation computer will do the calculation quickly and accurately. If, however, a navigation computer is not accessible, the pilot may have to depend on pencil-and-paper work supplemented by a calculator with a knowledge of vectors. An understanding of vectors and their operations is therefore vitally important.

At a certain point during a jump, there are two principal forces acting on a **skydiver**. One force ($\vec{g}$) gravity exerting straight down and another air resistance ($\vec{r}$) exerting up as well as to some direction. What is the net force acting on the skydiver? The answer is $\vec{g} + \vec{r}$. (how?)

Let $\vec{v}$ be the velocity vector of an aircraft. Suppose that the wind velocity is given by the vector $\vec{w}$, what is the effective velocity of aircraft? The answer is $\vec{v} + \vec{w}$. In what direction should the aircraft head in order to fly due west?



A **global positioning system** (GPS) is a system designed to help to navigate on the earth, in the air and on water. Vectors are also used in GPS.