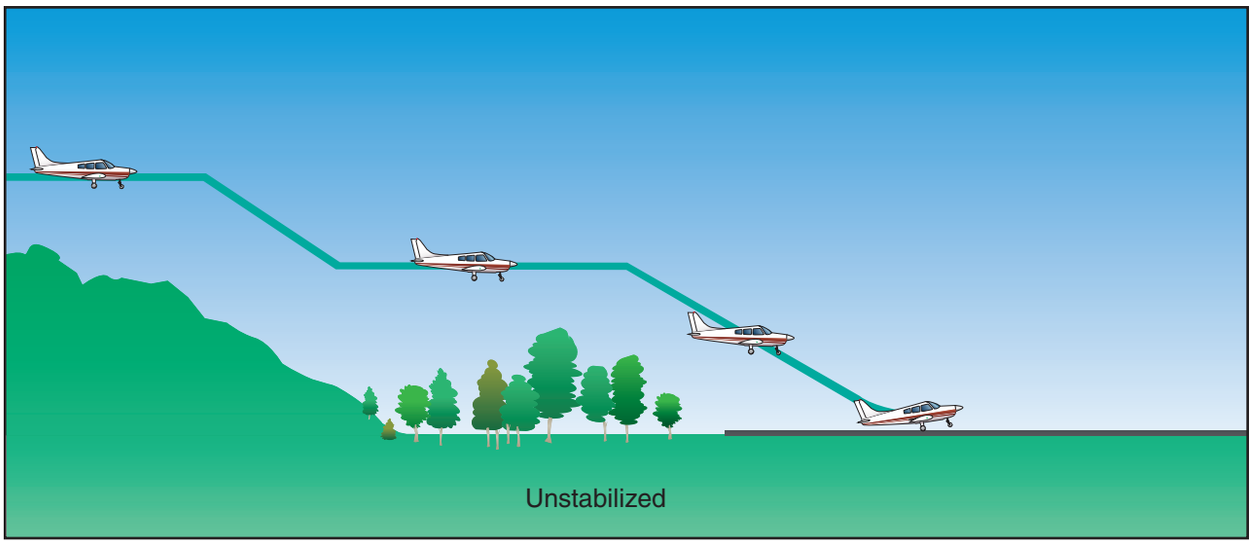

Figure 8-23. Unstabilized approach.

may only result in a further rate of descent. This occurs when the angle of attack is so great and creating so much drag that the maximum available power is insufficient to overcome it. This is generally referred to as operating in the **region of reversed command** or operating on the **back side of the power curve**.

Because the final approach over obstacles is made at a relatively steep approach angle and close to the airplane's stalling speed, the initiation of the roundout or flare must be judged accurately to avoid flying into the ground, or stalling prematurely and sinking rapidly. A lack of floating during the flare, with sufficient control to touch down properly, is one verification that the approach speed was correct.

Touchdown should occur at the minimum controllable airspeed with the airplane in approximately the pitch attitude that will result in a power-off stall when the throttle is closed. Care must be exercised to avoid closing the throttle too rapidly before the pilot is ready for touchdown, as closing the throttle may result in an immediate increase in the rate of descent and a hard landing.

Upon touchdown, the airplane should be held in this positive pitch attitude as long as the elevators remain effective. This will provide aerodynamic braking to assist in deceleration.

Immediately upon touchdown, and closing the throttle, appropriate braking should be applied to minimize the after-landing roll. The airplane should be stopped within the shortest possible distance consistent with safety and controllability. If the proper approach speed has been maintained, resulting in minimum float during the roundout, and the touchdown made at minimum control speed, minimum braking will be required.

Common errors in the performance of short-field approaches and landings are:

- Failure to allow enough room on final to set up the approach, necessitating an overly steep approach and high sink rate.
- Unstabilized approach.
- Undue delay in initiating glidepath corrections.
- Too low an airspeed on final resulting in inability to flare properly and landing hard.
- Too high an airspeed resulting in floating on roundout.
- Prematurely reducing power to idle on roundout resulting in hard landing.
- Touchdown with excessive airspeed.
- Excessive and/or unnecessary braking after touchdown.
- Failure to maintain directional control.

SOFT-FIELD APPROACH AND LANDING

Landing on fields that are rough or have soft surfaces, such as snow, sand, mud, or tall grass requires unique procedures. When landing on such surfaces, the objective is to touch down as smoothly as possible, and at the slowest possible landing speed. The pilot must control the airplane in a manner that the wings support the weight of the airplane as long as practical, to minimize drag and stresses imposed on the landing gear by the rough or soft surface.

The approach for the soft-field landing is similar to the normal approach used for operating into long, firm landing areas. The major difference between the two is

that, during the soft-field landing, the airplane is held 1 to 2 feet off the surface in ground effect as long as possible. This permits a more gradual dissipation of forward speed to allow the wheels to touch down gently at minimum speed. This technique minimizes the nose-over forces that suddenly affect the airplane at the moment of touchdown. Power can be used throughout the level-off and touchdown to ensure touchdown at the slowest possible airspeed, and the airplane should be *flown* onto the ground with the weight fully supported by the wings. [Figure 8-24]

The use of flaps during soft-field landings will aid in touching down at minimum speed and is recommended whenever practical. In low-wing airplanes, the flaps may suffer damage from mud, stones, or slush thrown up by the wheels. If flaps are used, it is generally inadvisable to retract them during the after-landing roll because the need for flap retraction is usually less important than the need for total concentration on maintaining full control of the airplane.

The final approach airspeed used for short-field landings is equally appropriate to soft-field landings. The use of higher approach speeds may result in excessive float in ground effect, and floating makes a smooth, controlled touchdown even more difficult. There is, however, no reason for a steep angle of descent unless obstacles are present in the approach path.

Touchdown on a soft or rough field should be made at the lowest possible airspeed with the airplane in a nose-high pitch attitude. In nosewheel-type airplanes, after the main wheels touch the surface, the pilot should hold sufficient back-elevator pressure to keep the nosewheel off the surface. Using back-elevator pressure and engine power, the pilot can control the rate at which the weight of the airplane is transferred from the wings to the wheels.

Field conditions may warrant that the pilot maintain a flight condition in which the main wheels are just touching the surface but the weight of the airplane is still being supported by the wings, until a suitable taxi surface is reached. At any time during this transition phase, before the weight of the airplane is being supported by the wheels, and before the nosewheel is on the surface, the pilot should be able to apply full power and perform a safe takeoff (obstacle clearance and field length permitting) should the pilot elect to abandon the landing. Once committed to a landing, the pilot should gently lower the nosewheel to the surface. A slight addition of power usually will aid in easing the nosewheel down.

The use of brakes on a soft field is not needed and should be avoided as this may tend to impose a heavy load on the nose gear due to premature or hard contact with the landing surface, causing the nosewheel to dig in. The soft or rough surface itself will provide sufficient reduction in the airplane's forward speed. Often it will be found that upon landing on a very soft field, the pilot will need to increase power to keep the airplane moving and from becoming stuck in the soft surface.

Common errors in the performance of soft-field approaches and landings are:

- Excessive descent rate on final approach.
- Excessive airspeed on final approach.
- Unstabilized approach.
- Roundout too high above the runway surface.
- Poor power management during roundout and touchdown.
- Hard touchdown.
- Inadequate control of the airplane weight transfer from wings to wheels after touchdown.
- Allowing the nosewheel to "fall" to the runway after touchdown rather than controlling its descent.

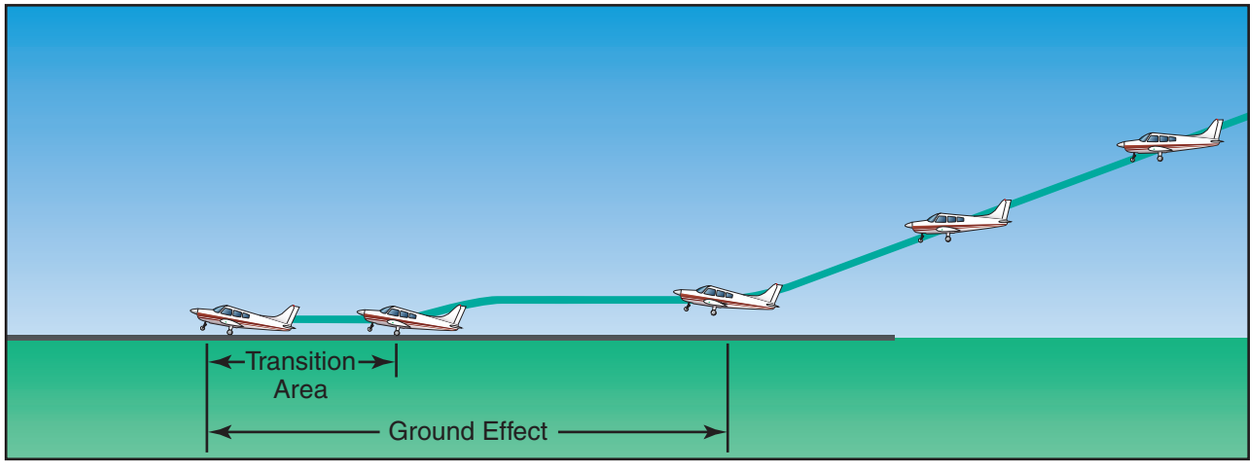

Figure 8-24. Soft/rough field approach and landing.