Once forward speed is established in the autorotative descent, the rotor disc may be inclined rearward. This will cause a flare. When this occurs, the greater lift will cause the forward speed to decrease and will cause the descent rate to zero. When this occurs on landing, the helicopter may be landed with no roll or skid.

Autorotation is most critical to forward speed, as well as descent. The actual height in which successful autorotation may occur is directly dependent on the forward speed. Although an autorotation may be sucessfully completed at a 300-foot hover, it would not be possible at a 100-foot hover due to the inertia of the blade. At the 300-foot hover the blade will carry enough inertia to allow autorotation.

On most helicopters, an area from approximately 12 feet to 300 feet would not be a safe area for autorotation without forward speed (Fig. 2-37). It should be noted that autorotation characteristics are affected by the same elements that alter flight performance, such as density, altitude, and maximum weight.

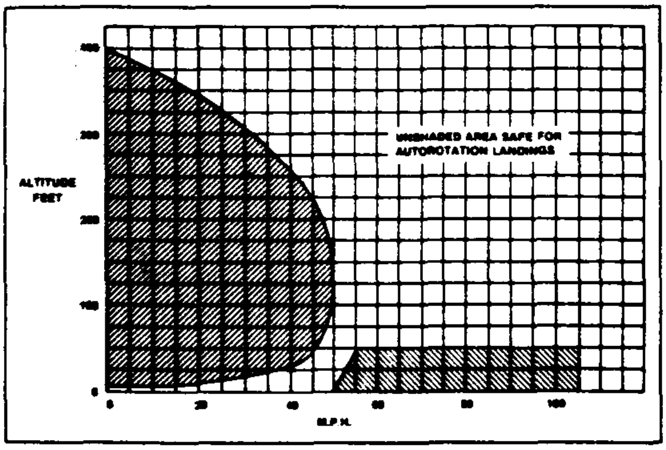

Fig. 2-37 Autorotation is not safe at low altitude and low airspeed.

During autorotation, the tail rotor will be at a negative pitch rather than a positive pitch as in normal flight. This is caused by the change in torque effect of the main rotor.

K. Ground Resonance

Ground resonance is a self-excited vibration which, as the name implies, occurs on the gound. It may manifest slowly with a gradual buildup or it may appear very rapidly. If ground resonance is not corrected immediately, it will often destroy the helicopter. This problem is associated with fully articulated rotor systems and is the result of geometric imbalance of the main rotor system. The fully articulated head is hinged about the lead-lag axis in order to provide corrections for the coriolis effect. It is this correction factor which allows the rotor blades to become out-of-phase and result in ground resonance.

What actually occurs is that the blades take abnormal positions, one blade leads while the adjacent blade lags. This imbalances the rotor and moves the center of gravity of the rotor off center. This imbalance of the rotor causes an oscillation which is transmitted throughout the entire helicopter, giving movement from side to side as well as fore and aft. If this action becomes violent enough, it may roll the helicopter over or cause structural damage.

This situation may be further aggravated by the reaction of the helicopter and the ground through the gear struts and wheels. During landing, a set of blades that are already out-of-phase may be further aggravated by the touchdown, especially on a one-wheel landing such as occurs on a slope landing or with a flat tire or strut.

When this occurs, the forces of the vibration cannot be absorbed by the strut or tire and a counterwave is sent back through the helicopter, usually resulting in further imbalance of the rotor.

Although ground resonance is associated with landing, it may also occur during ground run-up or take off, when the helicopter is partially airborne. It will be further aggravated by incorrect strut pressure and tire inflation.

When this situation occurs, immediate power application and takeoff will stop this condition by changing the natural frequencies of the helicopter. In recent years, manufacturers have reduced these occurences considerably by redesigning the dampeners, oleo struts, tires, and the gears.

L. Stability

Stability is a term used to describe the behavior of an aircraft after it has been disturbed from its trimmed position.

1. Static stability

Statically stable means that after a disturbance, the tendency is to return to its original position, as shown in Fig. 2-38. If an object is statically

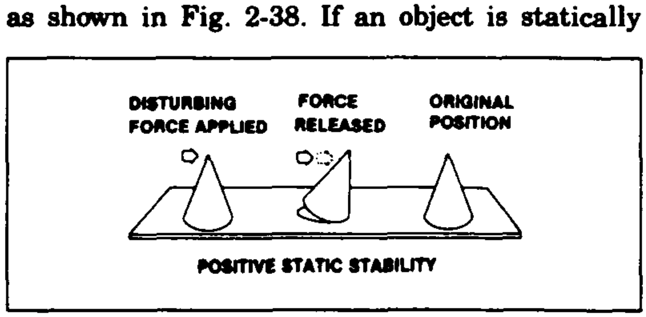

Fig. 2-38 All aircraft must be able to demonstrate stability.