CIVIL AVIATION DIRECTORATE
OF THE REPUBLIC OF SERBIA

FLIGHT CREW LICENSING DEPARTMENT

Theoretical Knowledge Examination for obtaining PPL (H)

Subject:
PRINCIPLES OF FLIGHT

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NOTE:
The correct answer is under letter a. During exam the order of answers will be different

1. Why is it usual that helicopter rotor blades have symmetrical aerofoil? (Fig. PPL(H) POF – 1)
   a. To avoid the introduction of dangerous forces.
   b. In order that the center of pressure is at the same points as the centre of gravity.
   c. To allow the centre of pressure to move more freely.
   d. Allows linear movement of the angle of attack.

2. Which of the following is correct regarding Angle of Attack and Pitch Angle of a helicopter rotor blade: (Fig PPL(H) POF – 2)
   a. The Angle of Attack is smaller than Pitch Angle in a forward going blade when a helicopter is moving forward.
   b. The Angle of Attack is greater than the Pitch Angle in a forward going blade when a helicopter is moving forward.
   c. The Pitch angle is greater than the Angle of Attack in a retreating blade when a helicopter is in forward flight.
   d. The Angle of Attack and the Pitch Angle will be the same in the fore and aft position, but only in the hover in zero wind.

3. Considering an aerofoil in a stalled condition, which of the following is correct?
   a. In a stalled condition, the lift has dropped considerably but not to zero.
   b. An aerofoil stalls at a certain speed.
   c. When an aerofoil stalls, the pressure over the top surface decreases considerably.
   d. At the onset of a stall, both lift and drag decrease abruptly.

4. Considering the forces acting on a rotor blade, which of the following is correct? (Fig. PPL(H) POF – 3)
   a. The angle of attack plus inflow angle equals the pitch angle.
   b. The angle between the relative airflow and the chord line is called the blade angle.
   c. The angle between the chord line and the plane of rotation is called the angle of attack.
   d. The angle between the relative airflow and the chord line is called the pitch angle.

5. Which of the following is correct regarding airflow about the rotor? (Fig. PPL(H) POF – 3)
   a. The angle of attack and induced airflow are inversely proportional for a given rotor section and RPM.
   b. The induced airflow remaining constant, the inflow angle and the Nr are directly proportional.
   c. The inflow angle and the induced airflow are inversely proportional for a given rotor RPM (Nr).
   d. For a given blade section and rotor RPM; for a reduction in induced airflow, the angle of attack decreases.

6. The speeding up and slowing down of the rotor blade during a given revolution accompanied by blade flapping is termed: (Fig. PPL(H) POF – 4)
   a. Coriolis Effect.
   b. Control orbit.
   c. Hooke's joint effect.
   d. Phase lag.

7. Cyclic stick movement:
   a. Alters the disc attitude.
   b. Changes the coning angle.
   c. Changes the „advance angle”.
   d. Alters the phase angle.

8. Translational lift at low forward air speeds or in the hover for a given engine power will:
   a. Cause the helicopter to climb.
   b. Maintain a constant total rotor thrust.
   c. Increase parasitic drag.
   d. Maintain constant airspeed.

9. Phase lag is the: (Fig. PPL(H) POF – 5)
   a. Angle, in the plane of rotation, through which a blade moves between a pitch selection and the corresponding, flapped position.
   b. Time between the collective pitch increase and the restoration of the original rotor RPM.
   c. Angle, in the plane of rotation, through which a blade moves between a collective selection and the corresponding disc attitude.
   d. That point where the blade receives the maximum alteration in cyclic pitch change 90^0 out of phase with the highest and lowest points of the control orbit.

10. Dynamic roll-over may be caused by:
    a. An excessive rolling movement developing about a skid or wheel in contact with a slope or uneven ground.
    b. Landing on a steep slope.
    c. Lifting off near buildings.
    d. An excessive movement of cyclic control in the pitch axis causing a rocking motion in the helicopter.

11. In the event that on touch down, ground resonance exists, the more appropriate action to take is to:
    a. Take off immediately if rotor RPM is high enough.
    b. Increase rotor RPM to change the resonant frequency.
    c. Turn the tail into wind to reduce resonance effects.
    d. Operate the cyclic control to change the ground/rotor re-circulating flow.

12. Airflow reversal is associated with: (Fig. PPL(H) POF – 6)
    a. Flight at high speed and originates at the root of the retreating blade.
    b. Retreating blade stall, starting at the root and progressing towards the blade tip.
    c. Autorotation, and originates at the root of the retreating blade.

d. Vortex ring state, and originates at the root of the retreating blade.

13. Should a helicopter suffer from retreating blade stall in flight, to reduce the effects? (Fig. PPL(H) POF – 7)
    a. Decrease the collective pitch to reduce the angle of attack below stalling angle.
    b. Power should be reduced and the collective pitch increased to reduce speed.
    c. Increase the backward pressure on the cyclic until the speed begins to decay, then apply more power.
    d. Reduce collective pitch and increase the forward speed.

14. One secondary effect which the tail rotor tends to produce in the hover if not corrected, is sideways drift: (Fig. PPL(H) POF – 8)
    a. In the direction of tail rotor thrust.
    b. In the direction of any cross-wind present.
    c. Can be either direction depending on the amount of tail rotor thrust being applied.
    d. In the opposite direction to the main torque reaction from the main rotor.

15. Which of the following is correct regarding the vortex state of the main rotor blades?
    a. Causes an even higher rate of descent when descending with power on.
    b. It describes the developing vortex around the root ends of the blades.
    c. The angle of attack increases at the blade tip.
    d. The rate of descent will decrease by raising the collective pitch, but the pilot must act quickly.

16. The centre of pressure of a symmetrical aerofoil when increasing the angle of attack:
    a. Moves very little.
    b. Moves forward.
    c. Moves rearwards.
    d. Does not move at all.

17. Washout describes rotor blades that have: (Fig. PPL(H) POF – 9)
    a. Increased blade angle at the tips.
    b. Reduced blade angle at the tips.
    c. A neutral angle of attack at the roots.
    d. A maximum blade angle at the ⅔ point.

18. Disc loading is defined as the:
    a. Ratio of the total weight of the helicopter supported, per unit of the disc area.
    b. Loading required to maintain the coning angle within safe limits.
    c. Maximum centrifugal loading of the rotor hub assembly.
    d. The disc area divided by the lift force in the hover.

19. Over- pitching in a helicopter is where:
    a. Rotor pitch angle already being high at maximum power to maintain rotor speed is further increased and the helicopter blades cone upwards.
    b. Too much forward (or rearward) cyclic control is used and insufficient power is available, and the helicopter descends.
    c. Increasing the Rotor pitch angle beyond the RPM limitation.

d. A pilot attempts to climb at altitudes higher than the optimum height for blade efficiency and the helicopter either maintains height or descends.

20. Overtorquing in a helicopter is where:
    a. If the rotor RPM reduces and the power to maintain total rotor thrust remains the same, the torque may increase over limits.
    b. The pilot attempts to increase the rotor RPM without a corresponding increase in power.
    c. The engine power is insufficient to maintain RPM without an increase in pitch.
    d. If the rotor RPM increases and the power to maintain total rotor thrust remains the same, the torque may increase over limits.

21. Flapback in a helicopter is where: (Fig. PPL(H) POF – 10)
    a. The disc tilts back in a horizontal airflow.
    b. During acceleration, the disc tilts, but because of phase lag it tilts sideways towards the advancing side which has to be corrected by cyclic control.
    c. During transition, because of phase lag, the disc tilts forwards causing the helicopter to accelerate.
    d. Cyclic pitch takes place in horizontal flight where it increases in the forward blade, and decreases in the retreating blade causing the disk to tilt forwards.

22. A helicopter which may be susceptible to „mast bumping" should not be flown in such a manner as to induce negative 'G'. However, if negative 'G' is accidentally applied the pilot should:
    a. Apply rearward cyclic to increase the angle of attack, then level the helicopter using the cyclic.
    b. Move the cyclic stick forward until the bumping stops, then level out.
    c. Keep the cyclic stick central and move the collective up.
    d. Immediately correct any roll by use of cyclic control.

23. The angle between the relative airflow (RAF) and the chord line of a rotor blade is called the: (Fig. PPL(H) POF – 2)
    a. Angle of attack.
    b. Coning angle.
    c. Inflow angle.
    d. Pitch angle.

24. The difference between a semi-rigid rotor and a fully articulated rotor is that a semi-rigid rotor is free to:
    a. Flap and feather, whereas the fully articulated rotor can flap, feather, lead and lag.
    b. Flap, feather, lead and lag, whereas the fully articulated rotor is free to feather.
    c. Lead, lag and feather, whereas the fully articulated rotor is free to flap, lead and lag.
    d. Lead and lag, whereas the fully articulated rotor is free to flap feather.

25. When in normal level flight, the advancing blade will: (Fig. PPL(H) POF – 5)
    a. Lag about its drag hinge.
    b. Increase its angle of attack.
    c. Lead about its drag hinge.

d. Flap up.

26. The effect of horizontal airflow over the rotor disc when hovering facing into wind is to: (Fig. PPL(H) POF – 11)
    a. Initially to reduce induced flow but at the same time adding a component to the induced airflow passing through the disc at right angles.
    b. Reduce induced flow considerably.
    c. Induced flow remains constant, but a component of a horizontal airflow now acts at 90^0 to the rotor.
    d. Induced flow will increase, allowing a smaller angle of attack, and therefore less collective pitch.

27. Movement of the tail rotor pitch of most types of helicopters is assisted by:
    a. Counterbalance weights.
    b. Tabs fitted to the trailing edge of each blade.
    c. Delta Three hinges.
    d. Drag hinges.

28. Some helicopter fins have a camber on one side to:
    a. Produce a side force to assist the tail rotor.
    b. Counteract tail rotor thrust at high speeds.
    c. Help in reducing tail rotor drift.
    d. Improve low-speed stability.

29. For a main rotor blade that turns anti-clockwise when viewed from above, movement of the cyclic control to the right produces the maximum rotor blade pitch when the blade is: (Fig. PPL(H) POF – 12)
    a. At the rearmost position.
    b. On the advancing side.
    c. On the retreating side.
    d. At the foremost position.

30. The tail rotor compensates for the torque effect of the main rotor in the:
    a. Normal axis.
    b. Horizontal axis.
    c. Lateral axis.
    d. Fore and aft axis.

31. For a helicopter in forward flight, maintaining a constant height, heading and speed, the deployment of forces are: (Fig. PPL(H) POF – 13)
    a. Lift, equal and opposite to mass. Horizontal thrust component opposite and equal to drag. Stabilizer producing negative lift.
    b. Lift, equal and opposite to mass. Horizontal thrust component opposite but greater than drag, stabilizer producing positive lift.
    c. TRT acting opposite to mass. Horizontal component of thrust acting forward, equal to drag. Stabilizer producing negative lift.
    d. Lift, opposite but greater than mass. Horizontal thrust component equal and opposite to drag, stabilizer producing positive lift.

32. With the main rotor blade, the drag force is compensated for by:
    a. Engine power.
    b. Blade dragging.
    c. The effect of blades flapping.
    d. The effect of cyclic pitch changes.

33. When the collective lever is moved upwards, the swash plate also moves upwards, this causes the rotor blades to:
    a. Increase blade angle equally and increases the total rotor thrust.
    b. Increase lift which is dependent on their position relative to the swash plate.
    c. Increase blade angle which will change the orientation of total rotor thrust.
    d. Increase the pitch angle on the retreating blade and decrease the pitch angle on the forward blade.

34. Airflow reversal is possible when:
    a. In high speed flight, it originates at the root of a retreating blade.
    b. In a vortex-ring state, it is originates at the tip of an advancing blade.
    c. In autorotation, it originates at the root of a retreating blade.
    d. In high speed flight, it originates at the tip of a retreating blade.

35. To correct the effects of retreating blade stall in flight, the pilot would:
    a. Reduce the collective pitch and reduce forward speed.
    b. Increase the collective pitch to increase the angle of attack.
    c. Push the cyclic stick forward to increase speed.
    d. Immediately reduce power and increase the collective pitch to reduce speed.

36. In a turn and slip indicator, the ball:
    a. Requires no power to operate and indicates slip, skid or balanced turns.
    b. Requires aircraft power off the bus bar and indicates correctly balanced turns.
    c. Requires battery power and will indicate slip or skid.
    d. Requires no aircraft power and will indicate correctly balanced turns.

37. A Directional Gyroscope operating under normal flight conditions can experience DRIFT. What degree of drift is considered acceptable?
    a. 3^0 every 15 minutes.
    b. 15^0 per hour.
    c. 0.3^0 every 15 minutes.
    d. 1.5^0 per hour.

38. Should an engine failure occur in flight?
    a. The freewheeling unit disengages the engine from the rotor.
    b. The rotor RPM is quickly restored by the autorotative forces.
    c. The rotor RPM is restored in the flare.
    d. The helicopter will tend slowly in the opposite direction from the main rotor.

39. Should the disc loading increase, under certain circumstances, i.e., during a flare, the total reaction can move closer to the axis of rotation, this result can be:

a. A decrease in rotor torque.
b. A decrease in the coning angle.
c. An increase in rotor torque.
d. An increase in rotor drag.

40. Considering a helicopter in autorotative flight, which of the following is correct? (Fig. PPL(H) POF – 14)
   a. If a helicopter is autorotating with forward speed, the inflow angle will reduce as does the pitch angle.
   b. If a helicopter is autorotating with forward speed, the angle of attack increases, and the inflow angle is reduced.
   c. If a helicopter is autorotating vertically, following autorotation with forward speed, the inflow angle decreases and the pitch angle increases.
   d. If a helicopter is autorotating vertically, the inflow angle increases as does the mean pitch angle.

41. Assuming an engine failure occurs in a HOVER, which of the following is correct?
   a. The autorotative force will produce an RPM and rotor thrust equal to the helicopter mass, then the helicopter will descend at a constant rate.
   b. The rate of descent is directly to the angle of attack.
   c. The helicopter will accelerate downwards, until the autorotative force equals the helicopter mass and then the acceleration will decrease.
   d. If for any reason, the angle of attack should increase, then there will be a rapid increase in the rate of descent.

42. In consideration of Tail Rotor Drift, with a helicopter that has a clockwise rotation of its main rotor, which of the following is correct? (Fig. PPL(H) POF -8)
   a. The helicopter tends to drift in the direction of tail rotor thrust.
   b. The helicopter tends to rotate in the same direction as the main rotor torque reaction, i.e. anti – clockwise.
   c. The helicopter tends to drift starboard when in ground effect.
   d. The corrective anti-torque force set up by the tail rotor causes the helicopter to hover with the starboard skid low.

43. Hovering in ground effect (IGE), the high pressure area underneath the helicopter is considered to extend up to: (Fig. PPL(H) POF – 15)
   a. ¾ of the main rotor disc diameter.
   b. ½ of the main rotor disc diameter.
   c. A height equivalent to the distance from the main rotor head to the tail rotor.
   d. ¼ of the main rotor disc diameter.

44. The fitting of a Tail Stabilizer on certain helicopters has the effect of:
   a. Limits the amount of pitch-up of a fuselage and rearwards tilt of the disc in gusts.
   b. Improving the directional control, particularly in slow speed flight.
   c. Limiting the amount of yaw in gusty conditions.
   d. Provides the pilot with improved pitch control particularly if the fuselage pitches downwards.

45. Carburetor icing takes place in the following conditions:
    a. In humid air where the temperature drops in the carburetor is due to adiabatic expansion.
    b. Only in cloud, above the freezing level and in the descent with a low power setting.
    c. Only when the outside temperature is below freezing.
    d. Is enhanced when flying at full throttle in humid air clear of cloud precipitation and fog.

46. If a fuse protecting a particular circuit blows, the pilot should:
    a. Wait at least 2 minutes before re-setting the appropriate circuit breaker or inserting a fresh cartridge fuse.
    b. Immediately reset the appropriate circuit breaker.
    c. Immediately isolate (switch off) all the electrics served by the particular fuse. Do not replace fuses in flight.
    d. Only reset the circuit breaker if the electrics served by it are vital for flight safety.

47. The acute angle between the rotor plane of rotation and the chord line of a rotor blade is called: (Fig. PPL(H) POF – 2)
    a. The Angle of attack.
    b. The Coning angle.
    c. The Inflow angle.
    d. The Pitch angle.

48. When the helicopter is in horizontal flight, the relative airflow is: (Fig. PPL(H) POF-16)
    a. A combination of the rotation of the rotor blades and the movement of the helicopter.
    b. A flow created by the wind blowing over the blades.
    c. A flow created by the motion of the rotor blades through the air.
    d. A combination of the wind and the motion of the rotor blades through the air.

49. The Pitch angle is determined by the:
    a. Direction of the relative airflow.
    b. Position of the appropriate cockpit controls (collective and cyclic pitch).
    c. Cyclic pitch only.
    d. It depends on Angle of Attack.

50. During forward flight the angle of attack is greater than the pitch angle☹Fig. PPL(H) POF – 12)
    a. For the forward going blade.
    b. At the fore position of the blade.
    c. For the retreating blade.
    d. At the aft position of the blade.

51. Drag is the term used for the force that tends to resist movement of the aerofoil through the air. It acts:
    a. Parallel and in the opposite direction to the relative airflow.
    b. Parallel and in the opposite direction to the movement of the aerofoil.

c. Parallel and in the same direction as the movement of the aerofoil.
d. Parallel and in the same direction as the lift.

52. Lift and drag vary with the density of the air as the following:
a. As the air density increases, lift and drag decrease.
b. As the air density decreases, lift and drag increase.
c. As the air density increase, lift increases but drag decreases.
d. As the air density decreases, lift and drag decrease.

53. For the two blades rotor turning anti-clockwise, when viewed from above, the maximum increase in angle of attack occurs: (Fig. PPL(H) POF – 7)
a. When blade passes the 90^0 position on the right.
b. At the maximum rear position.
c. When blade passes the 90^0 position on the left.
d. At the maximum front position.

54. The Rotor Blades are connected to the Rotor Head. The angle of the blades relative to the Plane of Rotation is called: (Fig. PPL(H) POF – 2)
a. Pitch Angle.
b. Angle of Attack.
c. Coning Angle.
d. Inflow Angle.

55. The axis of rotation is coincide with the shaft axis:
a. Always.
b. In forward flight.
c. Under ideal conditions of steady flight in equilibrium.
d. When hovering facing into wind.

56. The Tip Path Plane is the imaginary circular plane outlined by the rotor blade tips in making a cycle of rotation. The area encompassed within this path is known as:
a. The Coning Angle.
b. The Rotor Disc.
c. The Plane of Rotation.
d. The Control Orbit.

57. The formula which gives the magnitude of the lift are expressed by the Air density, Velocity of RAF, Plane Area of Aerofoil and:
a. Coefficient of Lift.
b. Angle of Attack.
c. Pitch Angle.
d. Disc Loading.

58. Blade Angle is also called:
a. Inflow Angle.
b. Angle of Attack.
c. Coning Angle.
d. Pitch Angle.

59. Considering airflow over the aerofoil of the rotor blade, if the relative airflow is only present, then blade angle would be the same as: (Fig. PPL(H) POF – 17)
    a. Angle of attack.
    b. Inflow angle.
    c. Coning angle.

60. Inflow angle is the angle between: (Fig. PPL(H) POF – 3)
    a. Relative airflow and the chord line of an aerofoil.
    b. Relative airflow and the rotational airflow.
    c. Rotational airflow and the chord line.
    d. Chord line and the axis of rotation.

61. Which force must be present to achieve forward flight?
    a. Lift.
    b. Vertical component of rotor thrust.
    c. Forward component of rotor thrust.
    d. Total rotor thrust only.

62. The Rotor Thrust at the blade tip is reduced by Washout, that is, making the Rotor Blade with a built-in twist such that:
    a. The Pitch Angle decreases from the root to the tip.
    b. The Pitch Angle decreases from the tip to the root.
    c. Rotor Thrust is increased with the Pitch Angle at the tip.
    d. Angle of Attack is increased with the Pitch Angle at the tip.

63. As the helicopter moves into forward flight, the relative airflow moving over each blade becomes a combination of the rotational speed of the rotor blade and the forward movement of the helicopter. The relative airflow is at a maximum at the: (Fig. PPL(H) POF – 17)
    a. 90^0 position on the retreating blade.
    b. 90^0 position on the advancing blade.
    c. Maximum rear position.
    d. Maximum front position.

64. Movements of cyclic pitch control will:
    a. Change pitch angle of all rotor blades together and in the same direction.
    b. Change pitch angle of the retreating blade only.
    c. Alter the angle of tilt of the rotor disk.
    d. Change blade angle in its maximum front position only.

65. In a three-bladed rotor, if one blade were passing through the minimum pitch position, the other two would be: (Fig. PPL(H) POF – 12)
    a. In the maximum pitch position.
    b. In the process of increasing and decreasing their pitch respectively.
    c. Also in the minimum pitch position.

66. The advancing blade is:

a. The blade moving forward into the relative airflow.
b. The blade moving into the opposite sector to the relative airflow.
c. The blade which produces the increased lift.
d. The blade which flaps up decreasing the angle of attack.

67. The position of the cyclic pitch control in forward flight causes:
a. A decrease in angle of attack on the advancing blade and an increase in angle of attack on the retreating blade.
b. A increase in angle of attack on the advancing blade and an decrease in angle of attack on the retreating blade.
c. A decrease in angle of attack on the advancing blade and retreating blade.
d. A increase in angle of attack on the advancing blade and retreating blade.

68. Flapping by definition is: (Fig. PPL(H) POF – 19)
a. The angular oscillation of the rotor blade about a substantially horizontal axis.
b. The angular oscillation of the rotor blade about a substantially vertical axis.
c. The angular oscillation of the rotor blade about Gimbal Mount.
d. The horizontal moving of the rotor blade about Shaft Axis.

69. Equalizing the lift over the two halves of the rotor disc is achieved by:
a. Increasing angle of attack on the advancing blade.
b. Decreasing angle of attack on the retreating blade.
c. The combination of decreased angle of attack on the advancing blade and increased angle of attack on the retreating blade through blade flapping action.
d. Tilting rotor disc in required direction.

70. Coning is the upward bending of the blades caused by the combined forces of:
a. Lift and gravity.
b. Lift and centrifugal force.
c. Drag and centrifugal force.
d. Gravity and drag.

71. The pilot can neutralize torque effect of the tail rotor in the cockpit by:
a. The Cyclic stick.
b. The Collective stick.
c. The Foot pedals.
d. The power setting.

72. What control compensates the torque effect of the main rotor?
a. The foot pedals.
b. The collective stick.
c. The tail rotor thrust.
d. The cyclic stick.

73. The most important factors that limit the maximum forward speed of the helicopter are:
a. The appearance of the stall area at the retreating rotor blade and loss the rotor thrust.
b. Weight and shape of a helicopter.

c. Limited forward movement of the cyclic stick and change the tilt of the rotor disc.
d. The force of drag and tail rotor thrust.

74. Turn-overing the two bladed helicopter in flight can be prevented, provided that:
   a. The lift on the right blade is equal to the lift on the left blade.
   b. Angle of attack on the right blade is equal to the angle of attack on the left blade.
   c. Lift coefficient is the same on both rotor blades.
   d. Speed of movement of both blades is the same.

75. Rotor blades in reality:
   a. Describe the conical surface.
   b. Rotate in the plane.
   c. Describe conical surface in the forward flight, while in hovering rotate in the plane.

76. The horizontal stabilizer creates a pitch-up moment in stationary flight and reduces the tendency of pitch-down the nose of the helicopter at high speeds. At the same time, the horizontal stabilizer increases:
   a. Longitudinal stability of the helicopter.
   b. Lateral stability of the helicopter.
   c. Stability about the vertical axis of the helicopter.
   d. Efficiency of the tail rotor.

77. Dynamic pressure can be transformed into static pressure:
   a. When the air flow velocity is reduced.
   b. When the air flow velocity is increased.
   c. When the dynamic pressure is equal to the atmospheric pressure.
   d. Never.

78. When the air flow velocity is zero, static pressure is equal to:
   a. Atmospheric pressure.
   b. Dynamic pressure.
   c. Zero.

79. Regarding the influence of the ground, the following statement is correct:
   a. Induced drag reduces, lift increases.
   b. Induced drag increases, lift reduces.
   c. Induced drag and lift do not change the value.
   d. Induced drag increases, lift does not change the value.

80. The rotor blades in reality:
   a. Describe the conical surface.
   b. Rotate in the plane.
   c. Describe conical surface in the forward flight, while in hovering rotate in the plane.

81. The rotor thrust balances drag force of the helicopter:
   a. During the forward flight, climbing and acceleration.
   b. In hovering.
   c. In descending.

d. During descending and climbing.

82. Considering the influence of aerodynamic forces and weight of the helicopter in hovering, which of the following statements is true? (Fig. PPL(H) POF – 20)
   a. Aerodynamic force of the rotor and the weight of the helicopter are equal.
   b. Rotor aerodynamic force is greater than the weight of the helicopter.
   c. If the hovering is conducted in the wind conditions, aerodynamic force of the rotor is less than the weight of the helicopter.

83. When the helicopter is transferred in descending by lowering the collective stick, and if the collective stick remains the same position:
   a. Descending speed will be reduced due to increased angle of attack caused by the upward flow of air through the rotor disc.
   b. Descending speed will increased as the angle of attack increases.
   c. Descending speed will remain constant.

84. What can happen if the helicopter descending is performed with a high blade angle, i.e. with certain engine power?
   a. There will be exceeding of the critical angle of attack and the stall at the root of blades.
   b. There will be an increase of lift and reduce the speed of descent.
   c. There will be speed increasing and drag reducing.

85. The loss of rotor RPM in autorotation is:
   a. Slower with heavy helicopters for a larger moment of inertia.
   b. Slower with light helicopter for a small moment of inertia.
   c. Faster with heavy helicopters for a larger moment of inertia.
   d. The same, regardless of weight of helicopters.

86. Air Density:
   a. Decreases with increasing altitude.
   b. Does not change with changing temperature.
   c. Increases with increasing altitude.
   d. Decreases with decreasing temperature.

87. The air pressure that acts on anything immersed in it:
   a. Is also known as Static Pressure.
   b. Is also known as Dynamic Pressure.
   c. Is greater at altitude than at sea level.
   d. Is also known as Total Pressure.

88. When considering the changes in air density with altitude, which of the following is correct?
   a. The reduction in pressure with increasing altitude causes density to reduce.
   b. The temperature increases with increasing altitude causes density to increase.
   c. The temperature reduction with increasing altitude causes density to increase.
   d. The increase in pressure with increasing altitude causes density to reduce.

89. The properties of Earth's atmosphere which influence the performance of aircraft are:
    a. Its water vapor content, temperature, pressure and density.
    b. Its temperature, pressure and humidity.
    c. Its oxygen content pressure and water vapor content.
    d. Its nitrogen content, oxygen content, temperature and pressure.

90. Air pressure:
    a. Acts in all directions.
    b. Acts only vertically downwards.
    c. Is measured in Pascal per square inch.
    d. Increases with altitude.

91. In the straight and level powered flight the following principal forces act on an aircraft:
    a. Thrust, lift, drag, weight.
    b. Thrust, lift, weight.
    c. Thrust, lift, drag.
    d. Lift, drag, weight.

92. The dynamic pressure exerted on an aircraft's frontal surface is equal to:
    a. Half the density multiplied by the true airspeed squared.
    b. Density multiplied by speed squared.
    c. Half the true airspeed multiplied by the density squared.
    d. Half the density multiplied by the indicated airspeed squared.

93. Relative airflow is ______ and _____ the movement of the aircraft. (Fig. PPL(H) POF-21)
    a. Parallel/ Opposite to.
    b. Perpendicular/ Opposite to.
    c. Perpendicular to/ in the same direction as.
    d. Parallel to/ in the same direction as.

94. Considering the forces acting up on an aircraft, at constant airspeed, which statement is correct?
    a. Weight always acts vertically downwards toward the center of the Earth.
    b. Lift acts perpendicular to the chord line and must be always greater than weight.
    c. Thrust acts parallel to the relative airflow and is greater than drag.
    d. The lift force generated by the aerofoil always acts in the opposite direction to the aircraft's weight.

95. An aircraft's mass is a result of:
    a. How much matter it contains.
    b. Its weight.
    c. How big it is.
    d. Its volume.

96. Dynamic pressure is equal to the:
    a. Total pressure minus static pressure.
    b. Total pressure plus static pressure.

c. Static pressure minus total pressure.
d. Total pressure divided by static pressure.

97. The boundary layer consists of:
a. Laminar and Turbulent flow.
b. Laminar flow.
c. Turbulent flow.
d. Turbulent flow at low speed only.

98. What must be the relationship between the forces acting on an aircraft in flight, for the aircraft to be in state of equilibrium?
a. Lift must be equal to the weight, and thrust must be equal to the drag.
b. Lift must be equal to the drag, and thrust must be equal to the weight.
c. Lift must be equal to the thrust plus drag.
d. Lift must be equal to the thrust, and weight must be equal to the drag.

99. The smooth flow of the air, where each molecule follows the path of the preceding molecule is a definition of:
a. Laminar flow.
b. Turbulent flow.
c. Free stream flow.
d. Wind.

100. In sub-sonic airflow, as the air passes through a venture, the flow mass _____, the velocity ______ and the static pressure ______ : (Fig. PPL(H) POF – 22)
a. Remains constant/ increases, then decreases/ decreases, then increases.
b. Decreases, then increases/ remains constant/ increases, then decreases.
c. Remains constant/ increases, then decreases/ increases, then decreases.
d. Decreases, then increases/ increases, then decreases/ increases, then decreases.

101. As airspeed increases, induced drag:
a. Decreases.
b. Increases.
c. Is dependent on the weight of the aircraft.
d. Remains unchanged.

102. If the Indicated Airspeed of an aircraft is increased from 50kts to 100kts, parasite drag will be:
a. Four times greater.
b. Six times greater.
c. Two times greater.
d. Decreased for one quarter.

103. An imaginary straight line running from the midpoint of the leading edge of an aerofoil to its trailing edge is called: (Fig. PPL(H) POF – 23)
a. Chord line.
b. Mean curvature.
c. Aerofoil thickness.
d. Maximum curvature.

104. As airspeed increases, induced drag _______, parasite drag _______ and total drag _______ :
   a. Decreases/ increases/ decreases, then increases.
   b. Increases/ increases/ increases.
   c. Increases/ decreases/ increases, then decreases.
   d. Decreases/ decreases/ decreases.

105. The definition of Lift is: (Fig. PPL(H) POF – 23)
   a. The aerodynamic force which acts at 90^0 to the relative airflow.
   b. The aerodynamic force which acts perpendicular to the chord line of an aerofoil.
   c. The aerodynamic force as result of the different pressure about an aerofoil.
   d. The aerodynamic force which acts perpendicular to the upper surface of the aerofoil.

106. At a given indicated airspeed, what effect will an increase the air density have on lift and drag?
   a. Lift and drag will remain the same.
   b. Lift will increase but drag will decrease.
   c. Lift and drag will increase.
   d. Lift and drag will decrease.

107. Yawing is a movement about the _______ axis:
   a. Normal.
   b. Longitudinal.
   c. Lateral.
   d. Horizontal.

108. Landing with precision control and a soft touch-down on a particular spot can be made:
   a. In-ground effect only.
   b. Out of ground effect only.
   c. In wind conditions only.
   d. Only with a helicopter that has wheels.

109. In relation to the landing with the in-ground effect, approaching angle for the landing with out-ground effect must be very small, in order to:
   a. Avoid a large increase in power.
   b. Cut short a distance to stop.
   c. Shorten the time of landing.
   d. Avoid adverse gusts.

110. At high speed, the bank of the helicopter will be limited due to:
   a. Appearing the rotor blades stall area.
   b. Limited movements of the cyclic stick.
   c. Decrease the rotor rotations.
   d. The construction and shape of a helicopter fuselage.

111. With an altitude increasing, reserve of engine power:
   a. Decreases.
   b. Increases.
   c. Does not change.
   d. It depends on the type of engine.

112. In order to prevent drift and rotation about the vertical axis of the helicopter in wind conditions, the pilot should:
   a. Move the cyclic stick to the wind direction and push the foot pedal to the opposite direction of the wind.
   b. Move the cyclic stick in the opposite direction of wind and push foot pedal to the direction of wind blowing.
   c. Always push the cyclic stick forward and increase engine power.
   d. Reduce the speed of flight in order to reduce the effect of wind.

113. In the tail wind conditions, the helicopter is:
   a. Unstable about the vertical axis.
   b. Stable about the vertical axis, but unstable about the lateral axis.
   c. Stable about the vertical axis.
   d. Stable about the longitudinal axis, unstable about lateral and the vertical axis.

114. The wind affects on the maximum rate of climb (in relation to the ground), as follows:
   a. Head wind increases the maximum rate of climb, and tail wind decreases it.
   b. Head wind reduces the maximum rate of climb, and tail wind increases it.
   c. Wind does not affect the maximum rate of climb.
   d. Maximum rate of climb depends on the progressive forward speed.

115. To recover from a state of vortex ring and reduce the rotor blades stall area, the pilot's correct action should be:
   a. First lower the collective stick, and then move the cyclic stick forward.
   b. First raise the collective stick, then move the cyclic stick forward.
   c. Only move the cyclic stick forward.
   d. Only raise the collective stick.

116. One of the causes of the tail rotor stall condition can be:
   a. Excessive and rapid raising the collective stick.
   b. Quick and unmeasured push the foot pedals.
   c. The gusty conditions.
   d. A high rate of the turn.

117. The forward speed of a helicopter is restricted primarily by:
   a. Dissymmetry of lift.
   b. Transverse flow effect.
   c. High-frequency vibrations.

118. When hovering, a helicopter tends to move in the direction of tail rotor thrust. This statement is: (Fig. PPL(H) POF – 8)
   a. True; the movement is called translating tendency.

b. False; the movement is opposite the direction of tail rotor thrust, and is called translating tendency.
c. True; the movement is called transverse tendency.

119. The purpose of lead-lag (drag) hinges in a three-bladed, fully articulated helicopter rotor system is to compensate for:
   a. Coriolis effect.
   b. Dissimmetry of lift.
   c. Blade flapping tendency.

120. What happens to the helicopter as it experiences translating tendency?
   a. It moves in the direction of tail rotor thrust.
   b. It tends to dip slightly to the right as the helicopter approaches approximately 15 knots in take-off.
   c. It gains increased rotor efficiency as air over the rotor system reaches approximately 15 knots.

121. The lift differential that exists between the advancing blade and the retreating blade is known as:
   a. Dissimmetry of lift.
   b. Coriolis effect.
   c. Translational lift.

122. Most helicopters, by design tend to drift to the right when hovering in no-wind condition. This statement is:
   a. True; the cyclic pitc system of most helicopters is rigged to the left to overcome this tendency.
   b. False; helicopters have no tendency to drift, but will rotate in that direction.
   c. True; The mast or cyclic pitch system of most helicopters is rigged forward, this with gyroscopic precession will overcome this tendency.

123. When a rotorcraft transitions from straight-and-level flight into 30^0 bank while maintaining a constant altitude, the total lift force must:
   a. Increase and the load factor will increase.
   b. Increase and the load factor will decrease.
   c. Remain constant and the load factor will decrease.

124. Cyclic control pressure is applied during flight that results in a maximum increase in main rotor blade pitch angle at the ”three o'clock” position. Which way will the rotor disc tilt? (Fig. PPL(H) POF – 12)
   a. Aft.
   b. Forward.
   c. Left.

125. The primary purpose of the tail rotor system is to:
   a. Counteract the torque effect of the main rotor.
   b. Assist in making coordinated turns.
   c. Maintain heading during forward flight.

126. Can the tail rotor produce thrust to the left?
    a. Yes; primarily to counteract the drag of transmission during autorotation.
    b. No; the right thrust can only be reduced, causing tail movement to the left.
    c. Yes; primarily so that hovering turns can be accomplished to the right.

127. The main rotor blades of fully-articulated rotor system can:
    a. Flap, drag, and feather indenpedently.
    b. Flap and feather collectively.
    c. Feather indenpendenly, but cannot flap and drag.

128. What is the primary purpose of the clutch?
    a. It allows the engine to be started without driving the main rotor system.
    b. It provides disengagement of the engine from the rotor system for autorotation.
    c. It transmits engine power to the main rotor, tail rotor, generator/alternator and other accessories.

129. What is the primary purpose of the freewheeling unit?
    a. It provides disengagement of the engine from the rotor system for autorotation purposes.
    b. It allows the engine to be started without driving the main rotor system
    c. It provides speed reduction between the engine, main rotor system and tail rotor system.

130. Ground resonance is more likely to occur with helicopters that are equipped with:
    a. Fully articulated rotor system.
    b. Rigid rotor system.
    c. Semi-rigid rotor system.

131. The proper action to initiate a quick stop is to apply:
    a. Aft cyclic, while lowering the collective and applying right foot pedal.
    b. Forward cyclic, while raising the collective and applying right foot pedal.
    c. Aft cyclic, while raising the collective and applying left foot pedal.

132. During the flare portion of a power-off landing, the rotor RPM tends to:
    a. Increase initially.
    b. Remain constant.
    c. Decrease initially.

133. Which would produce the slowest rotor RPM?
    a. Pushing over after a steep climb.
    b. A vertical descent with power.
    c. A vertical descent without power.

134. As altitude increases V_{NE} of a helicopter will:
    a. Decrease.
    b. Increase.
    c. Remain the same.

135. Should a helicopter pilot ever be concerned about ground resonance during take-off?
   a. Yes; although it is more likely to occur on landing, it can occur during take-off.
   b. No; ground resonance occurs only during an autorotative touchdown.
   c. Yes; but only during slope take-offs.

136. An excessively steep approach angle and abnormally slow closure rate should be avoided during an approach to a hover, primarily because:
   a. Settling with power could develop, particularly during the termination.
   b. The airspeed indicator would be unreliable.
   c. A go-around would be very difficult to accomplish.

137. Which procedure will result in recovery from settling with power?
   a. Increase forward speed and reduce collective pitch.
   b. Increase collective pitch and power.
   c. Maintain constant collective pitch and increase throttle.

138. The addition of power in a settling with power situation produces an:
   a. Even greater rate of descent.
   b. Increase in airspeed.
   c. Increase in cyclic control effectiveness.

139. Which is true with respect to recovering from an accidental settling with power situation?
   a. Since the inboard portions of the main rotor blades are stalled, cyclic control effectiveness will be reduced during the initial portion of the recovery.
   b. Antitorque pedals should not be utilized during the recovery.
   c. Recovery can be accomplished by increasing rotor RPM, reducing forward speed, and minimizing maneuvering.

140. When operating at high forward airspeed, retreating blade stalls is more likely to occur under conditions of:
   a. Low gross weight, high density altitude, and smooth air.
   b. High gross weight, high density altitude, and turbulent air.
   c. High gross weight, low density altitude, and smooth air.

141. How should a pilot react at the onset of retreating blade stall?
   a. Reduce collective pitch, increase rotor RPM, and reduce forward airspeed.
   b. Reduce collective pitch, rotor RPM, and forward airspeed.
   c. Increase collective pitch, reduce rotor RPM, and reduce forward airspeed.

142. The most power will be required to hover over which surface?
   a. High grass.
   b. Concrete ramp.
   c. Rough/uneven ground.

143. To taxi on the surface in a safe and efficient manner, helicopter pilots should use the:
   a. Collective pitch to control starting, taxi speed, and stopping.

b. Cyclic stick to control starting, taxi speed, and stopping.
c. Foot pedals to correct for drift during crosswind conditions.

144. During surface taxiing, the cyclic stick is used to control:
  a. Ground track.
  b. Heading.
  c. Forward movement.

145. Which statement is true about an autorotative descent?
  a. Generally, only the cyclic stick is used to make turns.
  b. The pilot should use the collective pitch control to control the rate of descent.
  c. The rotor RPM will tend to decrease if a tight turn is made with a heavily loaded helicopter.

146. Using right pedal to assist a right turn during an autorotative descent will probably result in what actions?
  a. An increase in rotor RPM, pitch down of the nose, increase in sink rate, and decrease in indicated airspeed.
  b. A decrease in rotor RPM, pitch up of the nose, decrease in sink rate, and increase in indicated airspeed.
  c. An increase in rotor RPM, pitch down of the nose, and increase in indicated airspeed.

147. When making a slope landing, the cyclic pitch control should be used to: (Fig. PPL(H) POF – 24 and 25)
  a. Hold the upslope skid against the slope.
  b. Lower the down slope skid to the ground.
  c. Place the rotor disc parallel to the slope.

148. Take-off from a slope is normally accomplished by: (Fig. PPL(H) POF – 24 and 25)
  a. Bringing the helicopter to a level attitude before completely leaving the ground.
  b. Making a downslope running take-off if the surface is smooth.
  c. Simultaneously applying collective pitch and downslope cyclic control.

149. You are hovering during calm wind conditions and decide to make a right-pedal turn. In most helicopters equipped with reciprocating engines, the engine RPM will tend to:
  a. Increase.
  b. Decrease.
  c. Remain unaffected.

150. When making an autorotation to touchdown, what action is most appropriate?
  a. The skids should be in a longitudinally level attitude at touchdown.
  b. A slightly nose-high attitude at touchdown is the proper procedure.
  c. Aft cyclic application after touchdown is desirable to help decrease ground run.

151. With respect to vortex circulation, which is true? (Fig. PPL(H) POF – 20)
  a. Vortex circulation generated by helicopters in forward flight trail behind in a manner similar to wingtip vortices generated by airplanes.

b. Helicopters generate downwash turbulence, not vortex circulation.
c. The vortex strength is greatest when the generating aircraft is flying fast.

APPENDIXES

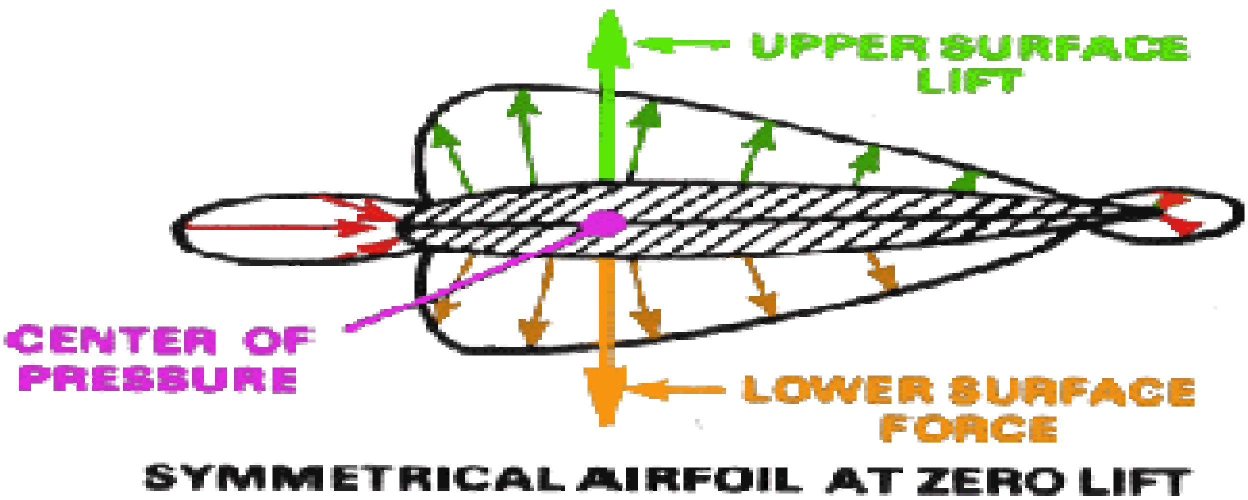


Fig. PPL (H) POF - 1

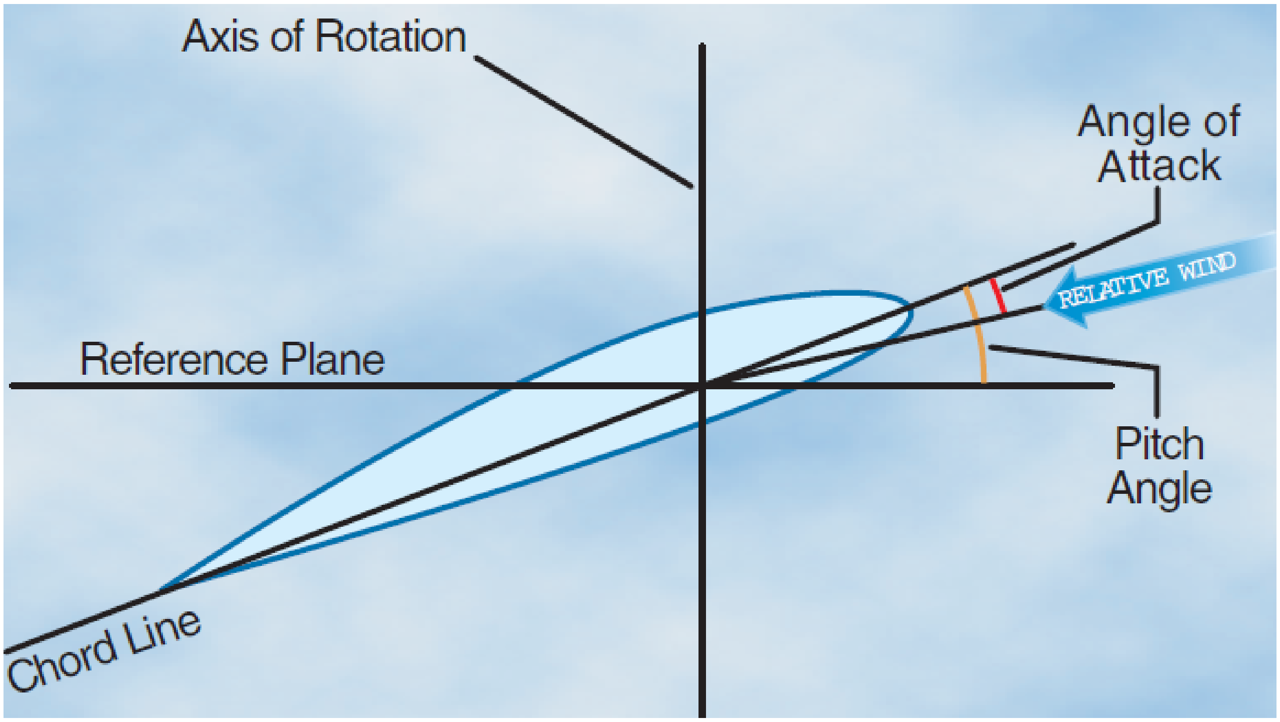


Fig. PPL (H) POF – 2

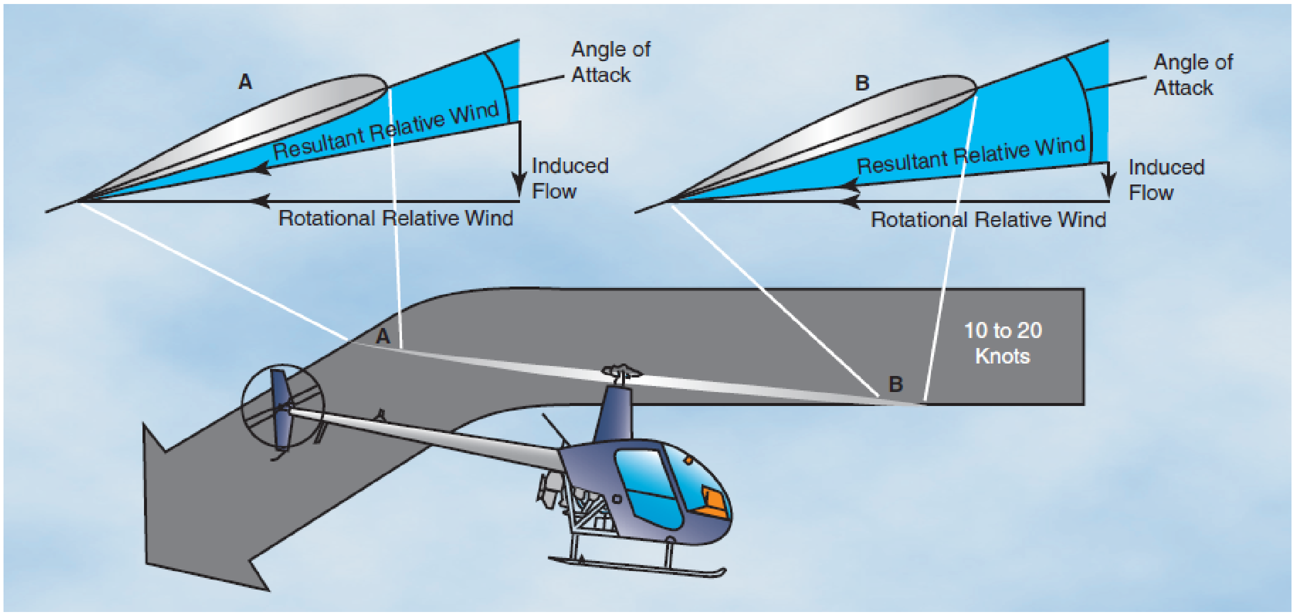


Fig. PPL (H) POF – 3

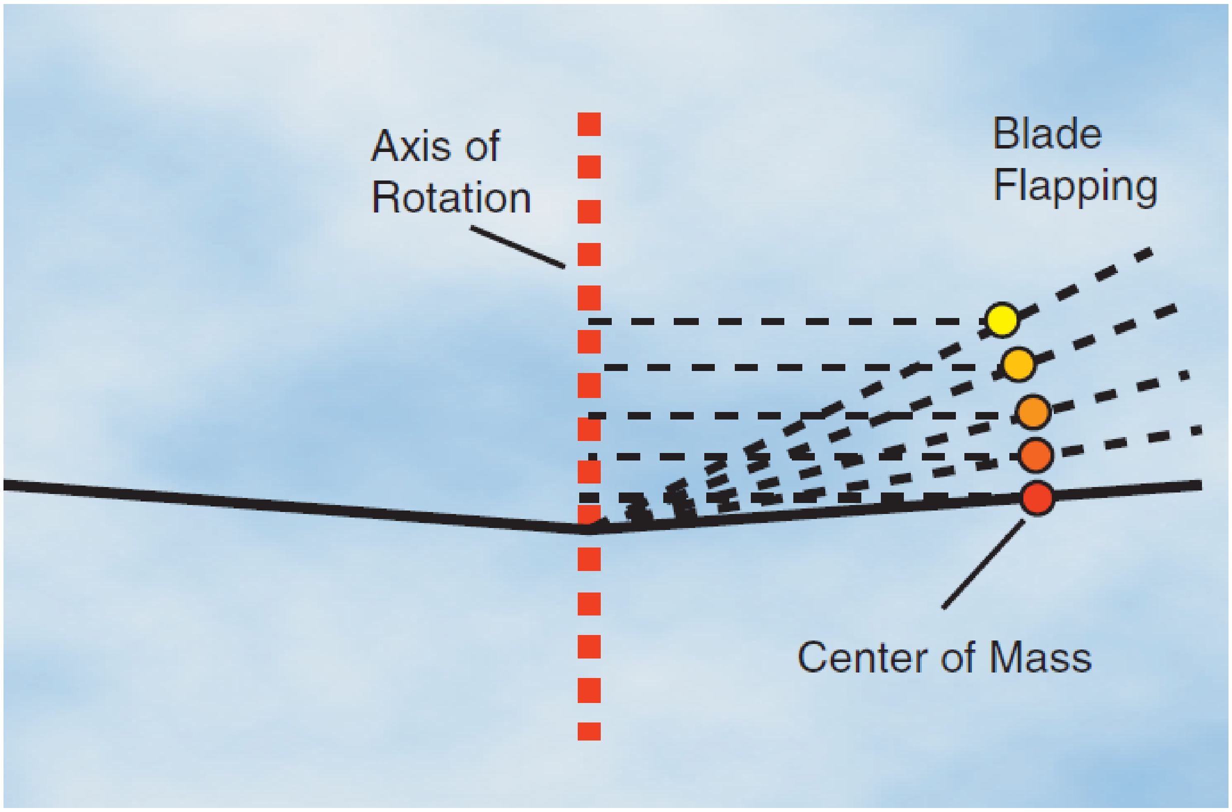


Fig. PPL (H) POF – 4

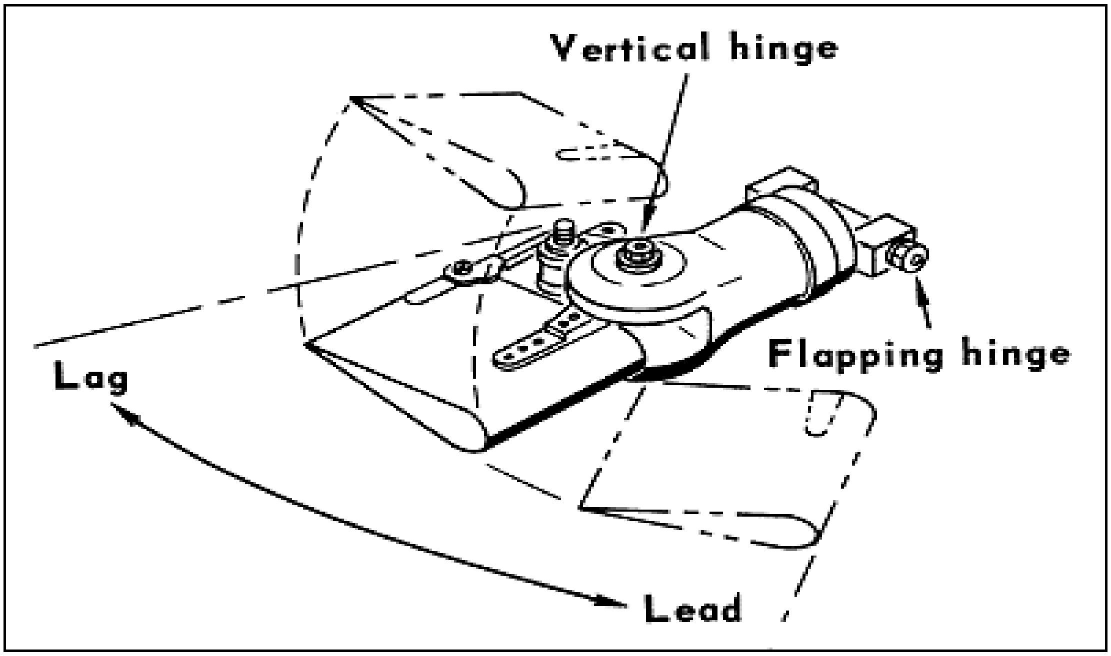


Fig. PPL (H) POF – 5

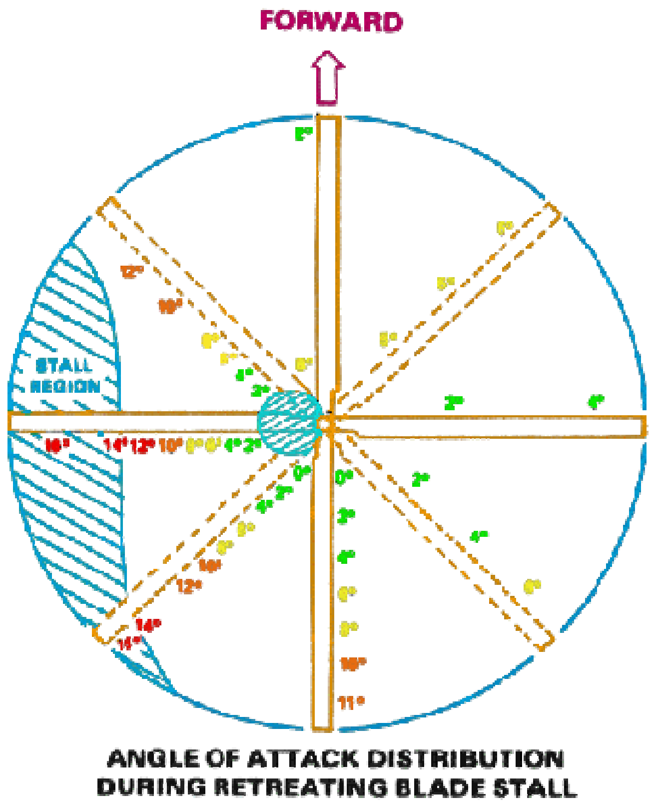


Fig. PPL (H) POF – 6

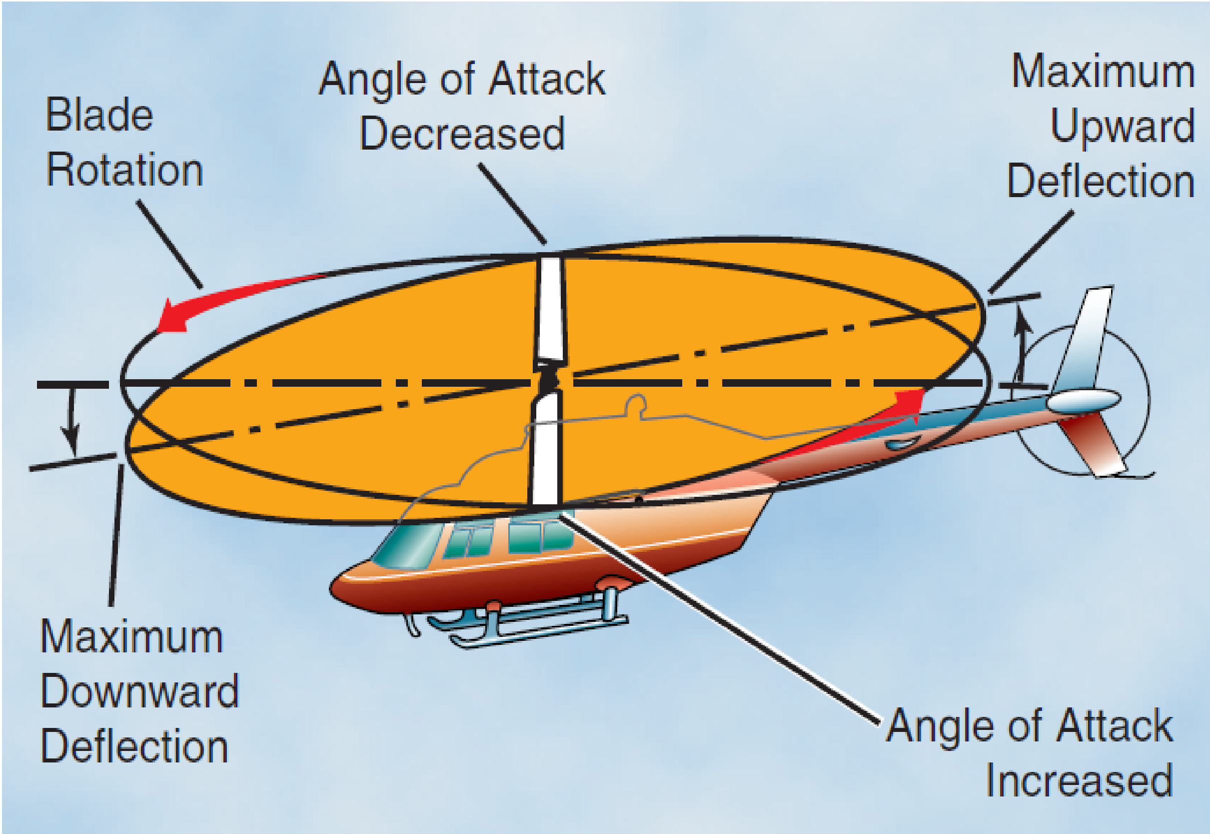


Fig. PPL(H) POF – 7

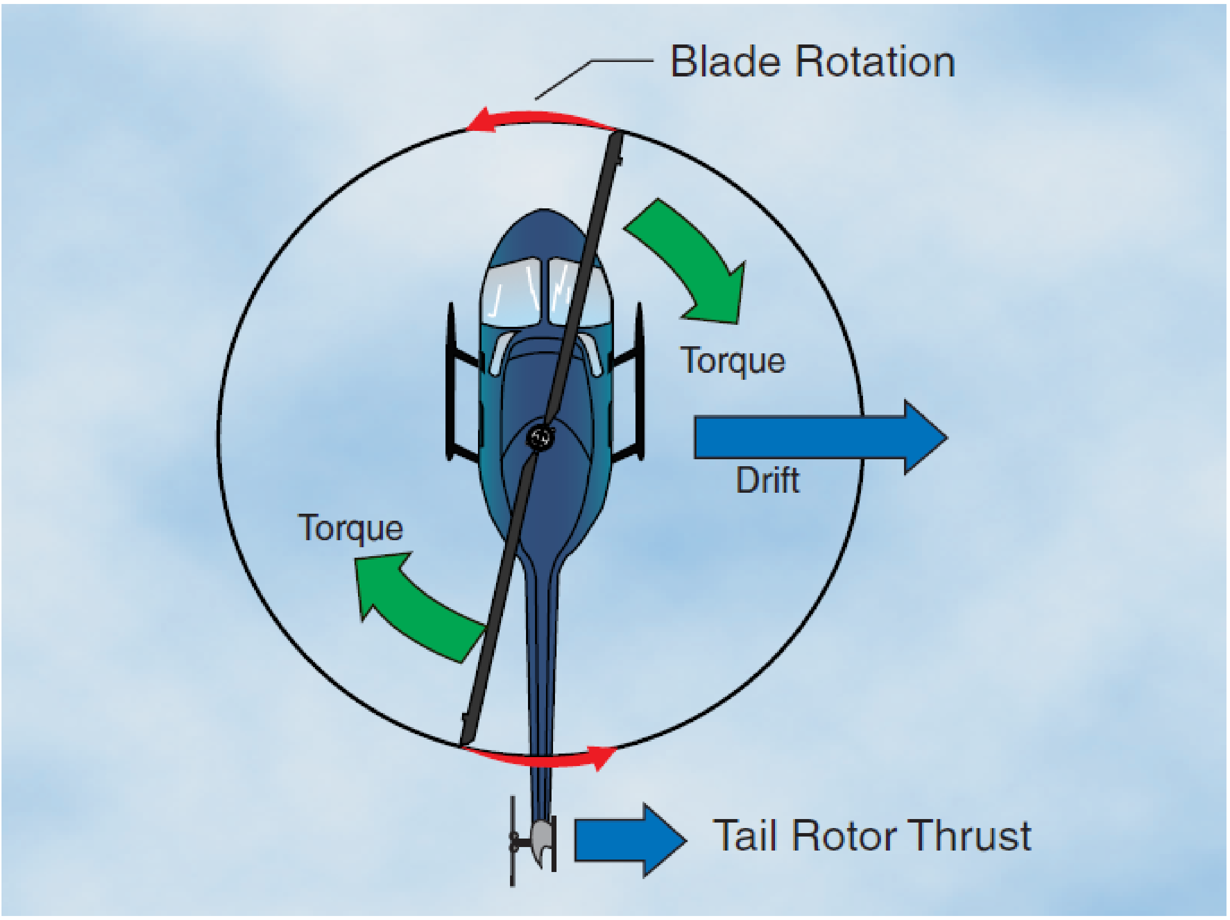


Fig. PPL(H) POF – 8

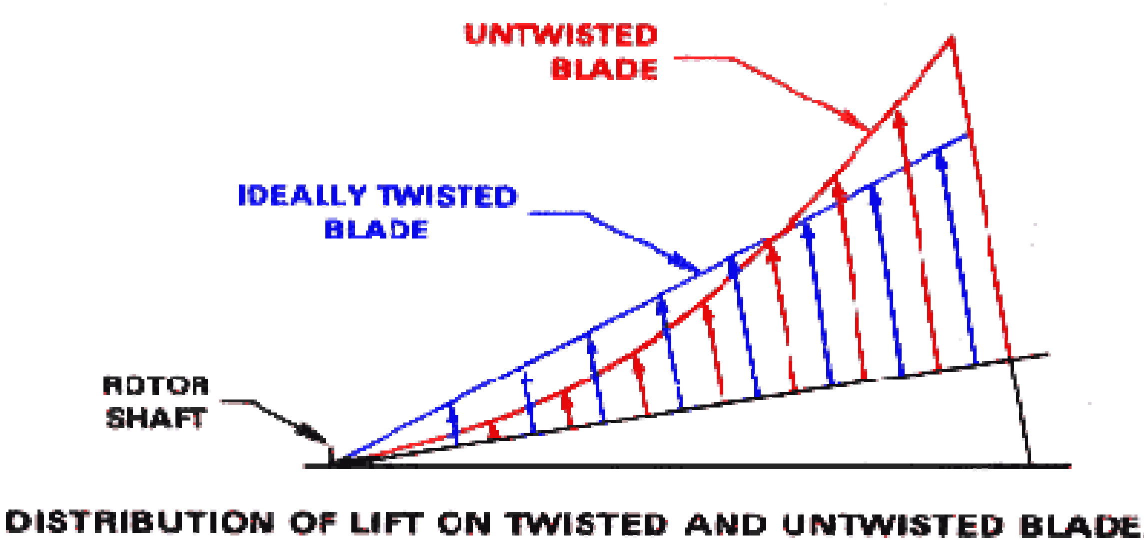


Fig. PPL(H) POF – 9

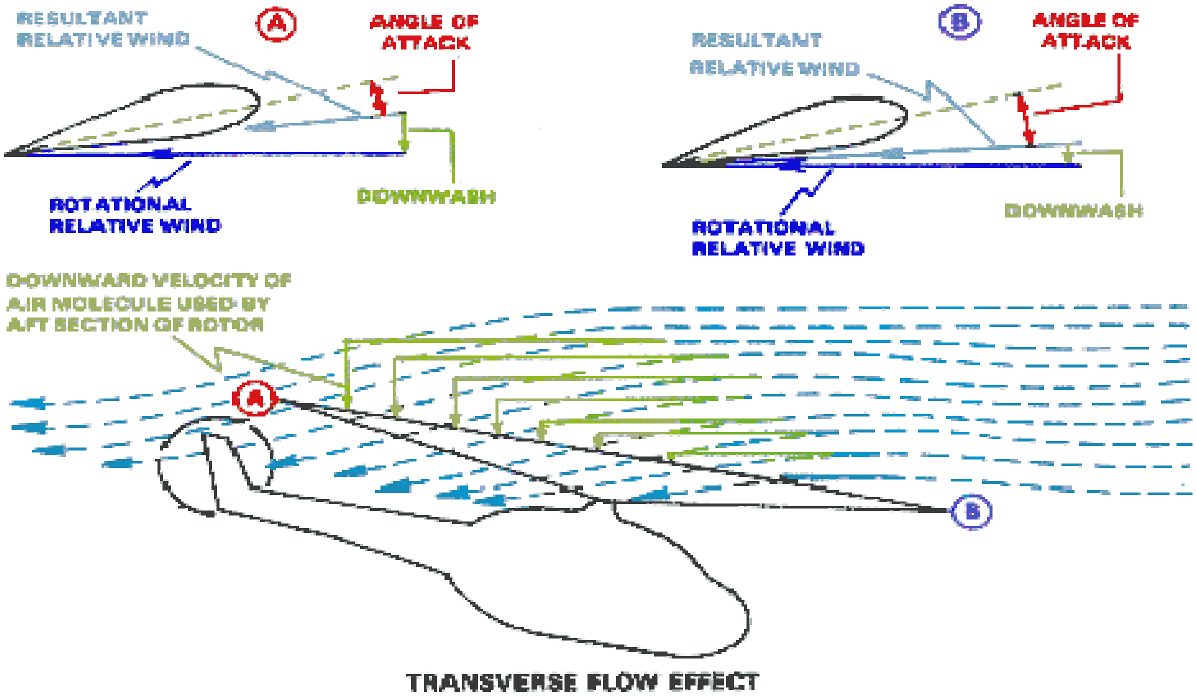


Fig. PPL(H) POF – 10

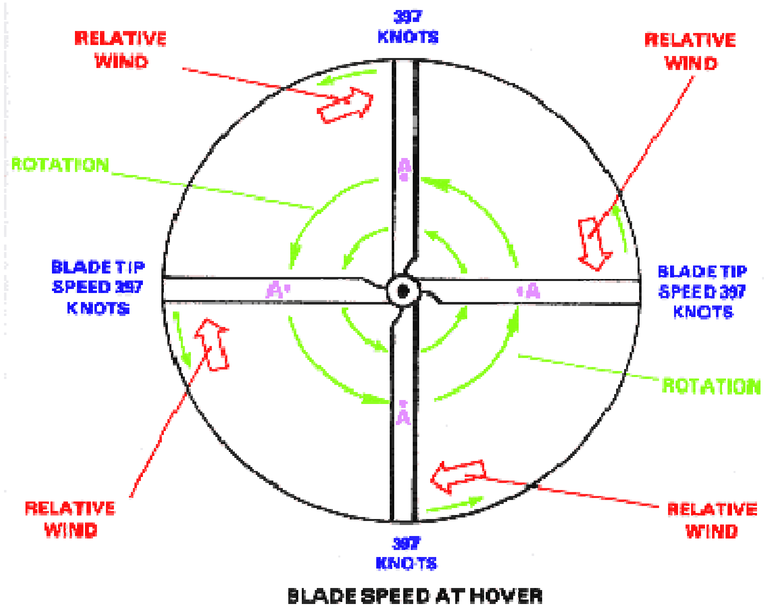


Fig. PPL(H) POF – 11

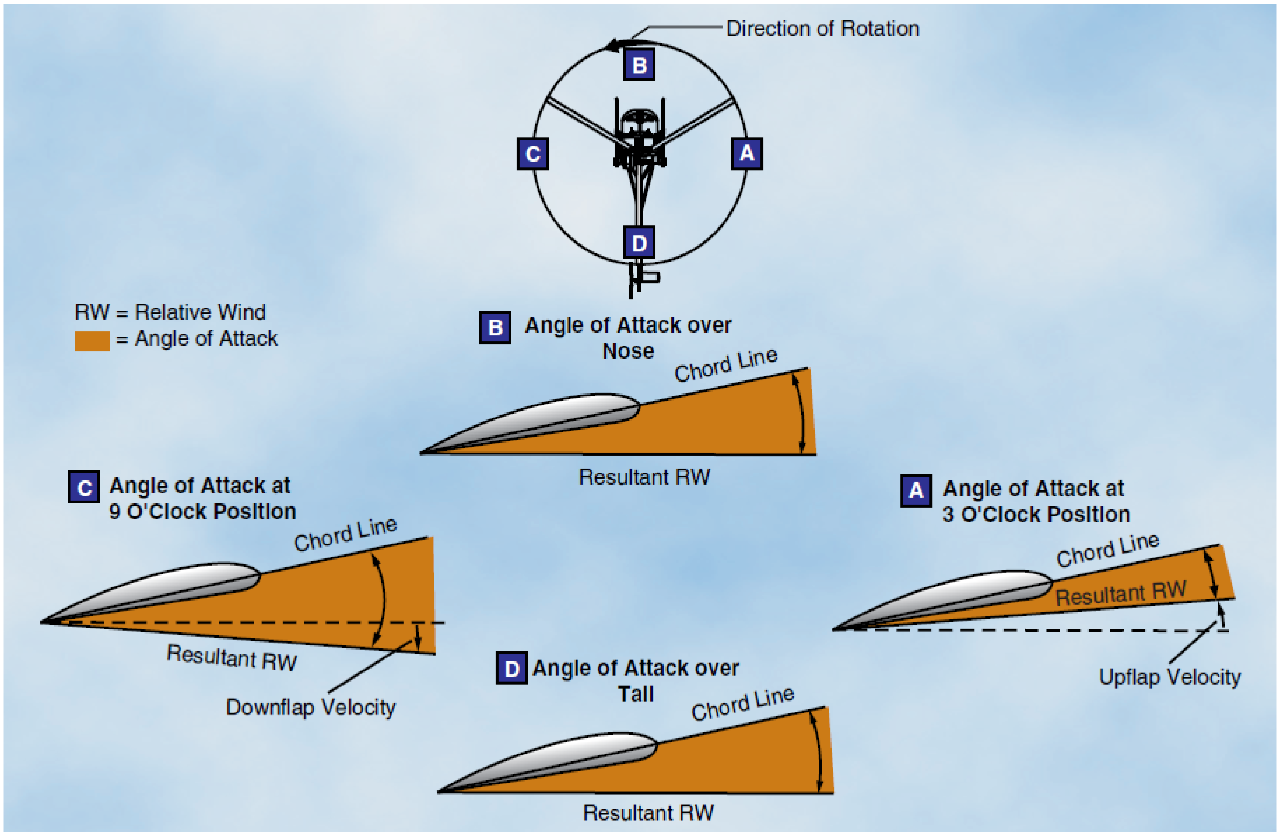


Fig. PPL(H) POF – 12

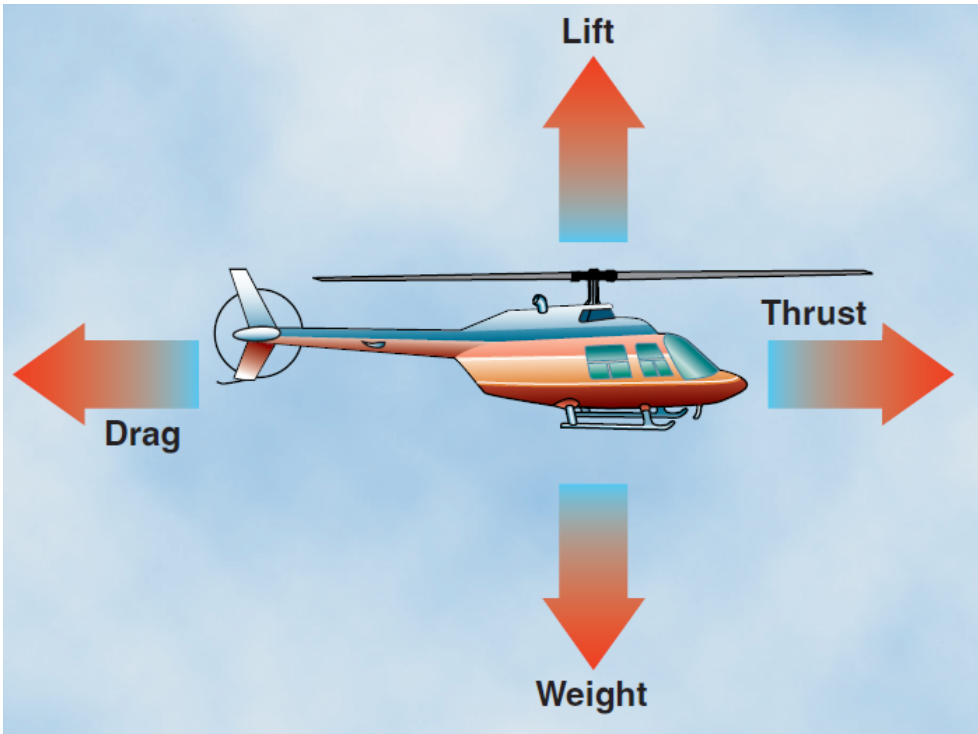


Fig. PPL(H) POF - 13

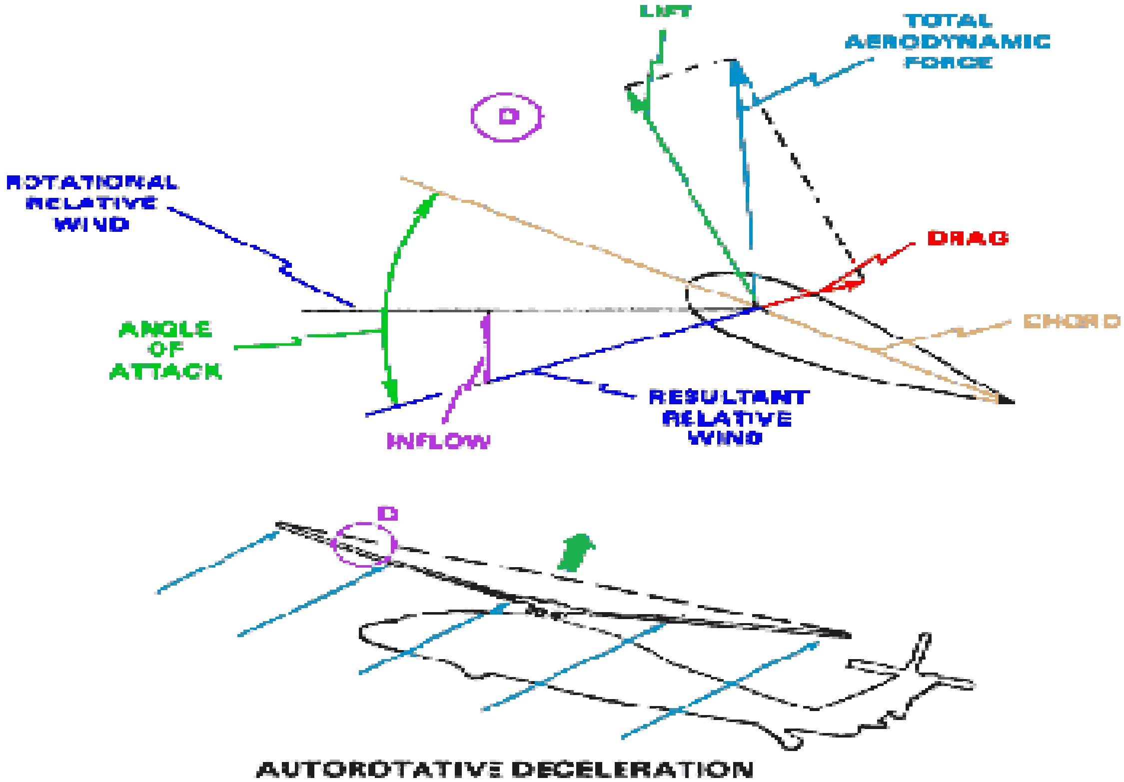


Fig. PPL(H) POF – 14

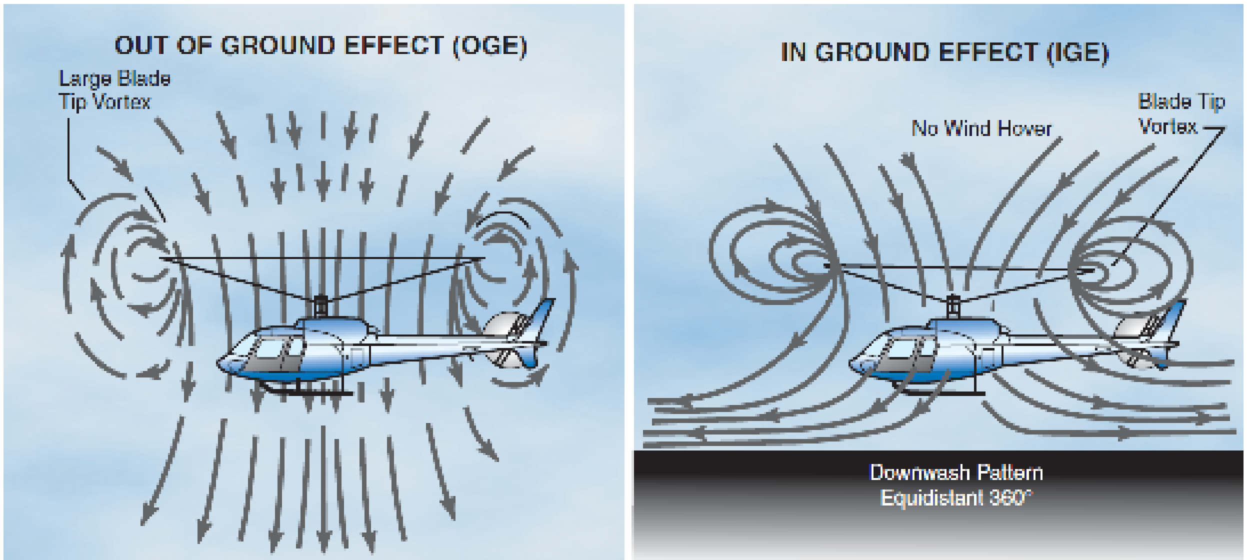


Fig. PPL(H) POF - 15

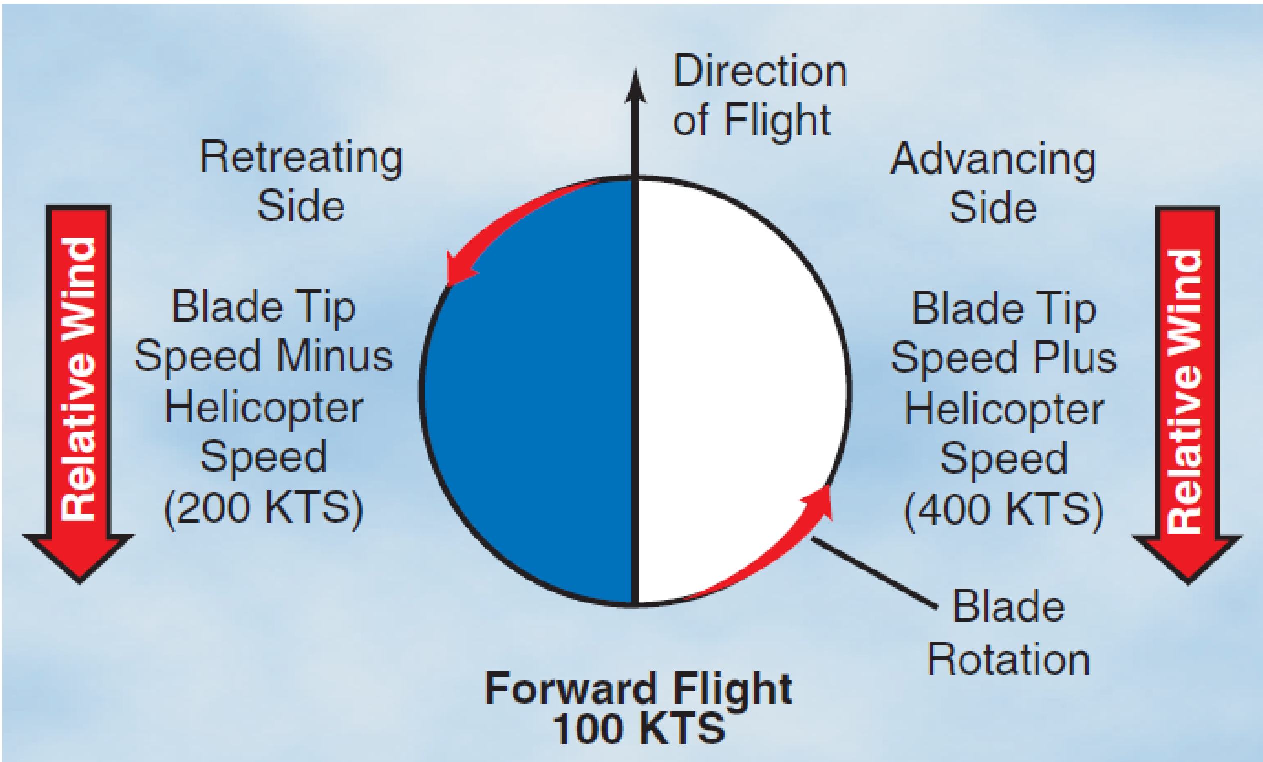


Fig. PPL(H) TL – 16

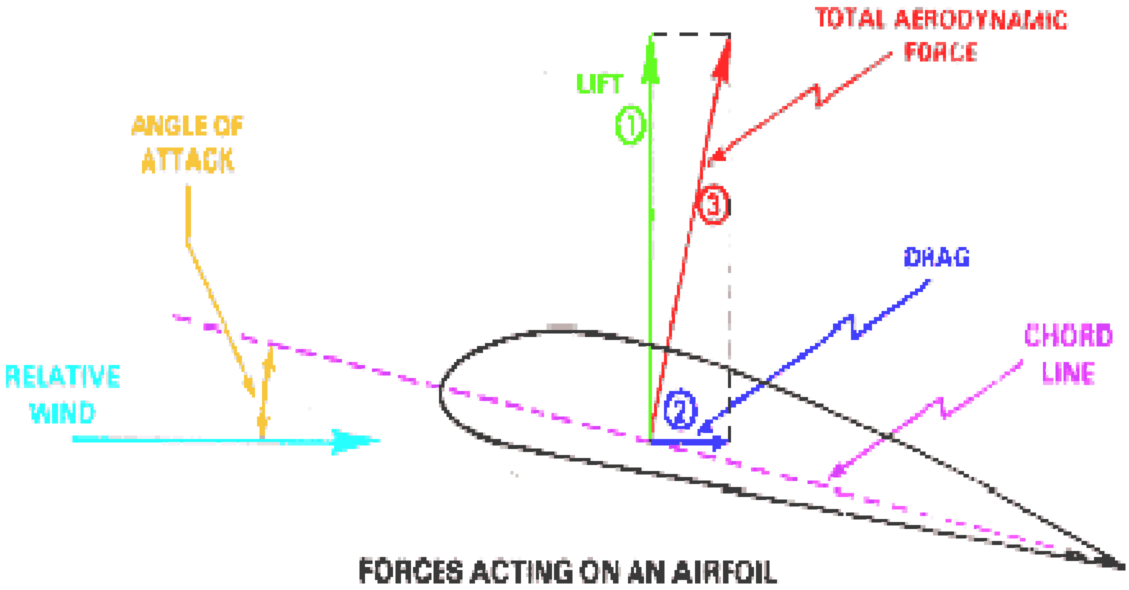


Fig. PPL(H) POF – 17

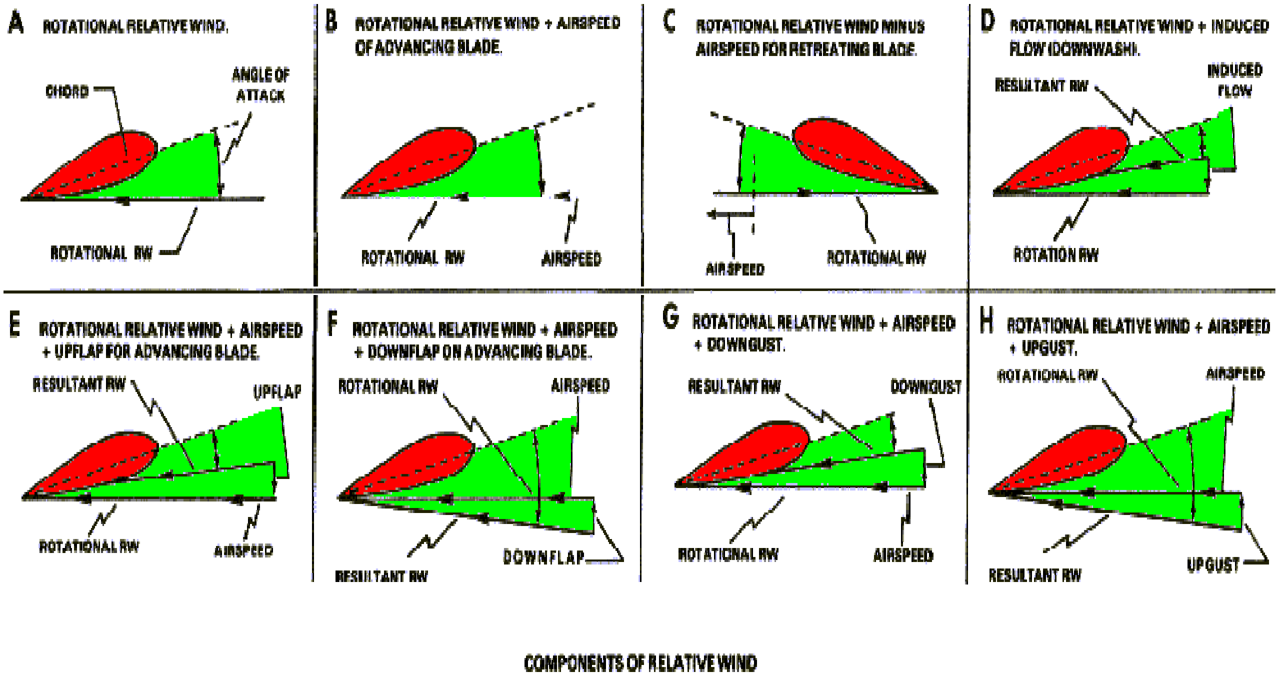


Fig. PPL(H) POF – 18

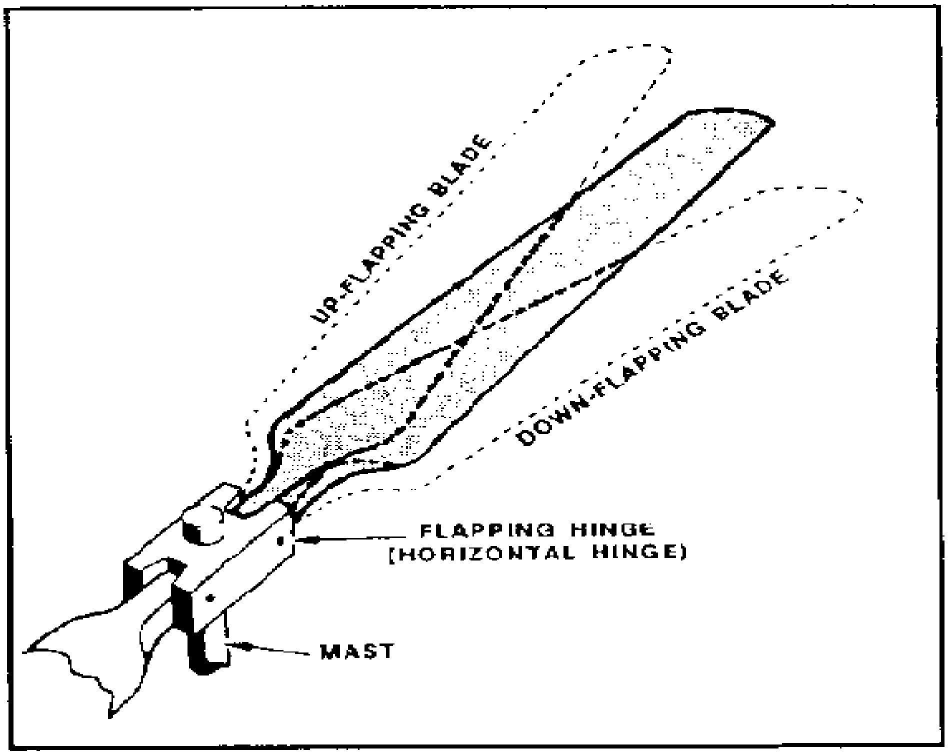


Figure 2-7. Flapping (articulated hub)

Fig. PPL(H) POF – 19

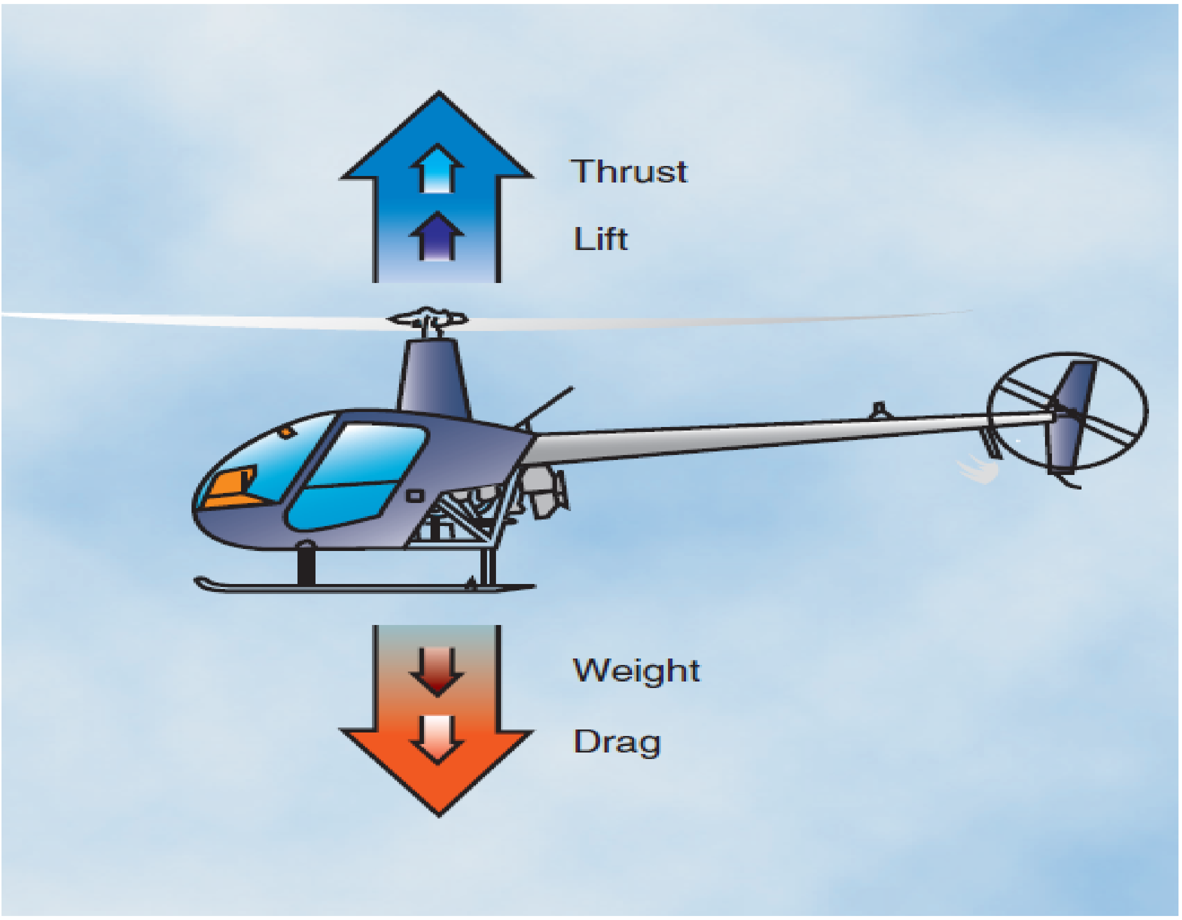


Fig. PPL(H) POF – 20

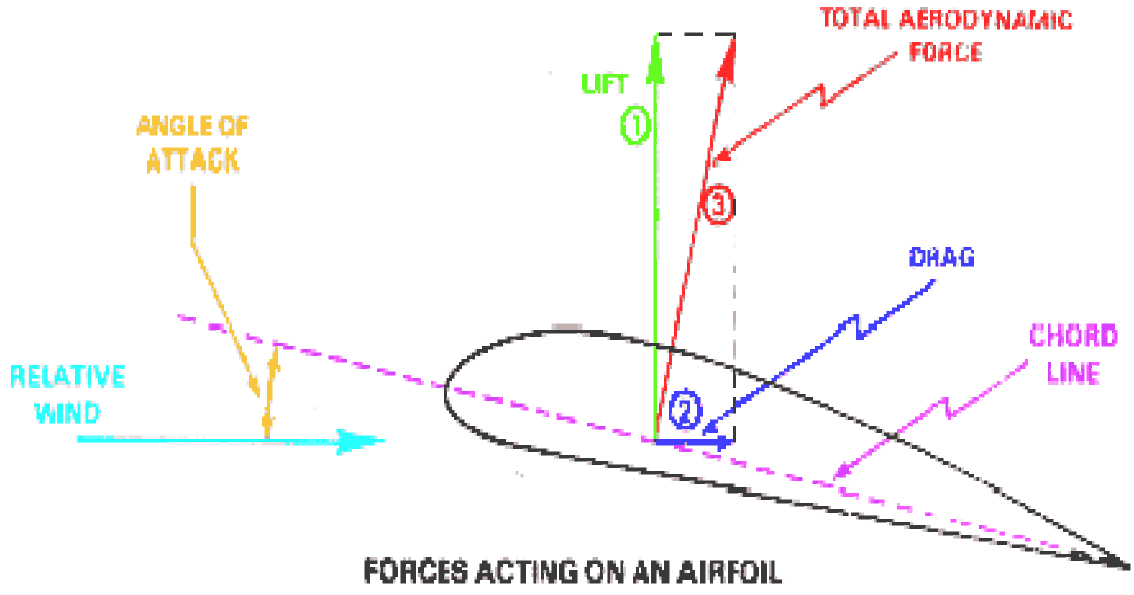
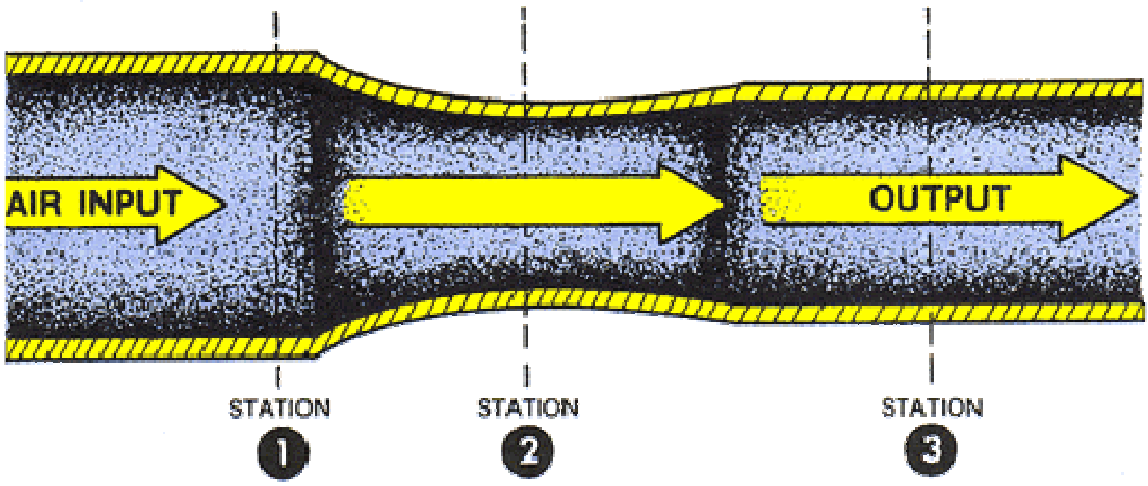


Fig. PPL(H) POF – 21



Flow through a tube.

Fig. PPL(H) POF – 22

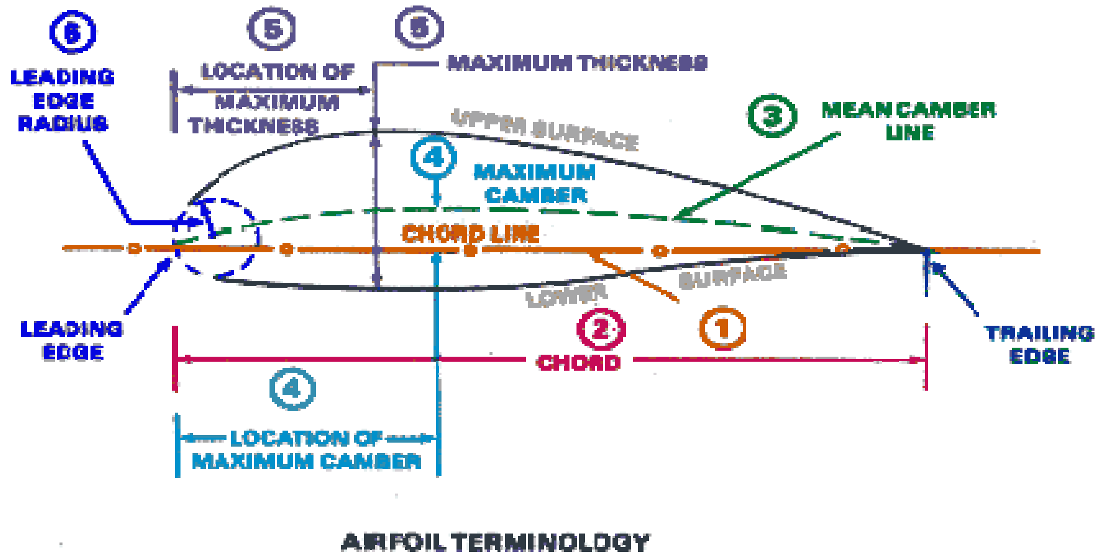
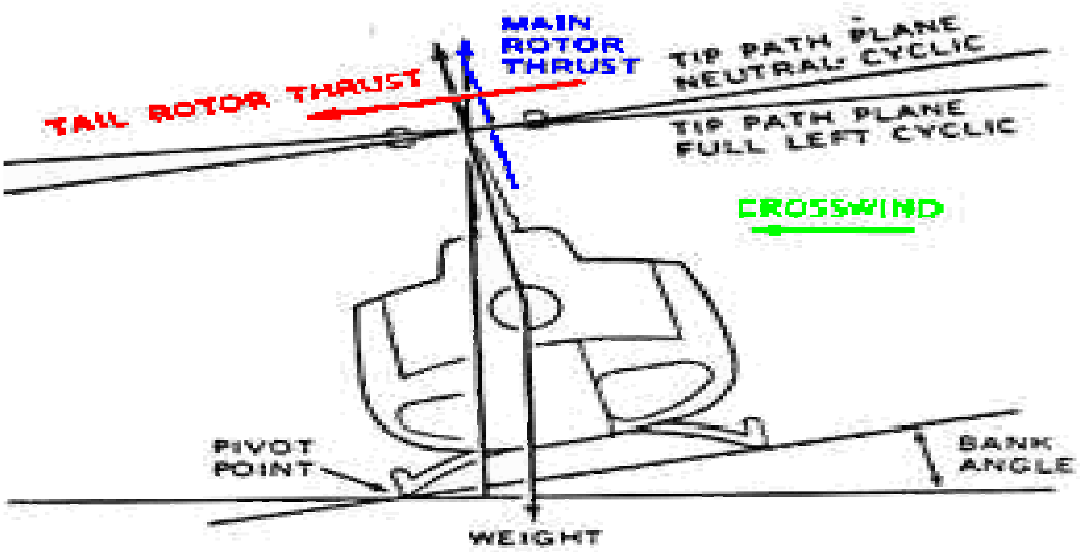


Fig. PPL (H) POF – 23



During normal takeoffs to a hover and landings from a hover, cross slope takeoffs and landings, and takeoffs from the ground with bank angle or side drift a situation can exist where the helicopter will pivot about the skid/wheel which remains on the ground and enter a rolling motion that cannot be corrected with full lateral cyclic input

Fig. PPL(H) POF – 24

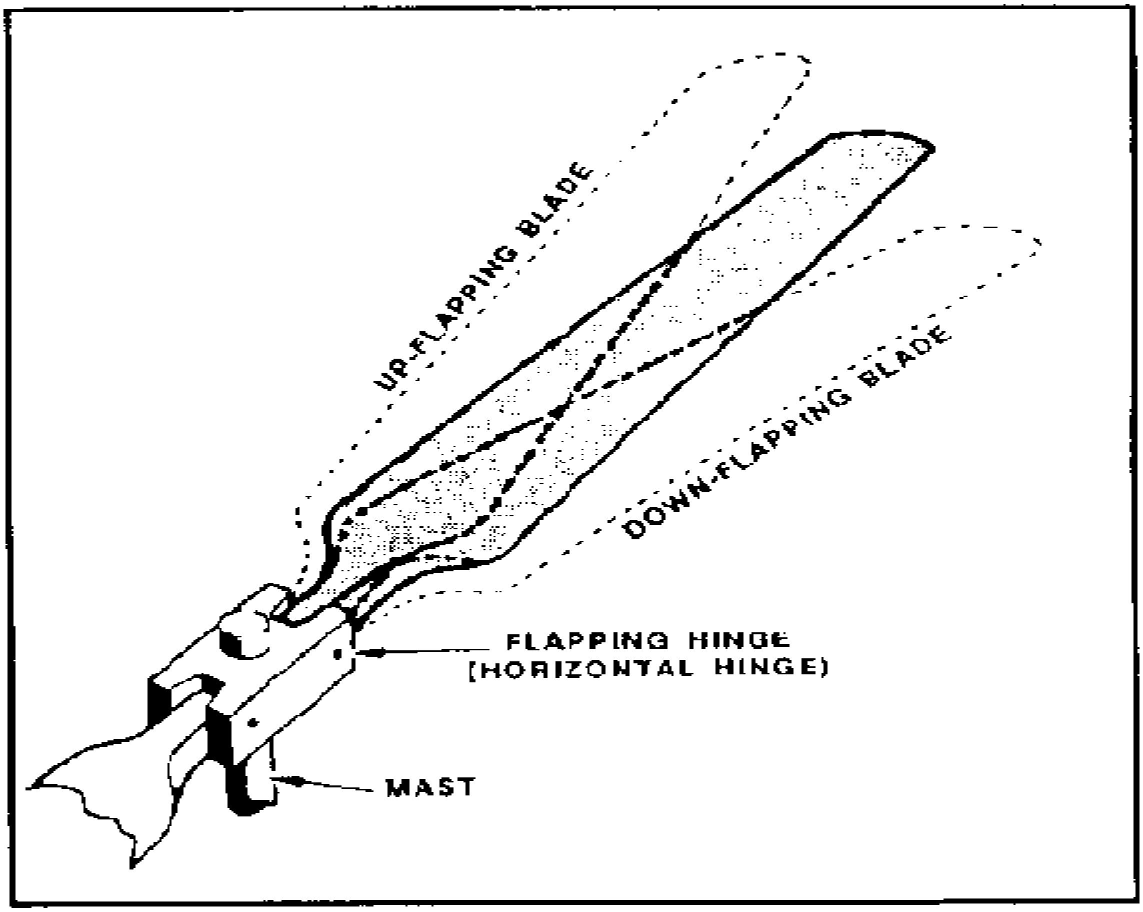


Figure 2-7. Flapping (articulated hub)

Fig. PPL(H) POF – 25

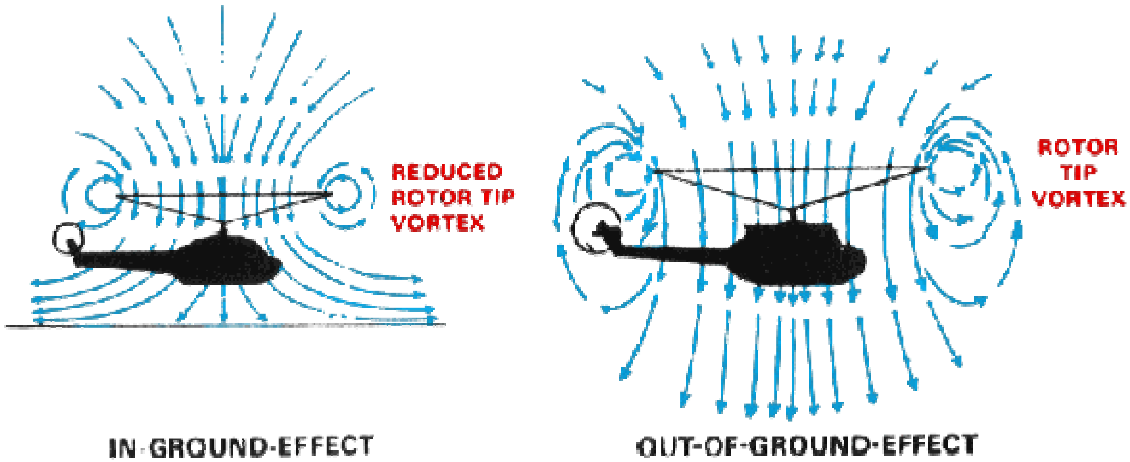


Fig. PPL(H) POF – 26