$$RC_{fpm}=33{,}000\left(\frac{Pa-Pr}{W}\right)$$

where

RC = rate of climb, ft. per min.
Pa = propulsive power available, h.p.
Pr = power required for level flight, h.p.
W = gross weight, lbs.

From this relationship it is appreciated that the rate of climb in steady flight is a direct function of the difference between power available and power required. If a given airplane configuration is in lift-equal-to-weight flight at some specific airspeed and altitude, there is a specific power required to maintain these conditions. If the power available from the powerplant is adjusted to equal the power required, the rate of climb is zero ($Pa-Pr=0$). This is illustrated in figure 6.1 where the power available is set equal to the power required at velocity (A). If the airplane were in steady level flight at velocity (A), an increase in power available would create an excess of power which will cause a rate of climb. Of course, if the speed were allowed to increase by a decreased angle of attack, the increased power setting could simply maintain altitude at some higher airspeed. However, if the original aerodynamic conditions are maintained, speed is maintained at (A) and an increased power available results in a rate of climb. Also, a decrease in power available at point (A) will produce a deficiency in power and result in a negative rate of climb (or a rate of descent). For this reason, it is apparent that *power setting is the primary control of altitude in steady flight*. There is the direct correlation between the excess power ($Pa-Pr$), and the airplane rate of climb, RC.

FLYING TECHNIQUE. Since the conditions of steady flight predominate during a majority of all flying, the fundamentals of flying technique are the principles of steady flight:

(1) Angle of attack is the primary control of airspeed.

(2) Power setting is the primary control of altitude, i.e., rate of climb/descent.

With the exception of the transient conditions of flight which occur during maneuvers and acrobatics, the conditions of steady flight will be applicable during such steady flight conditions as cruise, climb, descent, takeoff, approach, landing, etc. A clear understanding of these two principles will develop good, safe flying techniques applicable to any sort of airplane.

The primary control of airspeed during steady flight conditions is the angle of attack. However, changes in airspeed will necessitate changes in power setting to maintain altitude because of the variation of power required with velocity. The primary control of altitude (rate of climb/descent) is the power setting. If an airplane is being flown at a particular airspeed in level flight, an increase or decrease in power setting will result in a rate of climb or descent at this airspeed. While the angle of attack must be maintained to hold airspeed in steady flight, a change in power setting will necessitate a change in *attitude* to accommodate the new flight path direction. These principles form the basis for "attitude" flying technique, i.e., "attitude plus power equals performance," and provide a background for good instrument flying technique as well as good flying technique for all ordinary flying conditions.

One of the most important phases of flight is the landing approach and it is during this phase of flight that the principles of steady flight are so applicable. If, during the landing approach, it is realized that the airplane is below the desired glide path, an increase in nose up attitude will not insure that the airplane will climb to the desired glide path. In fact, an increase in nose-up attitude may produce a greater rate of descent and cause the airplane to sink more below the desired glide path. At a given airspeed, only an increase in power setting can cause a rate of climb (or lower rate of descent) and an in-