If the potential energy is represented by the static pressure, p, the sum of the potential and kinetic energy is the total pressure of the airstream.

$$H=p+\frac{1}{2}\rho V^2$$

where H= total pressure, psf (sometimes referred to as "head" pressure)
p= static pressure, psf.
ρ= density, slugs per cu. ft.
V= velocity, ft./sec.

This equation is the Bernoulli equation for incompressible flow. It is important to appreciate that the term $\frac{1}{2}\rho V^2$ has the units of pressure, psf. This term is one of the most important in all aerodynamics and appears so frequently that it is given the name "dynamic pressure" and the shorthand notation "q".

q= dynamic pressure, psf
$=\frac{1}{2}\rho V^2$

With this definition it could be said that the sum of static and dynamic pressure in the flow tube remains constant.

Figure 1.3 illustrates the variation of static, dynamic, and total pressure of air flowing through a closed tube. Note that the total pressure is constant throughout the length and any change in dynamic pressure produces the same magnitude change in static pressure.

The dynamic pressure of a free airstream is the one common denominator of all aerodynamic forces and moments. Dynamic pressure represents the kinetic energy of the free airstream and is a factor relating the capability for producing changes in static pressure on a surface. As defined, the dynamic pressure varies directly as the density and the square of the velocity. Typical values of dynamic pressure, q, are shown in table 1-1 for various true airspeeds in the standard atmosphere. Notice that the dynamic pressure at some fixed velocity varies directly with the density ratio at any altitude. Also, appreciate the fact that at an altitude of 40,000 feet (where the density ratio, σ, is 0.2462) it is necessary to have a true air velocity twice that at sea level in order to product the same dynamic pressure.

TABLE 1-1. Effect of Speed and Altitude on Dynamic Pressure

Velocity (knots)	True air speed (ft./sec.)	Dynamic pressure, q, psf				
		Sea level	10,000 ft.	20,000 ft.	30,000 ft.	40,000 ft.
	$\sigma=$	1.000	0.7385	0.5328	0.3741	0.2462)
100	169	33.9	25.0	18.1	12.7	8.4
200	338	135.6	100.2	72.3	50.7	33.4
300	507	305	225	163	114	75.0
400	676	542	400	289	203	133
500	845	847	625	451	317	208
600	1,013	1,221	902	651	457	300

$q=\frac{1}{2}\rho V^2$
where q= dynamic pressure, psf
ρ= air density, slugs per cu. ft.
V= air velocity, ft. per sec.
or $q=.00339\sigma V^2$
where σ= density ratio
V= true velocity, *knots*
0.00339= constant which allows use of knots as velocity units and the altitude density ratio
an alternate form is

$$q=\frac{\sigma V^2}{295}\quad\left(0.00339=\frac{1}{295}\right)$$

AIRSPEED MEASUREMENT. If a symmetrically shaped object were placed in a moving airstream, the flow pattern typical of figure 1.4 would result. The airstream at the very nose of the object would stagnate and the relative flow velocity at this point would be zero. The airflow ahead of the object possesses some certain dynamic pressure and ambient static pressure. At the very nose of the object the local velocity will drop to zero and the airstream dynamic pressure will be converted into an increase in static pressure at the stagnation point. In other words, there will exist a static pressure at the stagnation point which is equal to the airstream total pressure—ambient static pressure plus dynamic pressure.

Around the surface of the object the airflow will divide and the local velocity will increase from zero at the stagnation point to some maximum on the sides of the object. If friction and viscosity effects are neglected, the