

rotation and blade deceleration takes place. [Figure 3-5] Keep in mind that due to coning, a rotor blade will not flap below a plane passing through the rotor hub and perpendicular to the axis of rotation. The acceleration and deceleration actions of the rotor blades are absorbed by either dampers or the blade structure itself, depending upon the design of the rotor system.

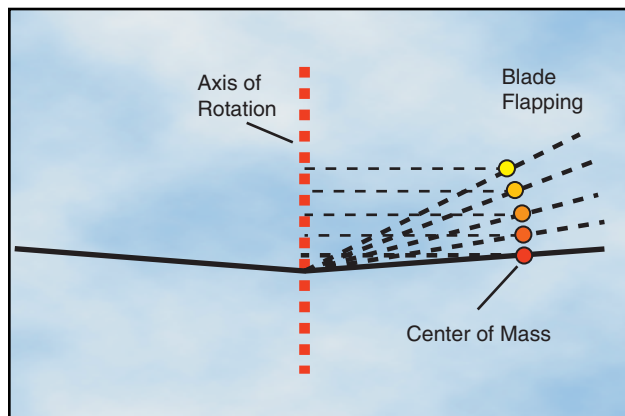


Figure 3-5. The tendency of a rotor blade to increase or decrease its velocity in its plane of rotation due to mass movement is known as Coriolis Effect, named for the mathematician who made studies of forces generated by radial movements of mass on a rotating disc.

Two-bladed rotor systems are normally subject to Coriolis Effect to a much lesser degree than are articulated rotor systems since the blades are generally “underslung” with respect to the rotor hub, and the change in the distance of the center of mass from the axis of rotation is small. [Figure 3-6] The hunting action is absorbed by the blades through bending. If a two-bladed rotor system is not “underslung,” it will be

subject to Coriolis Effect comparable to that of a fully articulated system.

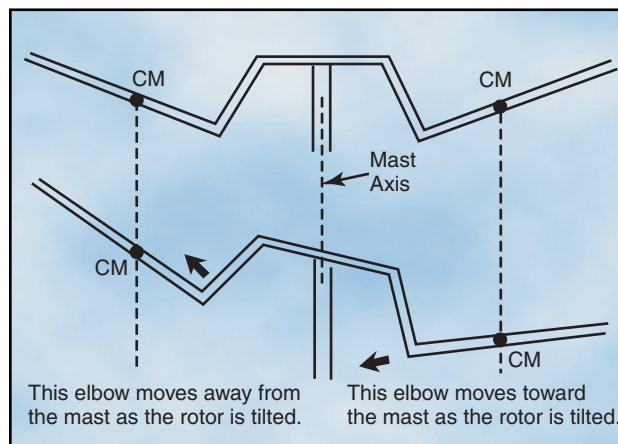


Figure 3-6. Because of the underslung rotor, the center of mass remains approximately the same distance from the mast after the rotor is tilted.

GROUND EFFECT

When hovering near the ground, a phenomenon known as ground effect takes place. [Figure 3-7] This effect usually occurs less than one rotor diameter above the surface. As the induced airflow through the rotor disc is reduced by the surface friction, the lift vector increases. This allows a lower rotor blade angle for the same amount of lift, which reduces induced drag. Ground effect also restricts the generation of blade tip vortices due to the downward and outward airflow making a larger portion of the blade produce lift. When the helicopter gains altitude vertically, with no forward airspeed, induced airflow is no longer restricted, and the blade tip vortices increase with the decrease in outward airflow. As a result, drag increases which means a

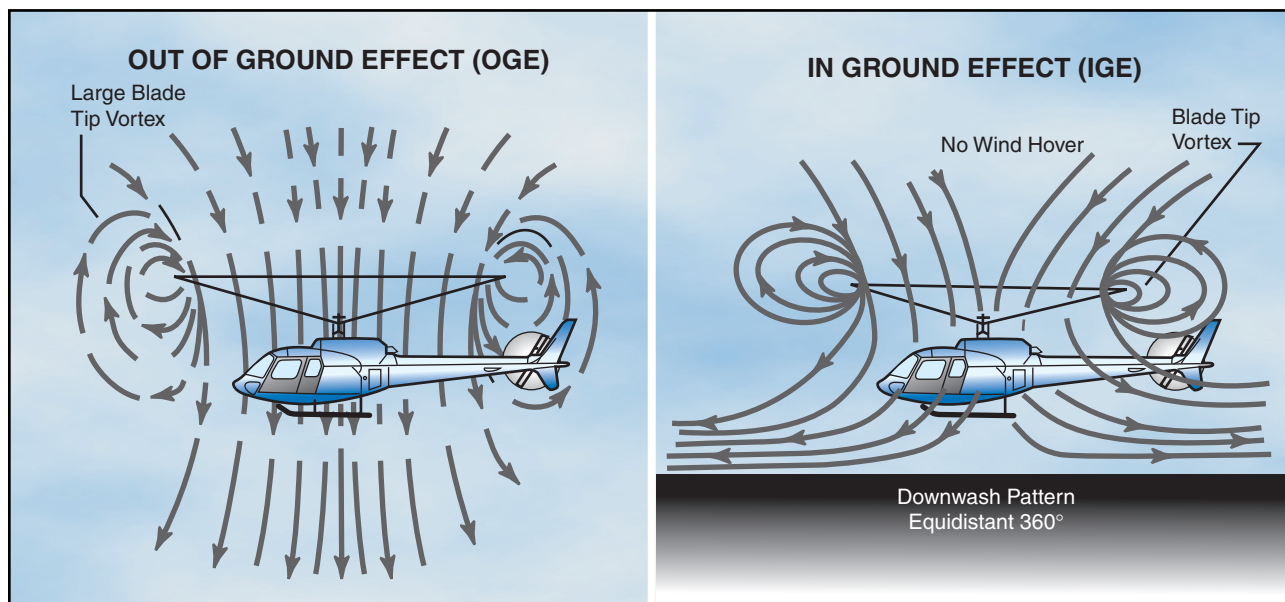


Figure 3-7. Air circulation patterns change when hovering out of ground effect (OGE) and when hovering in ground effect (IGE).