In straight-and-level (constant heading and at a constant altitude), unaccelerated forward flight, lift equals weight and thrust equals drag. If lift exceeds weight, the helicopter accelerates vertically until the forces are in balance; if thrust is less than drag, the helicopter slows until the forces are in balance. As the helicopter moves forward, it begins to lose altitude because lift is lost as thrust is diverted forward. However, as the helicopter begins to accelerate, the rotor system becomes more efficient due to the increased airflow. The result is excess power over that which is required to hover. Continued acceleration causes an even larger increase in airflow through the rotor disk and more excess power. In order to maintain unaccelerated flight, the pilot must not make any changes in power or in cyclic movement. Any such changes would cause the helicopter to climb or descend. Once straight-and-level flight is obtained, the pilot should make note of the power (torque setting) required and not make major adjustments to the flight controls. *[Figure 2-36]*

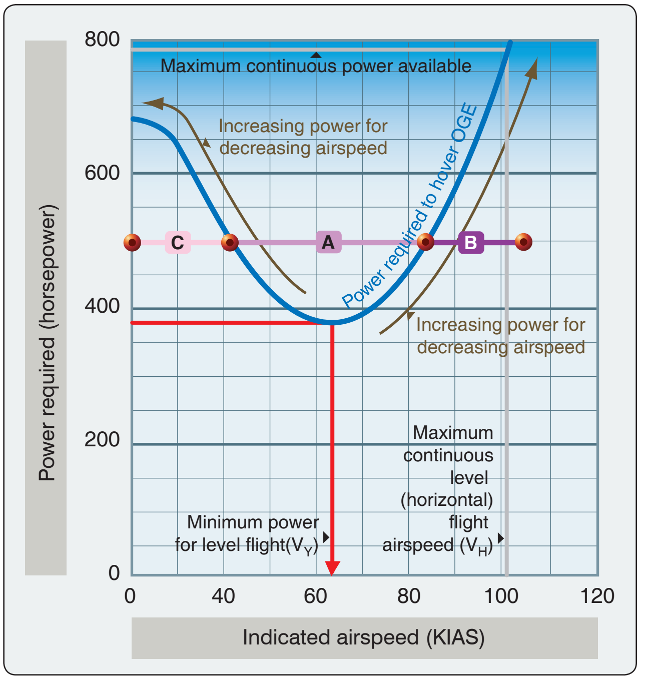

Figure 2-36. *Changing force vectors results in aircraft movement.*

Translational Lift

Improved rotor efficiency resulting from directional flight is called translational lift. The efficiency of the hovering rotor system is greatly improved with each knot of incoming wind gained by horizontal movement of the aircraft or surface wind. As incoming wind produced by aircraft movement or surface wind enters the rotor system, turbulence and vortices are left behind and the flow of air becomes more horizontal. In addition, the tail rotor becomes more aerodynamically efficient during the transition from hover to forward flight. Translational thrust occurs when the tail rotor becomes more aerodynamically efficient during the transition from hover to forward flight. As the tail rotor works in progressively less turbulent air, this improved efficiency produces more antitorque thrust, causing the nose of the aircraft to yaw left (with a main rotor turning counterclockwise) and forces the pilot to apply right pedal (decreasing the AOA in the tail rotor blades) in response. In addition, during this period, the airflow affects the horizontal components of the stabilizer found on most helicopters which tends to bring the nose of the helicopter to a more level attitude. *Figure 2-37* and *Figure 2-38* show airflow patterns at different speeds and how airflow affects the efficiency of the tail rotor.

Effective Translational Lift (ETL)

While transitioning to forward flight at about 16–24 knots, the helicopter experiences effective translational lift (ETL). As mentioned earlier in the discussion on translational lift,

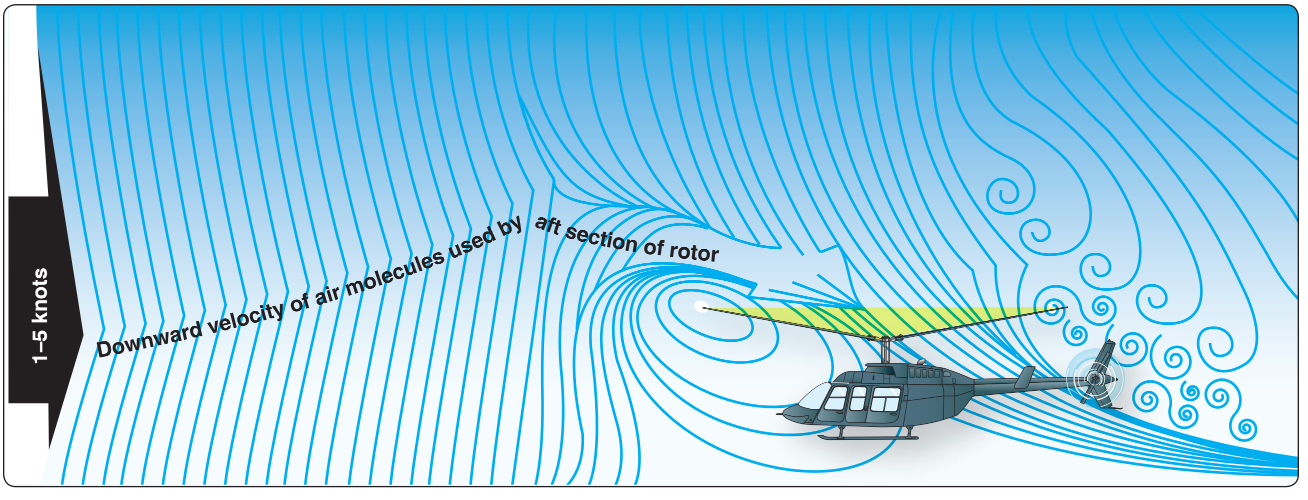

Figure 2-37. *The airflow pattern for 1–5 knots of forward airspeed. Note how the downwind vortex is beginning to dissipate and induced flow down through the rear of the rotor system is more horizontal.*