

flap setting, and one wind condition. A change in any one of these variables requires an appropriate coordinated change in the other controllable variables. For example, if the pitch attitude is raised too high without an increase of power, the airplane settles very rapidly and touches down short of the desired spot. For this reason, never try to stretch a glide by applying back-elevator pressure alone to reach the desired landing spot. This shortens the gliding distance if power is not added simultaneously. The proper angle of descent and airspeed is maintained by coordinating pitch attitude changes and power changes.

The objective of a good, stabilized final approach is to descend at an angle and airspeed that permits the airplane to reach the desired touchdown point at an airspeed that results in minimum floating just before touchdown; in essence, a semi-stalled condition. To accomplish this, it is essential that both the descent angle and the airspeed be accurately controlled. Since on a normal approach the power setting is not fixed as in a power-off approach, the power and pitch attitude are adjusted simultaneously as necessary to control the airspeed and the descent angle, or to attain the desired altitudes along the approach path. By lowering the nose and reducing power to keep approach airspeed constant, a descent at a higher rate can be made to correct for being too high in the approach. This is one reason for performing approaches with partial power; if the approach is too high, merely lower the nose and reduce the power. When the approach is too low, add power and raise the nose.

Use of Flaps

The lift/drag factors are varied by the pilot to adjust the descent through the use of landing flaps. [Figures 8-3 and 8-4] Flap extension during landings provides several advantages by:

- Producing greater lift and permitting lower landing speed,

- Producing greater drag, permitting a steeper descent angle without airspeed increase, and
- Reducing the length of the landing roll.

Flap extension has a definite effect on the airplane's pitch behavior. The increased camber from flap deflection produces lift primarily on the rear portion of the wing. This produces a nose-down pitching moment; however, the change in tail loads from the downwash deflected by the flaps over the horizontal tail has a significant influence on the pitching moment. Consequently, pitch behavior depends on the design features of the particular airplane.

Flap deflection of up to 15° primarily produces lift with minimal drag. The airplane has a tendency to balloon up with initial flap deflection because of the lift increase. The nose-down pitching moment, however, tends to offset the balloon. Flap deflection beyond 15° produces a large increase in drag. Also, deflection beyond 15° produces a significant nose-up pitching moment in high-wing airplanes because the resulting downwash increases the airflow over the horizontal tail.

The time of flap extension and the degree of deflection are related. Large flap deflections at one single point in the landing pattern produce large lift changes that require significant pitch and power changes in order to maintain airspeed and descent angle. Consequently, there is an advantage to extending flaps in increments while in the landing pattern. Incremental deflection of flaps on downwind, base leg, and final approach allow smaller adjustments of pitch and power compared to extension of full flaps all at one time.

When the flaps are lowered, the airspeed decreases unless the power is increased or the pitch attitude lowered. On final approach, the pilot must estimate where the airplane lands

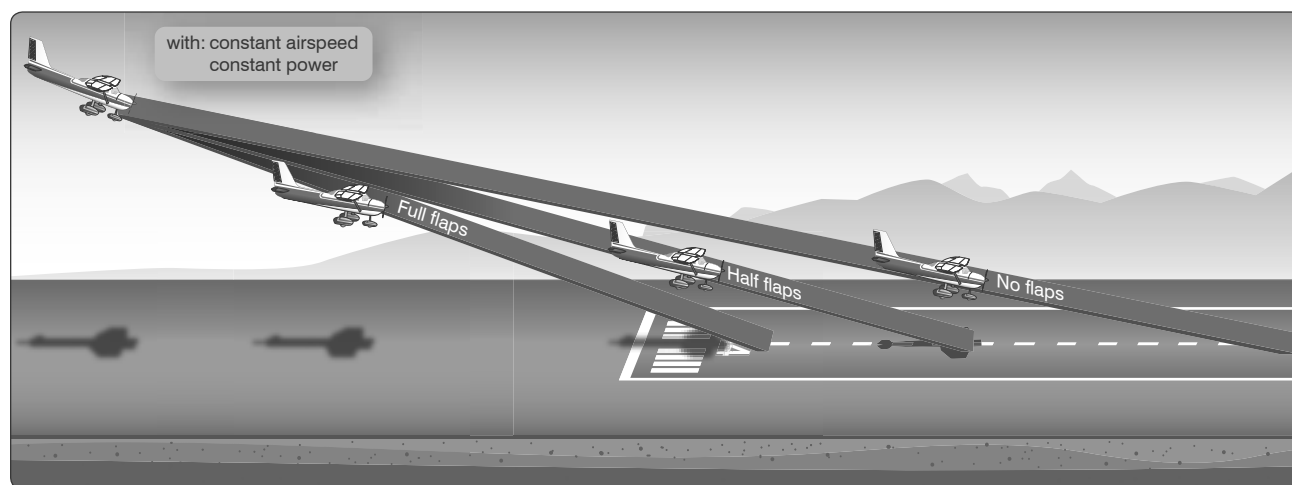


Figure 8-3. *Effect of flaps on the landing point.*