any changes in power or in cyclic movement, the helicopter begins either to climb or to 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 2-34]*

Airflow in Forward Flight

Airflow across the rotor disk in forward flight varies from airflow at a hover. In forward flight, air flows opposite the aircraft's flightpath. The velocity of this air flow equals the helicopter's forward speed. Because the rotor blades turn in a circular pattern, the velocity of airflow across a blade depends on the position of the blade in the plane of rotation at a given instant, its rotational velocity, and airspeed of the helicopter. Therefore, the airflow meeting each blade varies continuously as the blade rotates. The highest velocity of airflow occurs over the right side (3 o'clock position) of the helicopter (advancing blade in a rotor disk that turns counterclockwise) and decreases to rotational velocity over the nose. It continues to decrease until the lowest velocity of airflow occurs over the left side (9 o'clock position) of the helicopter (retreating blade). As the blade continues to rotate, velocity of the airflow then increases to rotational velocity over the tail. It continues to increase until the blade is back at the 3 o'clock position.

The advancing blade in *Figure 2-35,* position A, moves in the same direction as the helicopter. The velocity of the air meeting this blade equals rotational velocity of the blade plus wind velocity resulting from forward airspeed. The retreating blade (position C) moves in a flow of air moving in the opposite direction of the helicopter. The velocity of airflow meeting this blade equals rotational velocity of the blade minus wind velocity resulting from forward airspeed. The blades (positions B and D) over the nose and tail move essentially at right angles to the airflow created by forward airspeed; the velocity of airflow meeting these blades equals the rotational velocity. This results in a change to velocity of airflow all across the rotor disk and a change to the lift pattern of the rotor disk.

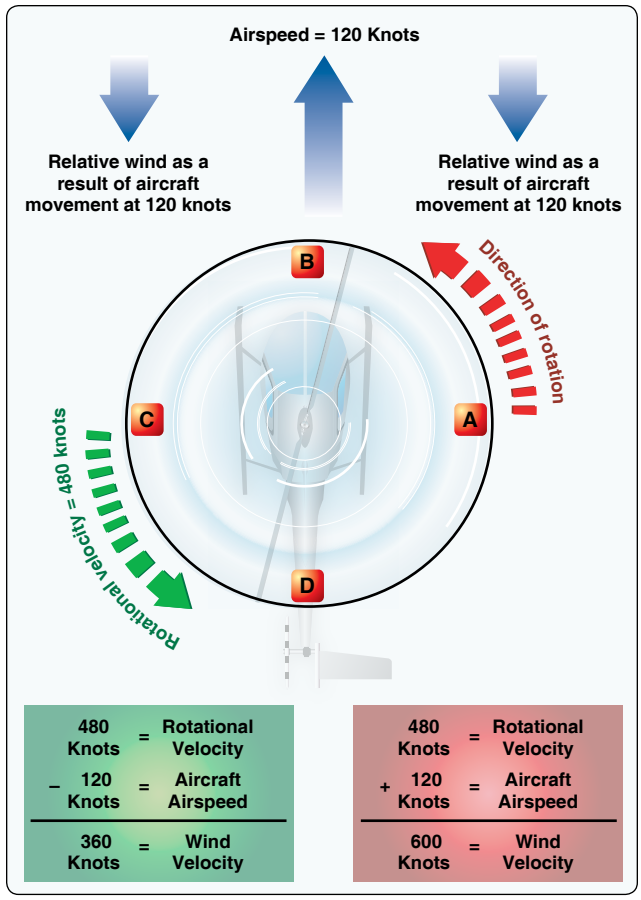

Figure 2-35. *Airflow in forward flight.*

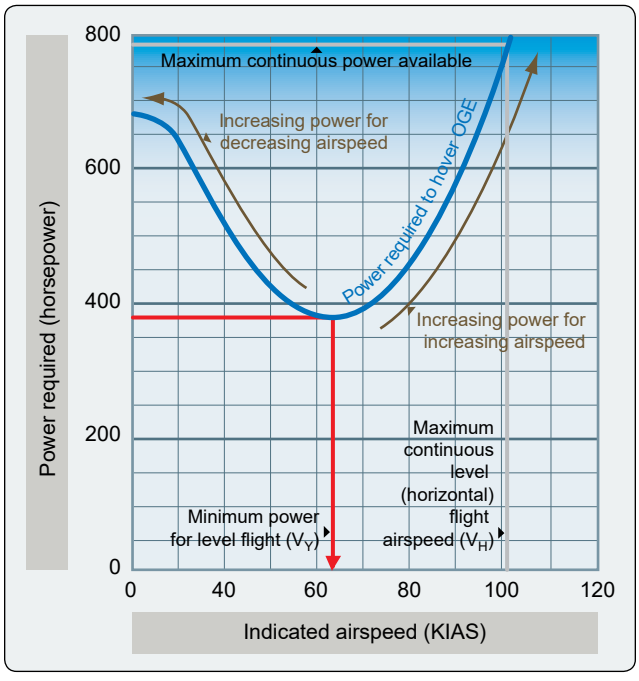

Figure 2-34. *Power versus airspeed chart.*

Advancing Blade

As the relative wind speed of the advancing blade increases, the blade gains lift and begins to flap up. It reaches its maximum upflap velocity at the 3 o'clock position, where the wind velocity is the greatest. This upflap creates a downward flow of air and has the same effect as increasing the induced flow velocity by imposing a downward vertical velocity vector to the relative wind which decreases the AOA.

Retreating Blade

As relative wind speed of the retreating blade decreases, the blade loses lift and begins to flap down. It reaches its maximum downflap velocity at the 9 o'clock position, where