SPECIALIZED HELICOPTERS

Robinson R22

Maneuver Guide

Introduction

The intention of this guide is to aid both students and instructors while conducting training in the R22. It should be understood that because of the many variables in geographic location, altitudes, loading and individual instructor techniques, minor modifications to certain maneuvers may be necessary. For the purposes of training, the following parameters should be adhered to.

Normal Climb	60 KTS @104% RPM
Normal Cruise	75 KTS @ 102% RPM
Hovering	5 feet @ 104% RPM
Takeoffs	104% RPM
Autorotative Descents	60 -70 KTS
Maximum Hover Speed - Forward	I0 KTS Groundspeed
Maximum Hover Speed Lateral/Rearward	5 KTS Groundspeed

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Maneuver

STRIGHT AND LEVEL FLIGHT

Purpose: To fly the helicopter at a constant airspeed, altitude, and heading.

Description

Attitude or pitch control with the cyclic is the most important aspect of straight and level flight. A level flight attitude is best determined by referencing the horizon with a fixed point in the cockpit, such as the magnetic compass or the tip path plane. The pilot will be able to detect changes in attitude by noting changes between the fixed point and the horizon. Airspeed is determined by attitude and controlled by the cyclic. As in all helicopters, the P.22 cyclic control is very sensitive and requires very slight pressure to effect a change. Normal cruise airspeed for training is 75 KTS.

Level Flight Attitude
Constant Airspeed

Nose High Attitude
Airspeed Decreases

Nose Low AttItude
Airspeed increases

Altitude is controlled primarily by the collective. Each collective movement will require a corresponding pedal adjustment to maintain the aircraft in trim. Art increase of collective will require left pedal.

A collective decrease will required right pedal. Additionally, when the collective is increased, the nose will tend to rise, requiring slight forward cyclic to maintain a level or cruise flight attitude. The opposite is true with a decrease in collective - — -the nose will move down, requiring a slight aft cyclic.

At most normal manifold pressure settings, the RPM is correlated and few throttle adjustments will be required. However, high manifold pressure settings or high density altitude conditions will require the pilot to maintain RPM with throttle. An increase in collective will require an increase in throttle to prevent low RPM. A decrease in collective will require a decrease in throttle to prevent high RPM.

PERFORMACE STANDARDS:

	Private	Commercial
Airspeed	± 10 KTS	± 5 KTS
Altitude	± 100 feet	± 50 feet
Heading	± 10°	± 5°
RPM	±2%	±2%

NORMAL CLIMBS AND DESCENTS

Purpose: To change altitude at a controlled rate in a controlled attitude.

Description:

1. Climbs:

For training purposes, climb airspeed is 60 KTS at a 500 feet per minute rate of climb. From straight and level flight at 75 KTS, clear above the aircraft. Initiate the climb by increasing collective to climb power (manifold pressure setting which will provide a 500 ft/mm climb at 60 KTS) and the RPM to 104% with throttle. Maintain aircraft trim with a slight amount of left pedal and apply aft cyclic to adjust the attitude to a “60 KT climb attitude.” 50 feet prior to reaching the level-off altitude, begin the level off lowering the nose to a 75 KT attitude with forward cyclic, decreasing the collective slowly to cruise power (manifold pressure setting for level flight at 75 ICTS) and reducing the RPM to 102%. Maintain aircraft trim with right pedal. Throughout the climb and level-off, continually crosscheck outside references - (attitude and heading) with inside references - (flight instruments).

2. Descents:

For training purposes, descent airspeed is 60 KTS at a 500 feet per minute rate of descent. From straight and level flight at 75 KTS, clear below the aircraft. Initiate the descent by decreasing collective to a manifold pressure setting that will provide a 500 ft/mm descent at 60 KTS. Maintain aircraft trim with a slight amount of right pedal and RPM, if necessary, with throttle. Apply aft cyclic to adjust the attitude to a “60 KT attitude.” 50 feet prior to reaching the level off altitude, begin the level off by increasing the collective slowly to cruise power. Maintain aircraft trim with left pedal and RPM, if necessary, with throttle. Apply forward cyclic to adjust the attitude to a level flight attitude. Throughout the descent and level off, continually crosscheck outside references - (attitude and heading) with inside references -(flight instruments)

PERFORMANCE STANDARDS:

	Private	Commercial
Airspeed	± 10 KTS	± 5 KTS
Level Off Altitude	± 100 feet	± 50 feet
Heading	± 10°	± 5°
RPM	±2%	±2%

TURNS

Purpose: To turn the aircraft using a constant angle of bank at a constant airspeed and altitude.

Description:

From straight and level flight at 75 KTS, clear the aircraft in the direction of turn. Smoothly apply cyclic towards the direction of turn until the desired angle of bank is reached. Unlike an airplane, the pedals should not be used to assist the turn. Use the horizon as a reference to maintain a 75 KT attitude and the desired angle of bank with cyclic. As the angle of bank increases, additional collective may be required to maintain altitude. Keep the aircraft in trim with the pedals. Begin the recovery from the turn just prior to reaching the desired roll-out heading. Apply cyclic opposite the direction of turn, and if any collective has been added during the turn, reduce it back to cruise power, while maintaining aircraft trim.

PERFORMANCE STANDARDS:

	Private	Commercial
Airspeed	± 10 KTS	± 5 KTS
Altitude	± 100 feet	± 50 feet
Roll-Out Heading	± 10°	± 5°

ACCELERATION/DECELERATION

Purpose: To increase pilot control co-ordination. Maintaining a constant altitude, accelerate to 85 KTS, decelerate to 60 KTS, then accelerate back to 75 KTS.

Description:

From straight and level flight at 75 KTS, slowly increase the collective approximately 2" above cruise power, adding left pedal and forward cyclic. As the aircraft begins to accelerate, adjust cyclic, collective, pedals, and throttle movements as necessary to stabilize at 85 KTS and level flight. Begin the deceleration by slowly reducing the collective co-ordinated with right pedal and aft cyclic. Again, use all controls slowly and smoothly as necessary to decelerate to 60 KTS and level flight. Accelerate back to 75 KTS by increasing collective to cruise power, left pedal and forward cyclic to attain level flight at 75 KTS.

Throughout the maneuver, a constant crosscheck of airspeed. altitude, attitude, RPM and trim must be maintained.

PERFORMANCE STANDARDS:

	Private	Commercial
Altitude	± 100 feet	± 50 feet
Airspeed	± 10 KTS	± 5 KTS
RPM	± 2%	± 2%
Heading	± 10°	± 5°

TAKEOFF TO A HOVER

Purpose: To transition from the ground to a stabilized 5 foot hover.

Description:

After completing a pre-takeoff check, clear the helicopter left and right. With the collective full down and the cyclic and pedals neutralized, slowly increase the throttle. As the RPM passes 95%, increase the collective and simultaneously adjust the throttle to maintain 104% RPM. Above 18" manifold pressure, the throttle is correlated, and few adjustments will be required. A small amount of left pedal will normally be required to compensate for the increased torque. As the helicopter becomes light on the skids, select a reference point 50 to 75 feet in front of the helicopter and neutralize all aircraft movement with the cyclic and pedals. Continue to increase the collective smoothly and slowly, maintaining heading with slight pedal corrections. Since the R22 normally hovers in a nose low attitude with two occupants, the heels of the skids will begin to break ground first. Compensate with aft cyclic. As the helicopter becomes light on the skids, extreme caution must be used to avoid any rearward or lateral movement since this can cause an immediate rollover. Should any lateral or rearward movement occur, immediately lower the collective and begin again. The helicopter should rise vertically, maintaining heading with pedals, position over the ground with cyclic, and altitude with the collective. After attaining a stabilized 5 foot hover, perform hover check:

1. RPM- 104%
2. Engine instruments - green range
3. Hover power (manifold pressure)
4. Carb Heat - As necessary

PERFORMANCE STANDARDS:

	Private	Commercial
Heading	± 100	± 50
RPM	±2%	±2%
Altitude	± 2 feet	± 1 foot
Position	10' Circle	5' Circle

LANDING FROM A HOVER

Purpose: To land the helicopter from a 5 foot hover.

Description:

From a stabilized 5 foot hover, headed into the wind, slightly lower the collective to establish a slow rate of sink. A small amount of right pedal will be needed to maintain heading. The cyclic will be used to maintain position over the ground. Vision should be directed 50 - 75 feet in front of the helicopter. Do not look immediately in front of the helicopter, as this will lead to over controlling.

As the helicopter descends to about 6 inches, additional downward pressure on the collective may be necessary to overcome the increase in ground effect. As the skids make ground contact, neutralize all aircraft movement with, cyclic and pedals, continuing to smoothly lower the collective until it is full down. Due to the nose low attitude of the R22 with two people aboard, the toes of the skids will normally touch first on level terrain. A slight amount of forward cyclic will be necessary as ground contact is made. During solo flight, the attitude of the R22 is level and will not require forward cyclic when ground contact is made.

-----C A U T I O N-----

Do not allow the helicopter to land with any rearward or sideward movement.

PERFORMANCE STANDARDS:

	Private	Commercial
Reading	± 10°	± 5°
RPM	± 2%	± 2%
Drift	4 feet	2 feet

HOVERING FLIGHT

Purpose: To maneuver the helicopter forward, sideward, rearward and turn the aircraft while hovering.

Description:

1. Forward, sideward and rearward flight.

From a stabilized 5 foot hover, headed into the wind, move the cyclic smoothly towards the desired direction of flight. Maintain heading with small pedal corrections and altitude with collective. As movement begins, adjust the cyclic to keep the groundspeed at a constant rate equivalent to a normal walk. Reference points along the direction of flight can be used to maintain correct ground track. To stop the movement, apply cyclic opposite to the direction of movement until the helicopter stops. During all phases of hovering, cyclic changes should be small and smooth to minimize the effects of over controlling or pendular action.

Crosswind hovering is accomplished in much the same manner. The cyclic must be inclined into the wind enough to cancel out any tendency for the helicopter to drift.

2. Hovering Turns.

Hovering turns are accomplished by use of the pedals. With the helicopter headed into~ the wind, apply pedal in the desired direction of turn. As the helicopter turns, counter pressures on the opposite pedal should be used to maintain a slow, constant rate of turn. (A rate of 360° in 15 seconds is recommended.)

Cyclic is used to control attitude and position over the ground and should be continually adjusted into the wind to avoid drifting and excessive attitude changes during the turn. Maintain a constant altitude with the collective. Normally, a slight altitude and RPM loss will occur in a left turn due to the increased pitch of the tail rotor blades. This can be corrected with a slight increase in collective and throttle if necessary. Right turns produce just the opposite effect. A decrease in the tail rotor pitch will cause a slight increase in RPM and altitude. If necessary, compensate by slightly lowering the collective and reducing throttle. As the desired heading is reached, stop the turn by applying slight pressure on the opposite pedal.

PERFORMANCE STANDARDS:

	Private	Commercial
Headings	± 10°	± 5°
RPM	±2%	±2%
Altitude	± 2 feet	± 1 foot
Ground Track	± 5 feet	± 3 feet

TRAFFIC PATTERN OPERATIONS

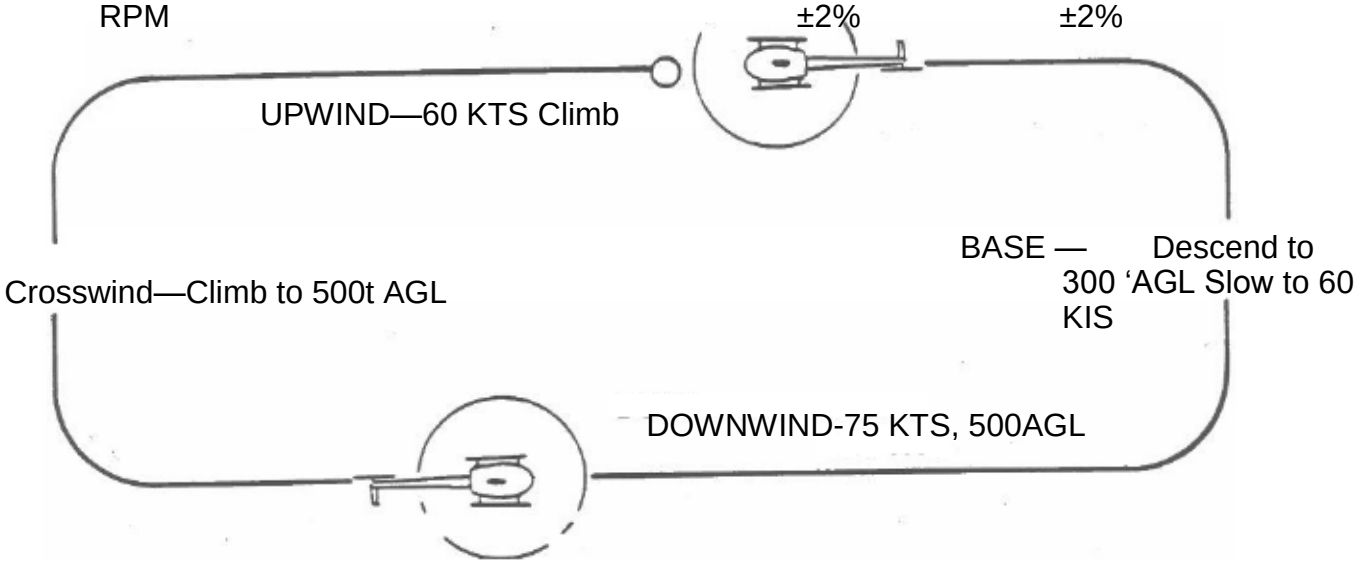
Purpose: For training purposes, traffic pattern operations are used for the practice of continual takeoffs and landings.

Description:

1. Upwind Leg - After takeoff, assume a normal climb at 60 ICS. Upon reaching a predetermined point on the ground, begin a 90° turn to crosswind.
2. Crosswind Leg - Maintain ground track by crabbing the helicopter into the wind. 50 feet prior to reaching 500 feet AGL, begin a level off by accelerating slowing to 75 KTS and reducing the power to cruise power. Upon reaching a predetermined point on the ground, begin a 90° turn to downwind.
3. Downwind Leg - Groundspeed will increase due to the downwind condition. Fly the downwind leg at 75 KTS and 500 feet AGL using ground reference points to maintain ground track. Upon reaching a predetermined point on the ground, decrease the collective to establish a descent. Once the descent is established, begin a 900 turn and start decelerating to 60 KTS. This turn will require a steeper angle of bank due to the downwind condition.
4. Base Leg - On base, descend to 300 feet AGL and slow to 60 KTS. Plan the turn from base to final so as to roll out aligned with the point of intended touchdown.
5. Final - Fly the final approach leg at 60 KTS and 300 feet AOL until the appropriate approach angle is reached.

PERFORMANCE STANDARDS:

	Private	Commercial
Altitude	± 100 feet	± 50 feet
Airspeed	± 10 KTS	± 5 KTS
RPM	±2%	±2%



NORMAL TAKEOFF FROM A HOVER

Purpose: To transition from a hover to a normal climb.

Description:

From a stabilized 5 foot hover, select an object(s) along the takeoff path for use as a reference point to maintain ground track. Clear the aircraft left and right with a clearing turn, then complete a before takeoff check (RPM 104%, warning lights, instruments and Carb Heat). Begin the takeoff with a small amount of forward cyclic to get the helicopter moving forward. If the helicopter begins to settle, increase the collective as necessary to hold altitude and maintain heading with pedals. As the airspeed increases to approximately 10 to 12 KTS, effective translational lift (ETL) will occur, and can be felt as a lateral vibration. At ETL, lift will increase noticeably causing the nose to pitch up. Apply sufficient forward cyclic to continue the acceleration and prevent the nose from rising. As airspeed increases, the streamlining of the fuselage and the increased efficiency of the tail rotor will cause a left yaw, requiring a right pedal correction. Continue to smoothly accelerate, maintaining ground track. At an altitude of 300 feet and an airspeed of 55 KTS, adjust manifold pressure to climb power and slight aft cyclic to establish a 60 IC climb attitude.

Crosswind Considerations:

During crosswind takeoffs, the helicopter is flown in a slip to an altitude fo 50 feet. Place the cyclic into the wind as necessary to maintain the proper ground track. Apply opposite pedal to align the fuselage with the ground track. Above 50 feet, crab the helicopter into the wind by putting the aircraft in trim and maintaining ground track with cyclic.

NOTE

During the takeoff, the acceleration to climb speed and the commensurate altitude gain should be accomplished without entering the shaded areas of the R22's height-velocity diagram.

PERFORMANCE STANDARDS:

	Private	Commercial
Drift below 10 feet	± 25 feet	± 10 feet
Drift above 10 feet	± 50 feet	± 25 feet

NORMAL APPROACH TO A HOVER

Purpose: To transition from flight at altitude to a stabilized 5 foot hover.

Description:

On final approach, the helicopter should be headed into the wind, aligned with the point of intended touchdown, at 60 KTS and 300 feet AGL. When a normal approach angle of 10° is intercepted, begin the approach by lowering the collective sufficiently to get the helicopter descending down the approach angle. With the decrease in collective, the nose will tend to pitch down, requiring aft cyclic to maintain a 60 IC attitude and right pedal to maintain heading. The pilot can determine the proper approach angle by relating the point of intended touchdown to a point on the helicopter windshield. The collective controls the angle of approach. If the touchdown point seems to be moving up on the windshield, the angle is becoming shallower, necessitating a slight increase in collective. If the touchdown point moves down on the windshield, the approach angle is becoming steeper, requiring a slight decrease in collective. The cyclic is used to control the rate of closure or how fast you are moving toward the touchdown point. Maintain entry airspeed until the apparent groundspeed and rate of closure appear to be increasing. At this point, slowly begin decelerating with slight aft cyclic, maintaining the approach angle by smoothly reducing the collective. Use the cyclic to maintain a rate of closure equivalent to a brisk walk. At approximately 25 to 40 feet, depending on wind, the helicopter will begin to lose effective translational lift. This loss will be felt as a lateral vibration and the aircraft will begin to settle. The pilot must anticipate the loss of ETh, and compensate with increased collective to maintain the approach angle, and increase the RPM to 104%. The increase of collective will tend to make the nose rise requiring forward cyclic to maintain proper rate of closure. As the helicopter approaches an altitude of 5 feet, the collective should be increased sufficiently to hold a 5 foot hover, maintaining RPM at 104% with throttle, and heading with pedals. A small aft cyclic input may be necessary to stop any forward movement.

Crosswind Considerations:

During the approach, maintain a crab into the wind and the aircraft in trim. At 50 feet of altitude, a slip should be used to align the fuselage with the ground track. Apply cyclic into the wind and opposite pedal.

PERFORI4ANCE STANDARDS:

	Private	Commercial
Drift above 10 feet in altitude	± 50 feet	± 25 feet
Drift below 10 feet in altitude	± 25 feet	± 10 feet
RPM	±2%	±2%

MAXIMUM PERFORMANCE TAKEOFF AND CLIMB

Purpose: To transition from the surface to a maximum performance climb, simulating obstruction clearance.

Description:

While on the ground at a reduced RPM, check the manifold pressure limit chart on the cyclic to determine the maximum power available. Clear the aircraft left, right and overhead, then complete a before takeoff check (RPM 104%, Warning Lights, Instruments, and Carb Heat). Select a reference point(s) along the takeoff path to maintain ground track.

Begin the takeoff by getting the helicopter light on the skids. Pause and neutralize all aircraft movement. Slowly increase the collective and position the cyclic so as to break ground and maintain a 40 KT attitude (approximately the same attitude as when the helicopter is light on the skids). Continue to slowly increase the collective until the maximum power available is reached. This large collective movement will require a substantial increase in left pedal to maintain heading. The pilot must closely monitor RPM when operating within the high power range in order to maintain 104% and maximum power. The R22's throttle/collective correlation will not be as effective at higher power settings, requiring the pilot to maintain RPM with throttle. If full throttle is reached, RPM can only be increased by lowering the collective.

At 50 feet of altitude, slowly lower the nose to a normal 60 KT climb attitude. As the airspeed passes 55 KTS, reduce the collective to normal climb power and reduce RPM as necessary to maintain 104%.

PERFORMANCE STANDARDS:

	Private	Commercial
RPM	±2%	±2%
Heading	± 100	± 5°

STEEP APPROACH TO A HOVER

Purpose: To transition from flight at altitude to a hover using a steeper that normal approach angle. -

Description:

On final approach, the helicopter should be headed into the wind, aligned with the point of intended touchdown, at 60 ICTS and 300 feet AGL. When a steep approach angle of 15° is intercepted, begin the approach by lowering the collective to get the helicopter descending down the approach angle and coordinate right pedal for trim. Since this angle is steeper than a normal approach angle, the collective must be reduced more than for a normal approach. As in the normal approach, reference the touchdown point on the windshield to determine changes in the approach angle. Aft cyclic will be required to decelerate sooner than in a normal approach due to the steeper angle and the rate of closure will become apparent at a slightly higher altitude. Maintain a crab above 50 feet, and a slip below 50 feet.

Maintain the approach angle and rate of descent with collective, rate of closure with cyclic, and trim with pedals. Loss of ETL will occur higher during a steep approach requiring an increase in collective to prevent settling, forward cyclic for proper rate of closure, left pedal for trim, and increased throttle to 104%. Terminate at a stabilized 5 foot hover.

NOTE

Avoid high rates of descent at airspeeds below 30 KTS.

PERFORMANCE STANDARDS:

	Private	Commercial
Heading	± 10°	± 5°
Termination	± 10 feet	± 5 feet
RPM	±2%	±2%

STRAIGHT-IN AUTOROTATION WITH POWER RECOVERY

Purpose: To simulate safely landing the helicopter with a complete power loss.

Description:

1. The Entry - From level flight at 70 to 75 KTS, 500 to 700 feet AGL, and headed into the wind, smoothly, but firmly, lower the collective full down without reducing the throttle. Coordinate the collective movement with right pedal for trim and aft cyclic to maintain a 75 IC attitude. The RPM needles will usually split establishing an autorotative descent. If the needles do not split, reduce the throttle slightly. Crosscheck attitude, trim, rotor RPM and airspeed.

2. The Glide - After descent has been established, slowly reduce the airspeed to 60 to 70 KTS and maintain this attitude throughout the glide. During straight-in autorotative glides, aft cyclic movements will cause an increase in rotor RPM which is controlled by a small increase in collective. If the collective is increased to control the rotor RPM, retard the throttle slightly to prevent the correlator from joining the needles. Avoid a large collective increase which will result in a rapid decay of rotor RPM and lead to “chasing the RPM.” Maintain RPM in green and the aircraft in trim during the glide. Below 100 feet AOL, maintain aircraft alignment with a slip. A constant 60 to 70 IC attitude should be held with the cyclic. Avoid looking straight down in front of the aircraft. Continually crosscheck attitude, trim, rotor RPM, and airspeed.

NOTE

As the aircraft descends through 100 feet AGL, make an immediate power recovery if the following conditions do not exist:

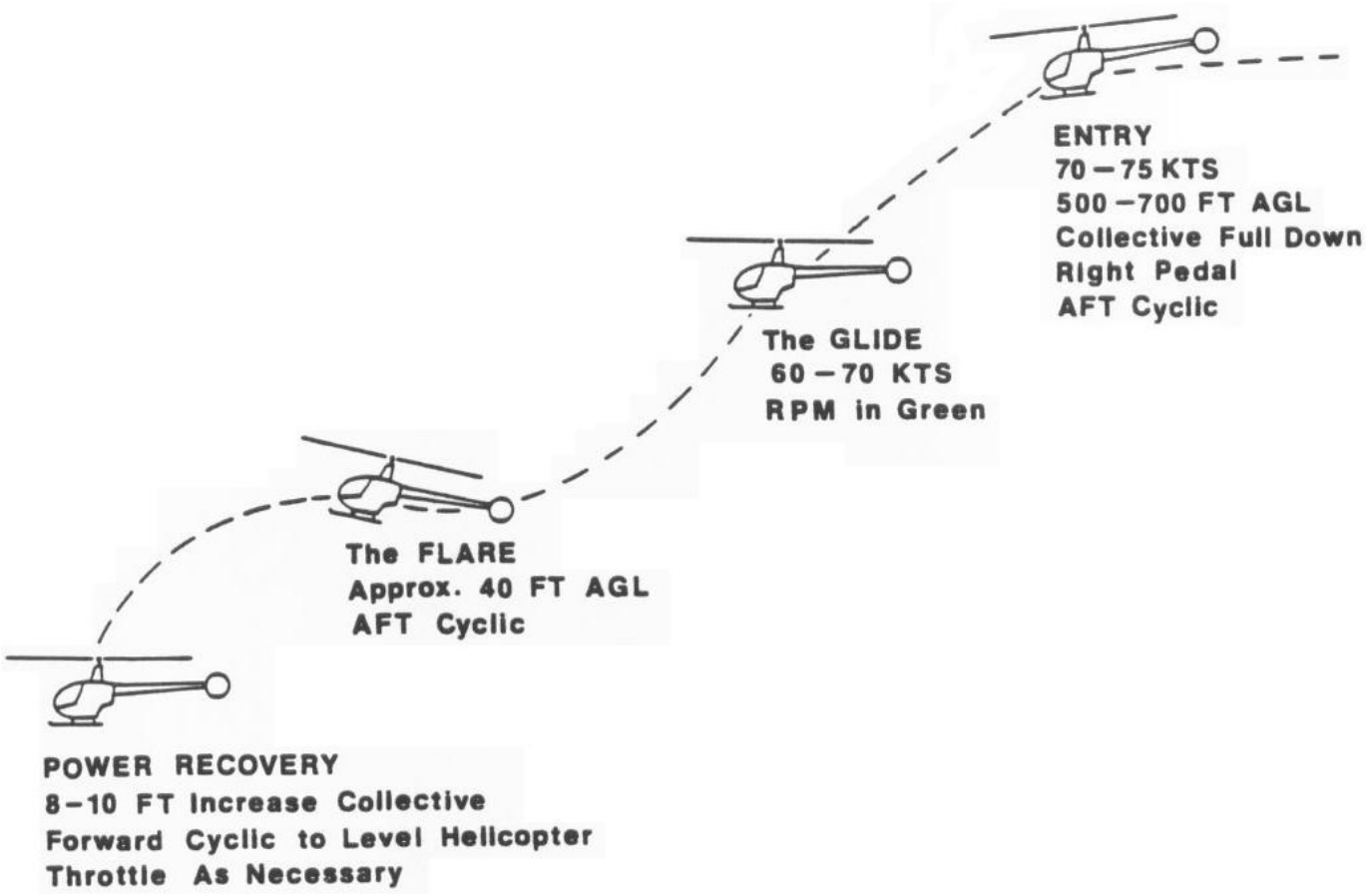
1. Rotor RPM in the green

2. Airspeed 60 to 70 KTS

3. Rate of descent less than 1500 FPM

3. The Flare - At approximately 40 feet AGL, begin the flare with aft cyclic to reduce forward airspeed and decrease the rate of descent. The amount of flare will depend on wind conditions and gross weight, and should gradually be increased so that groundspeed and rate of descent are significantly decreased. Too much flare will cause the helicopter to balloon up causing a high vertical descent as airspeed is lost.

4. The Power Recovery - At approximately 8 to 10 foot skid height, begin to level the helicopter with forward cyclic. Extreme caution should be used to avoid an excessive nose high/tail low attitude below 10 feet. Just prior to achieving a level attitude, with the nose still slightly up, increase the collective maintaining heading with left pedal. As the RPM needles join,. it may be necessary to add throttle to achieve a hover. Do not allow the helicopter to descent below 5 feet during the power recovery.



PERFORMANCE STANDARDS:

	Private	Commercial
Predetermined Spot	± 50 feet	± 25 feet
RPM	Green Range	Green Range
Airspeed	+ 10 KTS	± 5 KTS
	- 5 KTS	

180° AUTOROTATION WITH POWER RECOVERY

Purpose: To simulate safely landing the helicopter by turning 180° with a complete power loss.

Description:

1. The Entry - Establish the aircraft on downwind at 75 KTS and 700 feet AGL. When abeam the intended touchdown point, enter the autorotation by smoothly, but firmly, lowering the collective full down without reducing the throttle. Usually the needles will split establishing an autorotation. If the needles do not split, reduce the throttle slightly. Apply right pedal and aft cyclic to maintain the attitude. Crosscheck attitude, trim, rotor RPM, and airspeed.

2. The Glide/Turn - After the descent is established, apply aft cyclic to achieve a 60 to 70 K? attitude, then roll into a 180° turn. The proper angle of bank will be determined by wind velocity, but use caution to avoid an excessively steep turn. Throughout the turn, it is important to maintain the proper attitude (airspeed) and keep the aircraft in trim. Changes in the aircraft's attitude and the angle of bank will cause corresponding increases and decreases in rotor RPM. Adjust the collective as necessary in the turn to maintain rotor RPM in the green. Continually crosscheck rotor RPM when maneuvering the R22 in autorotative turns as the low inertia rotor system can allow rapid increases in rotor RPM. The turn should be completed and the helicopter aligned with the intended touchdown area prior to passing through 100 feet AGL. If the collective has been increased to load the rotor during the turn, it may have to be lowered on roll out to prevent a decay in RPM.

NOTE

As the aircraft descends through 100 feet AGL, make an immediate power recovery if the following conditions do not exist:

1. Aircraft aligned with the touchdown point
2. Rotor RPM in the green
3. Airspeed 60 to 70 KTS
4. Rate of descent less than 1500 PPM

3. The Flare - Same as straight-in autorotation.

4. Power Recovery - Same as straight-in autorotation.

PERFORNMWE STANDARDS:

	Private	Commercial
Predetermined Spot	± 50 feet	± 25 feet
RPM	Green Range	Green Range
Airspeed	+ 10KTS -5KTS	± 5 KTS

HOVERING AUTOROTATION

Purpose: To simulate landing the helicopter from a hover with a complete power loss.

Description:

Begin from a stabilized 2 to 3 foot hover at 104% RPM, over level terrain and headed into the wind. If necessary, reposition the left hand so that the throttle can easily by rolled off into the override. Firmly roll the throttle into the spring-loaded override while simultaneously adding right pedal to maintain heading. The loss of tail rotor thrust will cause a left drift when the throttle is rolled off. Compensate f or this drift with right cyclic. Use caution not to raise or lower the collective when rolling off the throttle. When the aircraft has settled to approximately 1 foot, fully increase the collective, holding the throttle firmly in the spring-loaded override, to cushion the landing. As the skids touch down, apply slight forward cyclic. Once firmly on the ground, lower the collective full down. Use caution to avoid any sideward or rearward movement on touchdown to prevent the possibility of a roll-over.

PERFORMANCE STANDARDS:

	Private	Commercial
Heading	± 10°	±5°
Touchdown	Level	Level

PRACTICE FORCED LANDINGS

Purpose: To simulate an emergency situation designed to develop the pilot's reaction time, planning and judgment in case of a engine failure during flight.

Description:

During cruise flight with the student at the controls, the instructor will initiate the forced landing by rolling the throttle to the idle position. The student will immediately lower the collective full down co-ordinated with the right pedal for trim, and aft cyclic to maintain attitude. This should be accomplished quick enough to prevent the rotor RPM from decaying below 90Z. As the rotor RPM builds back into the green, increase collective as necessary to maintain rotor RPM in the green. Once established in an autorotative descent, select an intended landing area. Maneuver the helicopter as necessary to align the aircraft with the intended landing area, generally headed into the wind. Use increases in the collective and forward cyclic, if necessary, to prevent the rotor from overspeeding while maneuvering. Airspeed should be adjusted to 60 to 70 KTS.

Prior to passing through 100 feet, the aircraft should be aligned with the touchdown area, at 60 to 70 KTS, rotor in the green range, and in trim. Execute a power recovery and transition to normal climb.

PERFORMANCE STANDARDS:

	Private	Commercial
RPM on Entry	Above 90%	Above 90Z
Airspeed	+ 10 KTS, -5 KTS	± 5 KTS
Area Selection	Suitable	Suitable

RAPID DECELERATION (QUICK STOP)

Purpose: To simulate a condition when a rapid decrease in forward airspeed is required as in an aborted takeoff.

Description:

Perform a normal takeoff into the wind. Once a minimum altitude of 25 feet is attained. apply additional forward cyclic to accelerate to 40 to 50 KTS while maintaining altitude. Begin the quick stop by smoothly lowering the collective, adding right pedal, and simultaneously applying aft cyclic to decelerate. Apply aft cyclic as needed to maintain entry altitude throughout the deceleration. As airspeed is lost, the helicopter will begin to settle. Slowly increase the collective to control the rate of descent adding forward cyclic to level the helicopter. Maintain heading with pedals and RPM at 104% with throttle. Terminate at a stabilized 5 foot hover. Use caution to avoid terminating at a high hover or in an extreme tail low attitude.

PERFORMANCE STANDARDS:

	Private	Commercial
Heading	± 10°	± 5°
Altitude	± 15 feet	± 10 feet
Termination Point	± 50 feet	± 25 feet
RPM	±2%	±2%

HIGH ALTITUDE (RUNNING) TAKEOFF

Purpose: To simulate a takeoff when a hover cannot be sustained due to high density altitude or high gross weight.

Description:

From a stabilized 5 foot hover, note the hover power in the direction of takeoff, set the helicopter down on the surface, and clear left and right. Increase the collective to get the helicopter light on the skids. Pause momentarily and neutralize any aircraft movement. Slowly increase the collective and apply forward cyclic to get the helicopter sliding forward on the surface. Maintain the heading with pedals and RPM at 104%.

Continue to slowly increase the collective until manifold pressure is 1” below noted hover power. As the aircraft approaches effective translational lift, slight back pressure on the cyclic will lift the helicopter off the ground. Continue to accelerate remaining below 10 feet until a minimum climb speed of at least 45 KTS is reached. At 50 feet of altitude, adjust manifold pressure to climb power.

PERFORMANCE STANDARDS:

	Private	Commercial
Heading	± 10°	±5°
RPM	±2%	±2%

ROLL ON (RUNNING) LANDINGS

Purpose: To simulate an approach and landing when sufficient power for hovering is not available.

Description:

On final approach, the helicopter should be headed into the wind at 60 KTS and 300 feet AGL. When a shallow approach angle of 5° is intercepted, begin the approach by lowering the collective to maintain the approach angle. Maintain entry airspeed until apparent rate of closure and groundspeed appear to be increasing. Begin a slow deceleration with aft cyclic, maintaining approach angle by reducing collective, the aircraft in trim, and RPM at 104%. Plan to arrive at the point of intended touchdown at or slightly above effective translational lift. Prior to ground contact, insure that the helicopter is in a level attitude. After ground contact, maintain heading with pedals and slowly lower the collective for braking action. Maintain RPM until the helicopter does come to a complete stop.

Crosswind Considerations:

As in normal and steep approach, crab the helicopter above 50 feet AGL, and use a slip below 50 feet AGL to align the aircraft with the ground track.

PERFORMANCE STAI'OA3DS:

	Private	Commercial
Heading	± 10°	± 5°
Touchdown Point	± 50 feet	± 25 feet
Manifold Pressure	Less than hover	Less than hover

SLOPE OPERATIONS

Purpose: To land from a hover and takeoff to a hover from a sloping surface.

Description

Prior to conducting slope operations, the pilot must be thoroughly familiar with dynamic roll-over characteristics and mast bumping. For training, use a maximum slope angle of 5°.

1. Slope Landings - Position the helicopter cross slope at a stabilized 5 foot hover headed into the wind. Lower the collective slightly to establish a slow rate of sink. When upslope skid contacts the ground, begin applying lateral cyclic in the direction of the slope (upslope) to hold the skid against the slope. Maintain heading with pedals. Continue to apply cyclic into slope as the collective is lowered until the downslope skid is firmly on the ground. Once the collective is full down, center the cyclic to allow safe “head clearance’ on the upslope side.

2. Slope Takeoffs - The procedure for a slope takeoff is almost the exact reverse of that for a slope landing. Apply cyclic into the slope (upslope) and slowly begin to increase the collective. As the helicopter becomes light on the skids, pause and neutralize any aircraft movement. Continue to increase the collective maintaining heading with pedals. When the downslope skid breaks ground, slowly begin to center the cyclic. As a level attitude is reached, the cyclic should be approximately neutral. Continue to increase collective, maintaining position over the ground with cyclic and heading weith pedals until a stabilized 5 foot hover is attained.

PERFORNANCE STANDARDS:

-	Private	Commercial
Heading	± 5°	± 5°

RECOGNITION AND RECOVERY FROM LOW ROTOR RPM

Purpose: To become thoroughly familiar with the recognition of low rotor RPM and the techniques of recovery. Prior to performing this maneuver, the pilot should be familiar with RHC Safety Notices #10 and #12.

Description:

1. Forward Flight - Power On

A. Entry and Recognition

During takeoff, cruise flight, high attitude and maximum performance climbs, at 104% RPM, the instructor will slowly decrease the throttle to 95% RPM. The low RPM condition will be recognized by:

1. A noticeable decrease in engine noise.
2. Aircraft vibration and cyclic stick shake at higher airspeeds.
3. The low rotor RPM warning horn and light at approximately 95% RPM.

The instructor should demonstrate the further increase in vibration and decrease in engine noise by decreasing the RPM to 90% RPM.

B. Recovery Technique

Upon recognizing the low RPM condition, simultaneously add throttle and lower the collective to regain operating RPM. A gentle aft cyclic movement will help the recovery, but the primary recovery controls are the collective and throttle. Avoid any forward cyclic input which will inhibit RPM recovery. Once RPM is regained, slowly raise the collective to reduce the sink rate, while closely monitoring the RPM.

2. At a Hover

During hovering flight at 104% RPM, the instructor will slowly decrease the throttle to 95% RPM. Note the obvious decrease in engine noise and the tendency for the aircraft to settle back towards the ground. As the aircraft settles, the tendency for some pilots will be to increase the collective to stop the descent. This may only increase the RPM decay and increase the descent. Recovery is the same as in forward flight. Lower the collective simultaneously adding throttle. If RPM cannot be regained prior to ground contact, insure that the helicopter touches down in a level attitude.

PERFORMANCE STANDARDS:

The pilot should be able to recognize and recover from low rotor RPM prior to reaching 90% RPM.

SETTLING WITH POWER

Purpose: To demonstrate the dangerous results of operating at low airspeeds, moderate to high power settings, and high rates of sink.

Description:

Settling with power is most dangerous when it happens at relatively low altitudes. The most common condition is during a steep approach with a tailwind. It should be demonstrated at an altitude of at least 1500 feet.

To enter the maneuver, adjust the power to approximately 5” below hover power. Hold altitude with aft cyclic until the airspeed approaches 20 KTS. Allow the sink rate to increase to 300 FPM or more as the attitude is adjusted to obtain an airspeed of less than 10 KTS. The aircraft will begin to shudder. Application of additional up collective will increase the vibration and sink rate. Once the condition is well developed, a rate of sink in excess of 2000 FPM can result. Recovery should be initiated at the first sign.

To recover, apply forward cyclic to increase airspeed and simultaneously reduce the collective. The recovery is completed when the aircraft passes through effective translational lift and a normal climb is established.

PERFORMANCE STANDARDS:

The pilot must thoroughly understand and recognize the settling with power conditions and be able to safely recover.