propellers is obtained by rotating the blade angle well below the low pitch stop and applying engine power. The action is to extract a large amount of momentum from the airstream and thereby create negative thrust. The magnitude of the reverse thrust from propellers is very large, especially in the case of the turboprop where a very large shaft power can be fed into the propeller. In the case of *reverse propeller thrust, maximum effectiveness is achieved by use immediately after the airplane is in contact with the runway.* The reverse thrust capability is greatest at the high speed and, obviously, any delay in producing deceleration allows runway to pass by at a rapid rate. Reverse thrust of turbojet engines will usually employ some form of vanes, buckets, or clamshells in the exhaust to turn or direct the exhaust gases forward. Whenever the exit velocity is less than the inlet velocity (or negative), a negative momentum change occurs and negative thrust is produced. *The reverse jet thrust is valuable* and effective but it should not be compared with the reverse thrust capability of a comparable propeller powerplant which has the high intrinsic thrust at low velocities. As with the propeller reverse thrust, jet reverse thrust must be applied immediately after ground contact for maximum effectiveness in reducing landing distance.

FACTORS AFFECTING LANDING PERFORMANCE. In addition to the important factors of proper technique, many other variables affect the landing performance of an airplane. *Any item which alters the landing velocity or deceleration during landing roll will affect the landing distance.* As with takeoff performance, the relationships of uniformly accelerated motion will be assumed applicable for studying the principal effects on landing distance. The case of uniformly accelerated motion defines landing distance as varying directly as the square of the landing velocity and inversely as the acceleration during landing roll.

$$\frac{S_2}{S_1}=\left(\frac{V_2}{V_1}\right)^2 \times \left(\frac{a_1}{a_2}\right)$$

where

S_1 = landing distance resulting from certain values of landing velocity, V_1, and acceleration, a_1

S_2 = landing distance resulting from some different values of landing velocity, V_2, or acceleration, a_2

With this relationship, the effect of the many variables on landing distance can be approximated.

The *effect of gross weight* on landing distance is one of the principal items determining the landing distance of an airplane One effect of an increased gross weight is that the airplane will require a greater speed to support the airplane at the landing angle of attack and lift coefficient. The relationship of landing speed and gross weight would be as follows:

$$\frac{V_2}{V_1}=\sqrt{\frac{W_2}{W_1}} \quad (EAS \text{ or } CAS)$$

where

V_1 = landing velocity corresponding to some original weight, W_1

V_2 = landing velocity corresponding to some different weight, W_2

Thus, a given airplane in the landing configuration at a given gross weight will have a specific landing speed (*EAS* or *CAS*) which is invariant with altitude, temperature, wind, etc., because a certain value of q is necessary *to provide lift equal to weight at the landing* C_L. As an example of the effect of a change in gross weight, a 21 percent increase in landing weight will require a 10 percent increase in landing speed to support the greater weight.

When minimum landing distances are considered, braking friction forces predominate during the landing roll and, for the majority of airplane configurations, braking friction is the main source of deceleration. In this case, an increase in gross weight provides a greater