SKT SKYRIDER

PROCEDURES AND FLIGHT MANEUVERS MANUAL

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1. INTRODUCTION

This manual has been compiled in accordance with the common criteria to all the manuals for flight schools.

The text complies with all the basic manoeuvres, including the use of the helicopter inside/outside the airport areas.

The procedures in this manual are in line with current aviation regulations (Rules of the Air) and with the requirements and recommendations contained in the manufacturer's manual helicopter flight SKT 06.

Instructive purposes benchmarks:

- Normal climb teaching	50 Kts
- Cruising speed	85 kts
- Hovering	5 feet
- Takeoff / Approach	60 Kts
- Autorotation	45-60 Kts
- Maximum speed of taxiing	10 kts
- Maximum speed taxiway side or back	5 Kts

2. FAMILIARIZATION: External & internal controls, geography, recommendations

PURPOSE: To accustom the student pilot with the helicopter and to get familiarized with the airport and the local area.

1) CHECKS

a) Both the internal and external checks should be performed with the helicopter's CHECK LIST on hand. It is imperative to acquire perfectly the internal checks, as during the flight it will not be possible to leave the flight controls or distract the attention to control the aircraft, while consulting the list of checks.

b) Sit comfortably on board and ensure that the flight controls can be reached to its full stops. For small Pilots it might be necessary to place a cushion to the back to reach the foot pedals comfortably.

c) Ensure that you have a good overview of the flight controls and visibility when seated in the student's seat (right hand).

d) Be careful not to keep pressing the starter after the engine has started, release the frictions well before take-off.

e) The button on the collective where the control is "free" is positioned in the lower position and it's pushed to release the force trim. To release the clutch cyclic rotate the knob counter clockwise

2) RADIO CALL

All aircraft flying in the same areas or airports must use common radio frequencies and phraseology. Communication must be clear and concise to avoid potential confusion or danger.

3) GEOGRAPHY

Refer to aerial maps or Jeppesen chapters.

4) RECOMMENDATIONS

a) Action on the controls

The action on the flight controls must be exercised in a gentle and uniform manner. Hold controls rigidly means no abrupt and jerky manoeuvres. The helicopter reacts to these manoeuvres sharply with unpleasant sensations during the flight. When you realize you stiffen the controls you need to relax. Pay attention to angular movement (compass) of the cyclic control lever, allowing rising and lowering the handle which only serves to pass commands from the instructor to the student and therefore has no effect on the continuation of the flight. Avoid then, once you find it comfortable and functional. Act in this way as it would causes confusion in the execution of manoeuvres.

b) Look out

Learn to look out in all directions is very important for the safety of the flight and for the conduction. Looking out will avoid possible collisions, maintain sufficient distance from clouds, electrical posts, buildings and other obstacles. Just looking outside will assist to maintain the aircraft latitude and help you to control the helicopter in the simplest way. The aid of instruments should be kept to a minimum.

5) INSTRUMENTATION

It is important to have a perfect knowledge of the location of the instruments, indicator lights and switches so that a quick glance is enough for checks it without distract your attention from flight latitude. Particular care must be taken in the interpretation of the double tachometer, fuel indicator, engine instruments and the indicator lights. It is a good way to check at least every 10 minutes that the values of temperatures and pressures values for the engine are within the operation limit and that the fuel quantity is more than enough for the expected flight time.

3. GENERAL DESCRIPTION

A helicopter pilot manipulates the helicopter flight controls in order to achieve controlled aerodynamic flight.[1] The changes made to the flight controls are transmitted mechanically to the rotor, producing aerodynamic effects on the helicopter's rotor blades which allow the helicopter to be controlled. For tilting forward and back (pitch), or tilting sideways (roll), the angle of attack of the main rotor blades is altered *cyclically* during rotation, creating differing amounts of lift at different points in the cycle. For increasing or decreasing overall lift, the angle of attack for all blades is *collectively* altered by equal amounts at the same time resulting in ascents, descents, acceleration and deceleration.

A typical helicopter has three separate flight control inputs. These are the cyclic stick, the collective lever, and the anti-torque pedals. Depending on the complexity of the helicopter, the cyclic and collective may be linked together by a *mixing unit*, a mechanical or hydraulic device that combines the inputs from both and then sends along the "mixed" input to the control surfaces to achieve the desired result. The manual throttle may also be considered a flight control because it is needed to maintain rotor speed on smaller helicopters without governors. The governors also help the pilot control the collective pitch on the helicopters main rotors, to keep a stable, more accurate flight.

Cyclic

The cyclic control is usually located between the pilot's legs and is commonly called the *cyclic stick* or just *cyclic*. On most helicopters, the cyclic is similar in appearance to a joystick in a conventional aircraft. The control is called the cyclic because it changes the pitch angle of the rotor blades cyclically. That is, the pitch or *feathering angle* of the rotor blades changes depending upon their position as they rotate around the hub so that all blades will have the same incidence at the same point in the cycle. The change in cyclic pitch has the effect of changing the angle of attack and thus the lift generated by a single blade as it moves around the rotor *disk*. This in turn causes the blades to fly up or down in sequence, depending on the changes in lift affecting each individual blade.

The result is to tilt the rotor disk in a particular direction, resulting in the helicopter moving in that direction. If the pilot pushes the cyclic forward, the rotor disk tilts forward, and the rotor produces a thrust vector in the forward direction. If the pilot pushes the cyclic to the right, the rotor disk tilts to the right and produces thrust in that direction, causing the helicopter to move sideways in a hover or to roll into a right turn during forward flight, much as in a fixed wing aircraft.

On any rotor system there is a delay between the point in rotation where a change in pitch is introduced by the flight controls and the point where the desired change is manifest in the rotor blades flight. This difference is caused by phase lag, often confused with gyroscopic precession. A rotor is an oscillatory system that obeys the laws governing vibration which, depending on the rotor system, may resemble the behavior of a gyroscope.

Collective

The collective pitch control, or *collective lever*, is normally located on the left side of the pilot's seat with an adjustable friction control to prevent inadvertent movement. The collective changes the pitch angle of all the main rotor blades collectively (*i.e.,* all at the same time) and independent of their position. Therefore, if a collective input is made, all the blades change equally, and the result is the helicopter increases or decreases its total lift derived from the rotor. In level flight this would cause a climb or descent, while with the helicopter pitched forward an increase in total lift would produce an acceleration together with a given amount of ascent.

The collective pitch control in a Boeing CH-47 Chinook is called a "Thrust Control", but it serves the exact same purpose, except that it controls two rotor systems and applies differential collective pitch into the two rotor systems.

Anti-torque pedals

The anti-torque pedals are located in the same position as the rudder pedals in an airplane, and serve a similar purpose, namely to control the direction in which the nose of the aircraft is pointed. Application of the pedal in a given direction changes the pitch of the tail rotor blades, increasing or reducing the thrust produced by the tail rotor and causing the nose to yaw in the direction of the applied pedal. The pedals mechanically change the pitch of the tail rotor altering the amount of thrust produced.

Throttle

Helicopter rotors are designed to operate at a specific rotational speed. The *throttle* controls the power produced by the engine, which is connected to the rotor by a transmission. The purpose of the throttle is to maintain enough engine power to keep the rotor speed within allowable limits in order to keep the rotor producing enough lift for flight. In many helicopters, the throttle control is a single or dual motorcycle-style twist grip mounted on the collective control (rotation is opposite of a motorcycle throttle), while some multi-engine helicopters have power levers.

In many piston engine-powered helicopters, the pilot manipulates the throttle to maintain rotor speed. Turbine engine helicopters, and some piston helicopters, use governors or other electro-mechanical control systems to maintain rotor speed and relieve the pilot of routine responsibility for that task. (There is normally also a manual reversion available in the event of a governor failure.)

Helicopter controls and effects

Name	Directly controls	Primary effect	Secondary effect	Used in forward flight	Used in hover flight
Cyclic (lateral)	Varies main rotor blade pitch with left and right movement	Tilts main rotor disk left and right through the swash-plate	Induces roll in direction moved	To create movement to sides	To move sideways
Cyclic (longitudinal)	Varies main rotor blade pitch with fore and aft movement	Tilts main rotor disk forward and back via the swash-plate	Induces pitch nose down or up	To adjust forward speed and control rolled-turn	To move forwards/backwards
Collective	Collective angle of attack for the rotor main blades via the swashplate	Increase/decrease pitch angle of all main rotor blades equally, causing the aircraft to ascend/descend	Increase/decrease torque. Note: in some helicopters the throttle control(s) is a part of the collective stick. Rotor speed is kept basically constant throughout the flight.	To adjust power through rotor blade pitch setting	To adjust skid height/vertical speed
Anti-torque pedals	Collective pitch supplied to tail rotor blades	Yaw rate	Increase/decrease torque and engine speed (less than collective)	To adjust sideslip angle	To control yaw rate/heading

4. CHECK LIST

BEFOR START-UP

seatbelts	fasten
cyclic, collective, pedals	movement free
Throttle	movement free
collective	fully lowered
cyclic	Neutral
Pedals	rest position
Landing light	off
Governor	off
Breaker	inserted

STARTING ENGINE AND RUN-UP

Key	inserted
Master battery	on
Strobe light	on
E.F.I.S. 1	on
E.F.I.S. 2	on
Engine Control 1	on
Engine Control 2	on
Fuel pump 1	start

Start
Automatic start-on procedure – pre rotation
Engine at Idle

Throttle	50%
Fuel pump 1	On
Fuel pump 2	On
Water temp	40/50 C°
Radio	on
Throttle	90%
Freewheel	verify rotor liberty

RPM 90%

Governor	on
Nav light	on

SHUTDOWN PROCEDURE

collective	Lowered
nav light	off
Governor	off
Throttle	50%
Breaker	disengage as required
Water temp	50/70 C°
Throttle	Idle
Fuel pump 1	off
Fuel pump 2	off
Engine control 1	off
Engine control 2	off
E.F.I.S. 1	off
E.F.I.S. 2	off
Radio	off
Master battery	off
Key	removed

5. EFFECT OF FLIGHT CONTROLS:

cyclic, pedals, throttle and collective pitch in hover and forward flight, use and coordination of the controls.

PURPOSE: To illustrate to the student pilot the relationship between cyclic pitch controls and collective pitch, the pedal and the throttle in hover and forward flight condition and to feel the behaviour (cause and effect) of the controls of the helicopter for future flights.

1) CYCLIC PITCH CONTROL

a) Hovering.
When flying to a fixed point, moving the bar of the cyclic pitch forward or backward and the swash plate on will get a tilt forward or backward performing a rotation around the transverse axis and allows moving the helicopter to move forward or backward.
Moving the cyclic towards left or right, the swash plat will tilt accordingly to the left or right and the helicopter performing a rotation about the longitudinal axis, moves to the left or to the right.
This is what allows our helicopter to fly forwards, backwards, sideways, or any combination of those.

b) Translated flight.
In forward flight the cyclic control takes the same function as the stick in aircraft. Moving the cyclic forward, you get a nose-down attitude with a consequent loss of altitude and speed increase. Pulling the cyclic back you get a nose-up attitude resulting in increasing of altitude and loss of speed. Tilting the cyclic left or right rotates the helicopter about the longitudinal axis and consequently you get a steer to the left or right.

2) PEDALS

The function of the pedals remains the same for both, for the forward flight and for a fixed point, that is the rotation around the vertical axis of the helicopter. We will examine below the effect of the use of the pedals in relation to his movements.

a) left foot
Pushing the left foot, you get an increase in the incidence of tail rotor that produces a rotation to the right of the tail and the cockpit to the left. The right foot is used whenever the collective is lowered to compensate for the reaction of torque which tends to rotate the nose of the helicopter to the left and thus keep constant the heading.

b) right foot
Pushing the right foot reduces the incidence of the tail rotor, you get an increase in the incidence of tail rotor that produces a rotation to the left of the tail and the cockpit to the right. The left foot is used whenever the collective is raised to compensate for the reaction of torque that tends to rotate the nose of the helicopter to the right and thus keep constant the heading.

3) COLLECTIVE PITCH CONTROL

a) Hovering
Raising the bar of the collective pitch control increases the incidence of the main rotor blades, the lift increases allowing the helicopter to rise. Lowering the collective command decreases the incidence of the main rotor blades, thus reducing the altitude.The control of the collective pitch is connected to the middle of the sync box with the throttle valve, therefore an increased of incidence, corresponds to an increase of the power that compensates for the increased resistance encountered by the rotor blades.

b) forward flight
In forward flight, lowering or rising of the collective produce a decrease or an increase in altitude as well as a decrease or increase in speed.
Lowering the collective coordinated with backward movement of the cyclic, will reduce the speed considerable, without a loss of altitude (pull cyclic far back), or a significant reduction of altitude without increase in speed (cyclic back slightly) .

4) THROTTLE

The end of the collective is provided with a knob. The activation of this knob controls the supply pressure regardless of changes in the collective.

A rotating of the knob with the left hand in clockwise direction, will increase the power supply. An anticlockwise rotation of the knob will decrease the power supply. The independence of the knob from the collective allows the preparation of the number of revolutions of the engine before take-off and the correction of any excesses or faults of the number of revolutions, caused by the perfect operation of gear synchronization.

For proper recovery of rotor revolutions, when using the governor it should be ruled out to use of the throttle should always be anticipated from the use of the collective as follows:

- Low speed : lower the collective and apply throttle
- High reverse: raise and lower the collective lever

The amount of movement of collective pitch and throttle, if done properly, will be quite little.

6. . HOVERING EXECUTION

PURPOSE: Coordinated use of all controls to achieve the separation of the helicopter from the ground. Normally any hovering with ground effect is made at 2 feet AGL.

1) OPERATION

After making the pre take-off checks, set 100% RPM with the throttle and engage the governor.

Look around for any obstacles. Lift gently, up to 17"-18" by checking that the governor maintains the constant RPM (100%) and accompany the increase in step with the right pedal. The increase of collective pitch should be done simultaneously with the increase of pedal to avoid any steer of the tail structure. Set the cyclic in the centre than move it slightly backward to the right , with the governor engage at around 15"-16", apply a bit of right pedal to be ready to counteract the yaw, so continue to raise the collective around 17"- 18" the helicopter lightens on skids ; take an external reference point looking over an imaginary line passing over the instrument console and act appropriately on the pedals to counteract the yaw, of the cyclic structure to maintain longitudinal and transverse levelled . Continue to raise the collective until the helicopter is hovering about 2 feet AGL and keep the external view to reference point.

2) RECOMMENDATIONS

Before you start the manoeuvre look around for any obstacle or person; obstacles must be kept at a safe distance. Pay attention during rotation at the length of the tail in order to avoid any collision with close obstacles. Same applies for overhead obstacles (eg. windsocks or eaves)

3) MOST COMMON ERRORS

- Do not look out enough.
- Abrupt use of the controls.
- Poor use of the foot to the rotation.
- Loss of the reference point.

NOTE:

Remark: the left foot always exerts the greater pressure on tail rotor, to rotate to the left requires more pressure to the pedal (turning left apply pressure on the left pedal , while turning to the right is simply "release" of the left pedal instead of pushing the right pedal).

Hovering

Hovering is considered by some pilots to be the most challenging aspect of helicopter flight to learn. This is because helicopters are generally dynamically unstable, meaning that deviations from a given attitude are not corrected without pilot input. Thus, frequent control inputs and corrections must be made by the pilot to keep the helicopter at a desired location and altitude. The pilot's use of control inputs in a hover is as follows: the cyclic is used to eliminate drift in the horizontal plane, (e.g. forward, aft, and side to side motion); the collective is used to maintain desired altitude; and the tail rotor (or anti-torque system) pedals are used to control nose direction or heading. It is the interaction of these controls that can make learning to hover difficult, since often an adjustment in any one control requires the adjustment of the other two, necessitating pilot familiarity with the coupling of control inputs needed to produce smooth flight.

7. TOUCH-DOWN FROM HOVERING

PURPOSE: Use and coordination of all commands to touch-down the helicopter in safety. Stabilize for hovering at 2 feet AGL.

1) OPERATION

Make sure the underlying ground is suitable for landing and that there are no obstacles nearby. Rotate the helicopter to the head-wind (or at least to abeam) at 2 feet AGL. Take an external reference point above the instrument console. Slowly lower the collective continuously, in such a way to achieve a slow and constant descent.

During the descent, check the attitude of the longitudinal and transverse axis, avoid any translation, sideways and, in particular backward; keep the heading, which tends to decrease due to the decrease of the reaction of torque, give right foot and proportionally lowering the collective.

The lift increases with decreasing altitude: it will therefore be necessary to lower the collective pitch of a larger amount, as the helicopter nears the ground.

2) RECOMMENDATIONS

Make the manoeuvre gently and gradually in order to obtain a contact with the ground very light, continue to lower slowly the collective using proportionally right foot and always keeping the RPM constant.

3) MOST COMMON ERRORS

- Decrease is not gradual and constant collective pitch
- Stop the descend at few inches above the ground
- Translation during the descent
- Heavy contact with the ground
- Forward movement in the phase of the contact
- Using the cyclic instead of the pedal to maintain the heading

8. TAXI

PURPOSE: To familiarize the use of commands to move the helicopter in any direction. The air taxi has to be done at a speed of not more than 3 kts and a maximum altitude of 3 feet above the ground.

1) OPERATION

Position the helicopter in hover position 3 feet above ground maintain 100% RPM. Set the cyclic slightly forward to give an input to move the helicopter forward, maintaining the heading, remember: at the beginning of the translation it is necessary to slightly increase collective pitch to prevent the helicopter to descent because part of the necessary lift during hovering is decomposed. Once initiated the translation, pull the cyclic slightly back in order to maintain a constant speed, about three knots.

During translation maintain the attitude with the cyclic and possibly compensate for the differences in weight on board. In the case of light wind side (6/7 kts), move the cyclic in the direction from the blowing wind and compensate with the opposite foot to keep the direction. In the presence of strong wind, do not taxi with the tailwind. The angular difference between the heading during taxi and the wind direction must not exceed 90°. To change the direction of taxiing you have to arrest the helicopter in hover and performing the rotation in flight at a fixed point.

To stop the taxi: move the cyclic slightly back in order to stop the forward movement of the helicopter and at the same time reduce the power with the collective to avoid an increase in altitude, always carefully to check that the RPM remain constant at 100%. Always refer to the variometer.

2) RECOMMENDATIONS

It is important to check the surrounding area to avoid passing too close to other aircraft or obstacles of any kind. If during taxiing there is a potential collision with another aircraft, steer immediately to the right.

A quick taxi is not an indication of skill as well as being dangerous clearly shows the lack of seriousness of the pilot and lack of knowledge on the use of the standard procedure. Only a slow, well-controlled translation is a clear sign of professional competence.

3) MOST COMMON ERRORS

- High speed and inconstant
- Rotations not at fixed points
- Changes in direction and heading
- Poor control of altitude and engine rpm
- Inaccurate control of the surrounding space

9. NORMAL TAKEOFF

PURPOSE: To obtain a normal take-off from hovering with the best rate of climb

1) OPERATION

The normal takeoff starts from the position of the helicopter on the runway in use oriented with airport QFU with an HIGE (hovering in ground effect).

Before take-off ensure that there are no other aircraft in the proximity, perform the pre take-off check as per the check list with the helicopter on the ground and the cyclic full down.

Check that the rotor disc profile is rotating above any front obstacle.

From the hover move cyclic slightly forward and increase collective slightly at the same time to prevent the helicopter falls due to the decrease of lift at the beginning of movement. The required MAP for initial climb is about 23/24 inches.

The coordinated action of cyclic and collective will serve to maintain a nose-up attitude of 10°/12°. During the initial phase, push with right pedal to compensate for the increased reaction of torque in order to maintain the direction constant during takeoff.

Keep the external reference point.

At around 10 kts, the helicopter enters into a translational lift and tends to take a nose-up attitude. At this stage it will be appropriate to push the cyclic slightly forward in order to maintain the constant nose-down attitude (5° almost). As the speed increases act co-ordinate with the left pedal to counteract the yaw due to the increase in speed.

The normal take-off ends after reaching speed of 55-60 kts (Vy). Set the MAP at a value of 21" almost.

2) RECOMMENDATIONS

Before beginning the procedure you need to take a separation from ground, so that during the maintain the direction of take-off in order to obtain the best performance in term of feet per minutes. In flight take care to use the collective slowly to avoid a loss of RPM (hardly recoverable).
Perform the checks with the helicopter on the ground and the collective fully down.

3) MOST COMMON ERRORS

- Excessive variation of attitude at the beginning of translation
- Uncoordinated use of flight control, especially when entering into translational lift
- Low attention to control of RPM
- None continuous climb
- Inconstant speed increase
- Unnecessary variations in longitudinal structures to stabilize before the climb. Over control on flight command
- Take-off direction discordant with the QFU airport or incapacity to follow the direction of the wind

10. CLIMB AND LEVELING

PURPOSE: To teach the climb and levelling using co-ordinately controls.

1) CLIMB

a) From takeoff
After take-off, reach 60 kts reduce power to 21”/22"(almost) and intervene with the right foot to counteract the tendency of the helicopter to yaw to left due to decrease of the torque and increased speed. In order to maintain the direction and the longitudinal attitude, refer to the disc rotor or a distant reference point. Keep the parameters fixed during the climb attitude. If the climb is long the MAP tends to decrease with increasing altitude (decrease in density).

b) From level flight
Level flight (75 kts 20"-21" almost) if you decide to climb, take a distant reference point, gently pull a bit the cyclic to bring the helicopter to flare out of climb and raise the collective to increase the power to about 22". The speed (if the attitude is set correctly) will decrease until it stabilizes at 60 kts. Increase the collective pitch followed by an appropriate intervention of the left pedal to maintain the direction. The reference point facilitates to maintain the direction of flight and control during climb.

2) LEVELING THE CLIMB

To level flight (70 kts) after climb apply the following steps:

20-40 feet before reaching the selected altitude, take a distant landmark reference point, reduce MAP of about 2" by acting simultaneously with the right foot. Keep the cyclic smoothly and move it continuously forward until you reach the attitude of 70 kts (vertical speed to zero). If the power setting is correct, maintain zero vertical speed and IAS (indicated air speed) to 70 kts. Maintain level flight with the rotor disk tracking.

Due to the inertia of the instrument the desired speed will reach slightly behind. Correct any errors with small variation of collective action.

Checks parameters after levelling.

2) RECOMMENDATIONS

Remember to take a point of reference.
Do not look too deep and not chase the airspeed indicator.
For the speed corrections always rely to the positioning of the rotor disk.

3) MOST COMMON ERRORS

- Excessive variations of attitude.
- Uncoordinated use of the pedals.
- Inaccurate control of power and speed.

11. LEVEL FLIGHT

PURPOSE : To teach the student to constantly maintaining level flight with external reference points

1) OPERATION

Level flight altitude and direction means constant speed of 70 kts in the circuit. The MAP is approximately 20- 21 inches depending on the flight conditions (weight of the helicopter, wind, up draught/downdraught). Any speed errors will be corrected with the use of cyclic, for the altitude use collective. If both are not in accordance, first the correction must be done related to speed.

2) COMMENTS

Maintain the level flight attitude with the cyclic. Level flight is achieved by setting the horizon line with a fixed reference in the cabin and maintaining this alignment. The pilot should notice the variations in attitude by checking the misalignment of the references above. The cyclic pitch control of the helicopter SKT 06 is very sensitive and requires small movements to get a change of attitude.

The altitude is controlled with the collective. Each variation of the collective requires a correction of the pedals in order to maintain the direction. An increase in collective requires a decrease of the right foot while the left foot requires collective. Furthermore, when the collective is increased the helicopter tends to pitch up„ while when it is decreased tends to sink.

3) MOST COMMON ERRORS

- Variations of attitude.
- Poor control of the management.
- Poor control of the power.

Forward flight

In forward flight a helicopter's flight controls behave more like those in a fixed-wing aircraft. Displacing the cyclic forward will cause the nose to pitch down, with a resultant increase in airspeed and loss of altitude. Aft cyclic will cause the nose to pitch up, slowing the helicopter and causing it to climb. Increasing collective (power) while maintaining a constant airspeed will induce a climb while decreasing collective will cause a descent. Coordinating these two inputs, down collective plus aft cyclic or up collective plus forward cyclic, will result in airspeed changes while maintaining a constant altitude. The pedals serve the same function in both a helicopter and an airplane, to maintain balanced flight. This is done by applying a pedal input in whichever direction is necessary to center the ball in the turn and bank indicator.

12. TURNS

PURPOSE : To teach the student turns in level flight, the coordinated use of the controls and safety.

A) TURNS IN LEVEL FLIGHT

Check the parameters, constant altitude and speed before starting the turn, carefully observe the space around you in order to make sure that there are no other aircraft and take also an external reference point. Gently apply a lateral pressure on the cyclic to tilt the rotor disk, and consequently the helicopter, with a gradual transverse variation buoyancy until reaching the inclination required, then maintain a constant pressure on the cyclic and always refer to the rotor disk to maintain the right attitude. During the turn the altitude and the speed should remain constant, it will be necessary to increase power as the incline increases by an amount proportional to the inclination to compensate for the decrease in lift due to entry into a turn (thus to its decomposition) of the helicopter. In this case, the pedals must be used appropriately to obtain a coordinated turn. Check and maintain the longitudinal and transverse attitude during the turn. The manoeuvre must be made with an appropriate advance (not to exceed the BANK chosen). This advance, in degrees, should be roughly equal to the degrees of inclination of the turn (BANK). To level the helicopter from a turn the pilot must anticipate the manoeuvre in order not to overshoot the chosen heading. In the last phase exert a slight forward pressure on the cyclic to counteract the tendency to pitch up of the aircraft, so as to maintain constant longitudinal attitude and therefore also to maintain speed. Then slowly restore power to the initial value in order to prevent loss in altitude.

BANK for training flights performed at 75 kts:

- Standard turn: 20°
- Medium turn: 30°
- High turn: 45°

Remember that the angular velocity of turn is a function of the inclination and speed of the aircraft. To make a turn with fixed angular velocity, the BANK angle should be 15 % of the speed in knots.

For example: speed 70 Kts standard BANK is 10.5 percent, at 100 kts is 15 °

The turning radius is given by:

$$R = \frac{V^2}{G \bullet \tan \Phi}$$

2) RECOMMENDATIONS

It is essential to look constantly out in order to avoid collisions, to maintain the orientation and to check the attitude of the helicopter with an external reference.

3) MOST COMMON ERRORS

- Change of attitude. It is common tendency to assume a nose-up attitude at beginning of the turn and a nose-down attitude during levelling.
- Uncoordinated use of the pedals. The improper action on the pedal may result in a change of speed which is erroneously corrected with a change of BANK up to 30 ° instead of using the pedals.
- Poor control of the surrounding space.

B) CLIMBING AND DESCENDING TURNS

The technique to begin climbing and descending turns is the same used for level flight turn. The BANK, however at 50 kts, should be around 10-15 ° and no further. Use pedals to coordinate turns.

2) RECOMMENDATIONS

It is essential to constantly look out to maintain the reference of the external point, to avoid collisions with other aircraft and not to lose the horizon.

MOST COMMON ERRORS

- Start the turn without looking outside.
- Variations in attitude when there is no reference to the rotor disk.
- Poor power control with consequent variation in altitude.

13. DESCENT AND LEVELING

PURPOSE : To teach the student how descent, levelling with a coordinated manoeuvre.

A) DESCENT

Start the descent taking a reference point, adjust the collective pitch until reaches 15" of MAP. Simultaneously act gently and gradually on the cyclic to start the descent, consequently the speed will reach the optimal descent, 60 Kts.

Maintain direction appropriately using the right foot.

During manoeuvre avoid the transverse attitude variation of the helicopter. As the altitude decreases restore MAP increasing collective.

B) LEVELING THE DESCENT

Before passing the altitude required anticipate (150ft before almost) pulling up gently the collective to stop the descent, move the cyclic slowly forward at the same time to maintain speed. The action of the collective should be continued until the required power level flight (20-21 inches around). Compensate with the left foot for the power recovery. Throughout this phase, attention should be paid to the positioning of the rotor disk on the horizon and the reference points. Cockpit instruments (artificial horizon, variometer, anemometer and altimeter) should be checked with one eye.

2) RECOMMENDATIONS

Before starting the manoeuvre take a reference point. Look carefully to keep out the structure and direction. During the levelling action commands must be slow and continuous.

3) MOST COMMON ERRORS

- Discontinuous action on the controls
- Poor use of pedals

14. LEVEL FLIGHT SPEED VARIATION

PURPOSE: To teach the student the coordinated use of flight controls while keeping the external reference points.

A) SPEED DECREASING

From straight and level flight conditions (70 kts constant altitude) decrease smoothly power of 6 inches and at the same time move the cyclic backward slightly to 60 kts. During the reduction of power give right foot and maintain the longitudinal and transverse attitude keeping in sight a distant point. Once reached 60 kts increase the power of about 2" and act appropriately on the controls to maintain altitude, speed and direction constant.

B) SPEED INCREASING

Referring to the rotor disc, move the cyclic slightly and continuously forward, raise the collective to about 20-21". Continue to move the cyclic gently forward while checking the instruments with one eye. 5 kts before the speed desired restore the cycle in neutral position. Correct any errors in speed and altitude with slight interventions on cyclic and collective.

2) RECOMMENDATIONS

It is good to check wind condition and put the helicopter upwind because tailwind reduces the tail rotor efficiency.

3) MOST COMMON ERRORS

- Perform manoeuvres without taking a point of reference resulting in poor coordination
- Poor use of the pedals with consequent use of cyclic to maintain direction
- Look to instruments.

15. TRAFFIC CIRCUIT

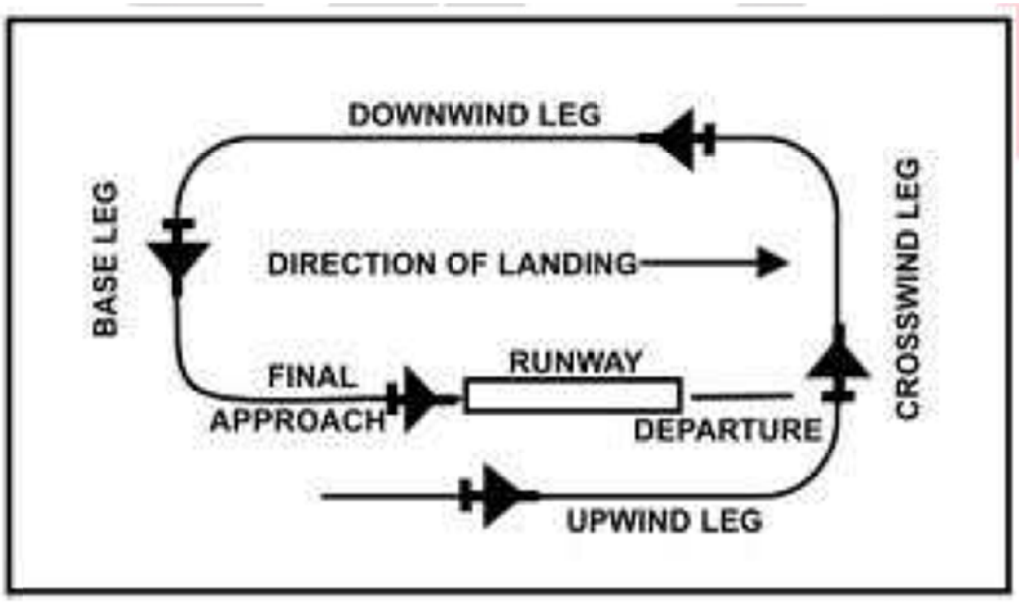
PURPOSE: Explain the rules of the airport circuit traffic

1) LOCATION AND LAYOUT OF THE CIRCUIT TRAFFIC

The traffic circuit has a rectangular shape having a longer side coinciding with the landing runway direction. The circuit start after 1 km after take-off from the runway. The first arm of the circuit traffic called take-off arm and is based on the runway axis extension than will follow a left steer (standard) or right steer (non-standard). The standard circuit is made of left turn execute at a minimum altitude of 1000 ft AGL. in case you make a right circuit it must be communicated to avoid confusion with the standard (for example: "downwind RIGHT 09 "). The next arm is perpendicular at runway direction called crosswind. After that start the downwind leg parallel to the runway, with a speed of 70 kts, start the turn for base leg 30” after abeam threshold reducing the MAP to 15 inches. Reduce speed to 60 kts maintaining 1000 ft. Begin an approach steering into final with 15-inch, 60 kts and a positive rate of descent.

2) RECOMMENDATIONS

Pay particular attention to radio calls to the maintenance of the parameters of the track and separation from other aircraft. Checks must always be during downwind.



16. QUICK STOP

PURPOSE: To teach the student the coordination and synchronization of commands. Improve the vision of the helicopter with respect to external references.

1) OPERATION

The quick stop is a manoeuvre that is performed by an variation of attitude and speed at a constant altitude. The minimum altitude for a quick stop is 500 ft. Before starting the manoeuvre perform at least two turns for safety at 90° and observe (EFIS, 100% RPM, SPEED, TEMPERATURE AND PRESSURE). Perform the manoeuvre preferably upwind. Take an external reference point in order to facilitate the maintenance of direction during the manoeuvre.

Read the altimeter indication then start the manoeuvre, gradually lowering the collective acting simultaneously on the cyclic for varying the position of the attitude from level flight up to 30° nose-up above the horizon. Apply right foot to maintain the heading, control the RPM due to the deceleration that tend to increase the RPM. Lower the collective up to about 14-15 inches and continue the change of attitude until the helicopter does not assume 30° above the horizon and the speed of 35 Kts. When the Anemometer passes this value move cyclic forward to change the attitude and return it to its original position at 70 kts. This change should be slow and continuous. The speed will gradually increase. In order to maintain constant altitude, increase power coordinate with the change of attitude. During this phase, act appropriately on the pedal so as to maintain the direction. Than push the cyclic gently forward up to 70 kts stabilize the helicopter and then set power for that speed, altitude and heading should be the beginning of the manoeuvre.

2) RECOMMENDATIONS

To correctly perform the manoeuvre is indispensable an accurate coordination of the use of power during the variation of speed to maintain altitude. The action of the pedal must be coordinated not only in relation to the change of power but also in relation to the change in speed to maintain constant heading throughout the manoeuvre. Control the roll with cyclic to prevent any unusual rotation.

SPEED INDICATED MUST NOT LESS THAN 25 Kts.

3) MOST COMMON ERRORS

- Discontinuous change of attitude during manoeuvre.
- Uncoordinated action on collective during the change of attitude. The most common trend is loss of altitude during all manoeuvre.
- Uncoordinated action on the pedal and consequent changes in heading
- Excessive nose-down attitude to restore flight at 70 kts.

17. NORMAL APPROACH

PURPOSE: To teach the student to perform a hovering with ground effect starting from a predetermined height and with a track of 10-15°

1) OPERATION

The normal approach begins with the preparation of the manoeuvre on the final leg in terms of horizontal flight level at 1000 ft and 60 kts. Immediately after the final turn reduce power to about 15" with target in sight. At the same times act gently on the cyclic to reduce the speed to 40 kts and maintain direction with the right foot. Continue with these parameters in order to descent with the target in sight. Passing 200 ft decelerated pull the cyclic slowly, taking care to mention just a call-back and keep the helicopter coordinated and aligned with target. Below 30 Kts, the helicopter will tend to assume a steeper trajectory with the result of undershoot the target. To avoid that situation, increase power to maintain the glide slope. The helicopter will continue to descend, adjust power setting and speed to maintain the glide slope and to avoid vortex rings. The increase in power must follow by a right pedals coordination and close to ground before arrest the forward motion push the cyclic gently forward to level the attitude and apply power to avoid any sinking until reaching the ground effect.

2) RECOMMENDATIONS

Maintain alignment with target and do not delay with power reduction. Rely on external reference points and altimeter to check the glide slope. When the helicopter comes close to the ground ENSURE LEVEL ATTITUDE to avoid any tail impact.

3) MOST COMMON ERRORS

- Poor control of the parameters during descending
- Delay in reducing power and speed
- Bad and inconstant glide slope
- Nose-up attitude in ground effect

18. MANEUVERS WITH GROUND EFFECT

PURPOSE: To teach the student the right use and combination of flight controls for the execution of manoeuvres as rotation and translation of the helicopter in ground effect.

1) OPERATION

The manoeuvres in ground effect for education purpose are carried out with the helicopter in hover (2 feet AGL, RPM 100%, MAP as required), search an adequate area free of obstacle and with good reference points. These manoeuvres include:

- Forward and backward movement
- Lateral, forward and backward translation
- Fixed-point rotation

a) Forward and backward movement

The shift forward and backward have to be done following a side of the "square" with the heading into the wind at an altitude of 2 feet from the ground and with a slow and steady speed. The longitudinal axis of the helicopter should move in parallel direction to the side of the square. To perform these movements push/pull with a slight pressure on the cyclic forward or backward, pay attention not to perform too fast manoeuvre. Compensate with pedals at any cyclic and wind variation to maintain the right heading. Particular care must be taken to altitude, especially when flying backwards, to prevent any tail impact. It is advisable to increase the height a little bit, about 4/5 feet, before moving backward.

b) Lateral translation

To translate a lateral movement it is necessary to make a lateral input on cyclic to the desired direction. You can follow different trajectories as necessary. Maintain the control during manoeuvre using all flight control with care and always keep the heading upwind. For left translation apply a gently left input on cyclic, increase power and apply left pedal as required and vice versa for a right translation. The rate of movement should be constant, at 2 feet AGL and constant 100% RPM.

c) Rotations

Fixed-point rotations is either a rotation of the cockpit, or a rotation of the rear end of the tail. In the first case, the rotation to the left or right on the reference point will be done using the pedal gradual pressure at a constant angular velocity. During this manoeuvre a combination of cyclic, collective and pedals will be necessary to prevent lateral displacement forward or backward of the cabin and to keep constant height. Performing this type of rotation it is necessary to remember that the helicopter maybe suffer a slight drop in engine RPM during left rotation, which is proportional to the rotational speed. The opposite will happen for the rotation to the right (emphasis on turns). If the manoeuvre is performed outside of an exercise square, pay attention to the tail rotor track in order to avoid a collision with any obstacles.

As for the tail rotation the pilot has to positioned the tail in an open space than apply slightly left/right with a gently pull and coordinate this dangerous manoeuvre. During rotation at a fixed point the angular speed must be constant and extremely slow.

2) RECOMMENDATIONS

The sudden and intense actions on the pedals can cause serious damages to the tail of the helicopter so we recommend extreme caution fixed point rotations. The aircraft will operate consistently close to the ground, so any distraction or improper use of controls may result in an accident.

3) MOST COMMON ERRORS

- Too large change in attitude and speed
- Speed not constant
- Incorrect use of flight controls with over control as result
- Poor control of parameters

19. AUTOROTATION WITH POWER RECOVERY

Autorotation is a state of flight where the main rotor system of a helicopter or similar aircraft turns by the action of air moving up through the rotor, as with an autogyro, rather than engine power driving the rotor. The term *autorotation* dates to a period of early helicopter development between 1915 and 1920, and refers to the rotors turning without the engine.

In normal powered flight, air is drawn into the main rotor system from above and exhausted downward, but during autorotation, air moves up into the rotor system from below as the helicopter descends. Autorotation is permitted mechanically because of both a freewheeling unit, which allows the main rotor to continue turning even if the engine is not running, as well as curved main rotor blades such that when the collective pitch is fully down the inner part of the blade has negative pitch relative to the horizontal plane and can be spun up by the relative wind. It is the means by which a helicopter can land safely in the event of complete engine failure. Consequently, all single-engine helicopters must demonstrate this capability to obtain a type certificate.

Manoeuvre that allows to minimize the falling speed of the helicopter in the proximity of the ground using the kinetic energy of the rotor and partly the translational lift.

PURPOSE: To familiarize the student with the helicopter glide without engine and teach the technique to be used in the event of a real emergency.

1) AUTOROTATION

Autorotation with power recovery performed during circuit traffic, which is done for training purpose, it will be repeated during training course either in traffic circuit that in off-field area in order to simulate an engine failure as much as possible. It is therefore essential that the pilot knows exactly the behaviour of the helicopter in autorotation and the trajectory of glide that follows during the descent, in order to be able to land without engine in completely safety.

2) PREPARATION

Perform the circuit at 1000 ft, 70 kts and during downwind perform internal checks and the radio call reporting the intention of simulate an engine failure. Maintaining constant altitude and speed to make the turn in the final in order to align with the runway direction, when you are sure to reach the target, start the autorotation.

3) OPERATION

Lower of the collective way full down really fast to limit the RPM drop and for restore the RPM as soon as possible, the support cyclic tendency to roll and apply immediately right foot. The action on the collective must be done with continuous motion and not too slow, taking care to maintain the rotor RPM / engine at 100% until the collective is fully lowered. Stabilize at speed 65 kts, maintain and control the attitude to reach the target. The rotor speed MUST be maintained at 100%. If the rotor speed is below the expected, check that the lever of the collective is fully lowered, pull a little bit the cyclic in order to have more disc rotor surface exposed to the relative wind and take advantage of the aerodynamic effect that cause increase the RPM. Continue descend at 65 kts up to a height of 200/150 ft. At this point begin a gradual but continuous flare in order to produce a large reduction either in forward speed that vertical speed. Keep the nose-up attitude with reference point in sight and avoid any lags with pedals or lateral translation that would be very dangerous in case of contact with ground. At 10 feet AGL, raise the collective and bring forward cyclic to level the helicopter. After that apply the normal power to maintain the helicopter in hovering and arrest the residual forward motion.

4) RECOMMENDATIONS

The autorotation phase is one of the most critical maneuver and requires a lot of coordination between the speed reduction and loss of altitude. In fact, if the speed is reduced too quickly, the helicopter will be found to excessive distance from the ground to when it loses translational lift and it starts to sink. If the speed is reduced too slowly, the helicopter will arrive in ground effect with excessive speed, with the risk to crash on ground. You should also remember that the speed reduction is strongly influenced by the intensity of the wind. In fact all autorotation MUST be made upwind.

5) MOST COMMON ERRORS

- Poor RPM control during initial phase
- Action on the collective abrupt or violent
- Poor control of rotor rpm throughout the engine during autorotation
- Right foot and resulting in too use of right cyclic in order to maintain the direction
- Too nose-up attitude close to the ground
- Uncoordinated use of controls during flare

20. TAKE OFF STEEP

PURPOSE: To teach the student to use the maximum power available and maintaining a steep climb (30/35 kts) simulating the overfly a 200 ft obstacle height.

1) OPERATION

Steep take-off is performed with a slope steeper than normal takeoff. This manoeuvre is carried out in aerodrome for training purposes in order to teach at student the different trajectories of climb. It will be practically performed outside the aerodrome whenever it will become necessary to overfly an obstacle during takeoff. Perform the required pre-takeoff checks and take a reference point, align the longitudinal axis of the helicopter to facilitate the manoeuvre during climb. Hover close to ground to take full advantage of the ground effect, compensate with pedals as required.

Hover at 2 feet from this position change the attitude giving a slow forward motion to maintain 30-35 kts. At the same time increased the collective pitch slowly but continuously, up to the maximum take-off power, compensate with the left foot. Once you reach the speed of 30-35 kts stabilize the attitude and keep it constant. Continue the climb up to 200 ft keeping the trajectory and reference point. Correct any directional errors.

Reached 200 ft out of any obstacle slightly move the cyclic forward to increase speed with the attitude of 60 kts. When the speed will be close to that desired slowly lower the collective in order to reduce MAP up to the value of about 22" and continue with the parameters of the normal slope. During the reduction of power pay attention to the maintenance of the heading acting appropriately with the right foot.

2) RECOMMENDATIONS

Before start monitor the surrounding area, take a reference point clearly visible and aligned with the longitudinal axis of the helicopter. In the initial stage of the climb avoid sudden movements that may cause a considerable change in engine speed and direction.

3) MOST COMMON ERRORS

- Excessive longitudinal variation at the beginning of the translation. This trend will require an excessive change in attitude in opposite direction to stabilize the speed at 30-35 Kts. Specially it requires more power for takeoff in the initial phase to maintain the predetermined trajectory. The anemometers are not very reliable in the first phase of the steep climb, so you have to refer at the attitude that you set.
- Uncoordinated use of controls
- Discontinuous climb

21. STEEP APPROACH

PURPOSE: To teach the student the setup and maintenance of a steep approach.

1) OPERATION

Steep approach is a steeper descent path than required for normal approach. This manoeuvre is carried out in aerodrome in order to familiarize the student with the steep approach. It will be necessary whenever you will need to land in confined areas to overfly obstacles during approach.

The circuit height and speed are the same for normal approach until the end of the final turn. After choosen the landing target reduce speed up to 40 kts maintaining 1000 ft, reduce the power of an inch to support for decreased cyclic attitude, use pedals to maintain direction.

Continue descend with that parameters until reaching the target than reduce speed, apply power and left pedal as required. Pay attention not to fall below 30 kts while over 300ft/min in order to avoid vortex rings.

2) RECOMMENDATIONS

Avoid large attitude change.

Too steep, low-speed, low power and nose-up attitude are dangerous situations for helicopters.

3) MOST COMMON ERRORS

- Delay in increasing power
- Glide-slope too steep
- nose-up attitude too steep with ground effect with poor use of pedal

OFF-FIELD ACTIVITES

INTRODUCTION

The helicopter has unique ability to land anywhere. For this reason, there's some activities for off-field operation. Keep the following three items in mind:

1) Operation in unknown areas requires a lot of additional care, cautions and attention;

2) Pay attention not to cause damage or disturbance to others;

3) If you intend to land off-field check before the mission, local regulations, governing flight on helipads.

However, avoid over flying residential and industrial areas.

22. CIRCUIT AND OFF THE FIELD APPROACH

PURPOSE: To teach the student in the circuit and the approach in areas outside the field.

CIRCUIT AND OFF THE FIELD APPROACH

To approach off the field means to approach in unknown area. The glide-slope descent must be decided after a good recognition. The right glide-slope descend must avoid obstacle, village and wires.

1) RECONNAISSANCE

Check the area, obstacles, wind, ground surface in order to establish the circuit. The first recognition is carried out at 1000 ft with 65 Kts. Maintain landing point in sight and observe the surrounding area, the origin of the wind, large obstacles. Depending on these elements you have to decide four things:

1) Circuit (to turn left or right)

2) Management Approach

3) Type of approach

4) Management of take-off

The recognition can be performed at an higher height to avoid obstacle and not change altitude and speed. Start the descent simultaneous turning on the side where you want to do the circuit. During the descent, take care to set up a circuit preferably rectangular and about the same distance of the circuit Airport. The height should be at 500 ft at 65 kts. This circuit must be made with an emergency place over the circuit path. Pay attention to avoid wires, trees or any other obstacle. Also, during this reconnaissance check the power available based on density altitude. The best way to check the power available is out of ground effect.

Check:

1) Obstacle

2) Suitability for landing
3) Determination of power
4) Confirm type of approach

2) CIRCUIT

Take the appropriate reference points to perform a rectangular circuit, speed 65 kts, 500 ft above ground. In the down-wind perform the pre-landing checks.

3) APPROACH

The methods chosen for the type of approach are the same as those applied in several approaches in the field. However it is necessary to remember that the area is smaller, unknown and with the possible presence of obstacles.

4) RECOMMENDATIONS

Maintaining a safe distance from obstacles, do not make wide variations in cyclic. Keeping level hovering and check the RPM at 100%.

5) MOST COMMON ERRORS

- Changes in altitude and speed on reconnaissance
- Circuit too high/low
- Lag in start descend
- Nose-up too high attitude with low power close to the ground
- Poor control of RPM
- Bad wind check

23. OFF-FIELD TAKE OFF

To take off out off-field is defined as a takeoff from an unknown area, the trajectory of climb should be the same as for approaching. The choice of this trajectory is determined by the size of the area, the nature of any obstacles, wind direction.

PURPOSE: To teach the student to take off out of the field in limited areas with obstacles.

1) PREPARATION

During the reconnaissance carry out before approaching the landing must be always in sight, depending on the direction and intensity of wind, visibility, obstacles, weight of the helicopter and the path to follow. Perform any rotations on ground at fixed-point in order to prevent collisions with tail rotor.

2) TAKE-OFF

The climb path must be established by the pilot, in relation to the characteristics of the takeoff area. The take-off technique does not differ from that used for the normal takeoff and steep, described in the previous sections.

Remarks:

- The trajectory of climb above 300 feet/min must be performed only in case of necessity and the speed must not be less than 20 Kts. Obviously, in special cases, it may be necessary to perform a vertical climb, with zero speed, but this manoeuvre is not performed during training mission, the trajectory of climb is influenced by the wind and speed.
- The path of climb is performed with a gradual increase of the speed up to 30-40 Kts, then keep it constant until passing from the steep climb to normal.
- What is mentioned about the rate of progress does not take into account the collective pitch control. This must be adjusted so as to keep the trajectory of climb constant. Pay attention not to over MAP.
- During the transition from steep to normal very slowly change in speed and act co-ordinately on the pedals in relation to any change of power.
- Do not make any turn under of 300 ft AGL

3) RECOMMENDATIONS

During the initial stage of climb using the collective gently, avoid sudden movements that may cause a considerable change in engine speed and direction. Minimize the variations of attitude to avoid any loss of power, in order not to exceed the structural stress limits. Not exceed the maximum value of MAP.

4) MOST COMMON ERRORS

- Insufficient separation from obstacles during initial climb
- Too fast in ground effect and underestimate the danger of collision with obstacles
- Action too fast and large with the collective resulting in loss of rpm. This would reduce rate of climb and result in a very uneven climb path and loss altitude.
- Tendency to follow a steeper climb path than necessary
- Excessive variation of attitude. It will be noted because the anemometer is not reliable during the initial phase of the steep climb, so you should refer to the horizon.
- Uncoordinated use of controls, especially in the initial phase, during the start of the climb
- Poor direction control

24. APPROACH WITH LANDING CRAWLED

The approach with landing crawled is a particular manoeuvre that exposing the helicopter to possible damages. In fact helicopter might impact with the ground because the available power is less than that required for the fixed-point stationary flight with ground effect.

PURPOSE: To familiarize the student with the technique of the approach with the landing crawled, simulating the conditions of low power.

1) CRAWLED APPROACH

This manoeuvre is carried out in the field for training purpose. The approach is carried out with landing crawled into the wind and in a suitable area.

Bring the helicopter hovering at 2 feet AGL and reading on the gauge of MAP indicated. For landing crawled you will use less than 2 inches than normal.

Perform the procedures for a normal approach making sure not to take steep trajectory.

Once reached the height of about 100 ft, begin a slow deceleration with the cyclic, avoid a nose up attitude. Apply collectively to decrease the speed of descend and apply foot to maintain direction. There should be no rolling. As ground approaches gradually raise the collective without exceeding the value of MAP previously established and maintain the level attitude during impact with the ground at the lowest speed possible. After contact adequately use the pedals to maintain direction.

The cyclic will be placed longitudinally at the centre and across a bit ' on the left. Do not abruptly lower the collective fully down. Accurately maintain the direction, before, during and after contact with the ground.

2) RECOMMENDATIONS

The phase of this manoeuvre is the most critical and requires a lot of coordination. After the contact it is recommended to keep the helicopter level and well coordinated in order to avoid sudden impact.

3) MOST COMMON ERRORS

- Last stage inconstant
- Too nose-up attitude during the impact
- Poor direction control

25. HOVERING OUT GROUND EFFECT

PURPOSE: To familiarize the student with the hover out ground effect

This manoeuvre is repeated in the training course and will be enforced in the advanced operational flight, particularly in the use of the hoist hook and use the winch.

2) PREPARATION

Before beginning the procedure, perform the checks.
Carefully check the ground surface and make sure that there are suitable areas for a possible emergency landing. Set the helicopter upwind. Be prepared with the helicopter upwind at 70 kts and at a height not less than 1000 ft above ground.

3) OPERATION

Reduce power to 15 inches, at the same time apply right foot and pull cyclic and slightly reducing the speed. At about 30-35 kts gently return the collective not to loose on altitude. Maintain direction, acting with small interventions on the cyclic and collective until reach to zero forward speed at constant height level. During this stage do not relay to the anemometer but take a reference point on the ground below. Without distraction of the attitude maintain the trend of the altimeter and the value of the MAP, not exceed the maximum allowed. The use of the collective, to correct any erroneous altitude must be slow and steady. Pay attention to vortex rings.

RECOMMENDATIONS

During the manoeuvre, which is always performed against the wind, do not look at the airspeed. Not take nose-up attitude or delaying the use of the collective to stop the tendency to declaim altitude and to avoid any vortex rings. This can be recognized by the strong vibrations, sudden and strong rotations of helicopter and drop in speed despite the power used. As soon as feeling approaching such conditions,
LOWER THE COLLECTIVE TO BRING CYCLIC A LITTLE FORWARD to regain control of the helicopter.

26. AUTOROTATION 180° WITH POWER RECOVERY

1) ENTRY

Set the helicopter into downwind at 70 kts and 1000 ft AGL ; abeam the landing point enter the autorotation by lowering the collective completely without closing the throttle. Apply the right foot and cyclic back in order to maintain the attitude.

2) TURN IN GLIDE

Set the helicopter in glide maintain 60/70 kts and turn 180°. The appropriate bank angle is determined by the wind speed. Pay particular attention to avoid skidding or slipping during the turn. Changes in attitude and bank angle involve changes of rotor RPM. Continuously monitor the speed and number of revolution. Complete the turn and align the helicopter above 100 ft AGL.

NOTE

If the helicopter drops below 100 ft immediately recovery the power unless the following conditions remain:

1) Helicopter aligned with the landing point
2) RPM within green arc
3) Speed 60/70Kts
4) Rate of descent below 100 ft / min

27. REAL AUTOROTATION

PURPOSE: To familiarize the student with the glide slope without engine and demonstrate the proper technique with ground contact.

It is the manoeuvre that allows us, in case of engine failure to make a safe landing.

1) OPERATION

The preparation, circuit and parameters are the same as for autorotation with power recovery. The instructor will reduce the engine speed to a minimum (no influence by the governor) and demonstrate how to perform within the limited time available as the ground is approaching quickly, appropriately and in a coordinated all commands to obtain a soft and safe landing. The upwind will facilitate the autorotation.

28. AUTOROTATION FROM HOVERING IGE

PURPOSE : Simulate the helicopter landing form hovering IGE with the complete loss of engine

1) OPERATION

Start from a stabilized hover at 2 or 3 ft above ground level and setting with a headwind. Close the throttle, right pedal to maintain direction. The loss of the deflecting force of the tail rotor will cause a shift to the left when the throttle is lifted.

Compensate for this tendency with the cyclic to the right. Be careful not to raise or lower the collective when closing of the throttle.

When the helicopter has dropped to about 1 ft above the ground, raise collective, keeping the throttle fully closed to build a cushion for a smooth landing. With skids on ground apply a little cyclic forward.

Fully lower the collective to the ground.

Be careful to avoid any lateral movement when touched or backward which can result in the reversal of the helicopter (roll-over).

2) COMMON ERRORS

- Lack of right foot
- Sudden use of collective
- Poor control of the helicopter longitudinal and transverse

29. TAKE OFF CRAWLED (HIGH ALTITUDE)

PURPOSE: Simulate a take-off when you can't make the hovering IGE due to the high altitude (density altitude) or overweight.

1) OPERATION

From a hovering standardized to 5 ft, note the MAP needed to keep the helicopter hovering above ground wind facing. Set the helicopter on ground and control the area to the right and to the left for any other traffic. Raise the collective to lighten the helicopter on the skids. Pause momentarily, neutralizing any movement. Slowly raise the collective and apply forward cyclic in order to slide the helicopter forward on the surface.

Maintain direction with the pedals. Continue slowly increase the collective until reaching a MAP of one inch below the power necessary for hovering. As the helicopter approaches the speed of lift, slightly make pressure on the cyclic climbing so as to raise the helicopter from the ground. Continue the acceleration remaining below 10 ft in order to maintain all the ground effect until a minimum climb speed of at least 45 Kts has been reached. A 50 ft height set the MAP maximum continuous power.

2) RECOMMENDATIONS

For instruction purposes use 2 inches less, but in the case of uneven surface avoid stressing the helicopter. Reaching the speed of translation and raised the helicopter with a cyclic movement by pushing the cyclic forward immediately to continue to accelerate the helicopter, taking advantage of the ground effect, or decreasing the speed you lose altitude.

3) MOST COMMON ERRORS

- Poor maintenance of direction
- Tendency to sink
- Poor acceleration after transition lift

30. FIELD OPERATIONS ON INCLINED PLANE

PURPOSE: Land and take off from hovering on an inclined surface.

1) DESCRIPTION

Before performing a landing on an inclined plane, the pilots must be fully familiar with the features of dynamic rollover (rollover dynamic).

A) LANDING INCLINED

Place the helicopter in hovering diagonally to the inclination on a surface to 5 feet in upwind. Gently lower the collective to establish a rate of descent very slow. When the skid touches the ground, begin to apply cyclic laterally in the upstream direction of the slope to keep the skid levelled. Maintain the direction with the pedals continue to apply cyclic laterally upstream then finally lowering the collective. When the collective is fully lowered, centralize the cyclic.

B) TAKE-OFF INCLINED

The procedure for take-off from the inclined plane is almost the exactly opposite of the procedure for landing on an inclined plane. Move the cyclic to the upstream slope and slowly lift the collective. As the helicopter gets lighter on skids stop momentarily and neutralize any movement. Continue to raise the collective, maintain the direction with pedals, when the skid downstream lifting off the ground, slowly begin to centralize the cyclic. When the two skids are levelled, cyclic should be approximately at neutral. Continue to raise the collective maintaining the position on the ground with the cyclic and direction with the pedals as long as hovering at 5 ft has not been stabilized.

31. CONSIDERATIONS IS OUT OF LANDING FIELD IN THE MOUNTAINS

INTRODUCTION

The possibility of landing outside the airport and in particular in alpine areas is regulated by a special law which must be taken in account before taking any initiative. Following this interpretation, the decision to land on an unfamiliar area should be taken only after having carefully examined all the features of the landing point.

The helicopter SKT 06 presents good performance that allows operations on a certain elevation alpine areas. The performance graphs contained in the flight manuals clearly define the limits of permissible size. It is therefore essential that the pilot know the total weight of the helicopter prior the flight and to check the following limits as per the operating manual:

- In ground effect ceiling
- Out ground effect ceiling
- Maximum take-off power
- Maximum continuous power
- Take the following into consideration:

THE LIMITS DESCRIBED IN FLIGHT MANUAL PROVIDE OPTIMUM CONDITIONS BUT DO NOT TAKE INTO ACCOUNT OF ANY ADVERSE FACTORS SUCH AS:

- Reduced engine performance due to various causes (engine spark, stress and etc.).
- Wind components (tail wind, up-draught, downdraught, turbulence etc.).
- Main rotor condition (dirt, pollen, dust etc.)
- Other unpredictable causes that could affect the performance

Remember:

CHECK THE POWER AVAILABLE FOR THE DENSITY ALTITUDE.

Reconnaissance flight

A good reconnaissance in order to land safely is to remember the following:

1) Identification of obstacles to be considered for approach and take-off
2) Estimation of the wind
3) Estimate of any up-draught and downdraught (thermal or dynamic)
4) Type of circuit to be executed
5) Estimate altitude of landing place
6) Management of the optimal final path
7) Selection of the altitude from where to begin the final approach
8) Management of take-off and go-around

Final approach

It is advisable to adopt a certain standardization in order to complete the section of the final approach, the slope of the approach can't be neither steep nor flat (unless special requirements), but moderate, constant, possibly rectilinear.

During the approach you will have different feelings confirmation or less on assessments made earlier and in relation to obstacles to both wind components

The need for a go-around must be kept constantly present and must be achieved without hesitation in the event of unexpected factors.

The final approach must be completed only within the area of the intended landing.

At the time of take-off from hovering ensure stability of the rotor and engine rpm.

EMERGENCIES

During the flight missions, emergency procedures are simulated as described in the Flight Manual. In order to improve the students skill for emergency procedures, the instructor will choose various emergency procedures relating to the skill level of the student pilot to improve his flight skill during emergencies.

32. APPENDIX

ROTOR STALL

There are several factors that contribute to the stalling affect of the main rotor and every pilot must be able to perform and recover it.

During each flight condition that causes excessive angle of attack to the blade can cause a rotor stall. Rotor revolutions bases of high collective pitch (often the result in high density altitudes, excessive collective pitch, exceeding the same power as used during the ascent or high-speed in forward flight). A reaction too slow will activate warning light "low speed" which can result in rotor stall. This phenomenon is more intense during air turbulence.

RECOMMENDATIONS AND CRITICAL SITUATIONS

All SKT 06 pilots must comply with the following recommended procedures:

1) Avoid travel speed too high or too low
With travel speed lower than 60 Kts, in case of low speed rotor, the kinetic energy available to recover a rotor stall or to flare could be more difficult.
All pilots should maintain cruising speed between 70 and 100 kts and in no case less than the minimum rate as shown in the diagram “height / speed” in the flight manual.

2) Maintain, except in autorotation, rotor and engine rpm to 100%. The loss of rotor rpm can be caused due to engine failure (exceeding the operating limits) or by pilot mistake. The margin of flapping of the main rotor decreases with decreasing speed. The loss of revolutions is insidious and quick, so it requires a constant surveillance by the pilot to recover it.

3) Maintain a coordinated flight. The forward flight increase the flapping side compared to straight flight.

4) Make the hover out of ground effect always upwind. This manoeuvre often requires less power than one execute in downwind condition. Crosswind or tail rotor wind increase the power to compensate the tail rotor power absorption.

5) Pilot must react instinctively to correct of low speed rotor situations.

a) In the case of light and buzzer "low speed" immediately lower the collective and open the throttle.

b) In case of low RPM during hovering with ground effect gently lower the collective, open the throttle and slightly move the cyclic forward to avoid any loss of height for hovering or any backward movement.

FORCED LANDING

PURPOSE: To simulate an emergency situation to check the reaction time, planning and decision making in the event of an engine failure during flight.

1) DESCRIPTION

During the cruise flight with the student pilot to the instructor in command will initiate the forced landing by closing the throttle to the idle position. The student must immediately lower the collective all the way down in coordination with the right pedal to keep the cyclic trim and back to achieve balance. This will have to be performed quick enough to prevent a decrease in rotor rpm to below 90%.

As the rotor turns back to the green arc, raise the collective lever retaining spring over the limit.

Once the autorotation is stabilized, search for a suitable area to make a forced landing. Operate the helicopter to properly aligned with the landing area and possible to headwind.

Increased use of the collective and forward the cyclic to prevent a possible over- speed of the rotor during this manoeuvre .The speed must be placed between 60 and 70 kts. Before passing through the last 100 ft , the helicopter must be aligned with the point of contact , with a speed of 60-70 Kts and rotor revolutions in the green arc .

Run a passing motor recovery to a normal climb.

FAILURE TO TAIL ROTOR

PURPOSE: To recognize the condition of loss of tail rotor and familiarize themselves with the technique for maintaining the direction for landing.

1) During forward flight

The failure is indicated by a yaw to the right that cannot be corrected by the pedals. Maintain speed not less than 50 kts which allows controlling the direction with the cyclic. (Thanks to the vertical plane that provides adequate stabilization about the yaw axis). Divert to a suitable area for a possible smooth landing with headwind. Set a flat approach, starting a slow deceleration to reach about 20 kts a few feet above the ground, avoid not a too much nose-up attitude. Level the helicopter while maintaining 100% Rotor rpm. The tendency of the helicopter will yaw to the right, then slowly close the throttle just enough to realign the longitudinal axis with the direction of motion with a gently sink until ground contact. On the ground gradually lower the collective to stop.

2) During the hovering

In this situation, immediately close the throttle and perform an autorotation from hovering in ground (affect described in the chapter above).

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1) Before each flight carry out thorough pre-flight inspection to make sure that the helicopter is airworthy and ready to fly.

2) To avoid a refuelling flight, always check the amount of fuel contained in the tanks

3) Near the ground very careful with the obstacles present in the area, recalls that the helicopter is made to fly and the ground is like a fish out of water

4) Remember, losing is like refusing rides daily bread

5) Fly always at safe altitude above the leaves and the birds flying low

6) Your ability to finish the work begins when your guardian angel

7) Inspect carefully the tail rotor if you do not want to become a top

8) Always land with the head-wind if you want your career to have the wind in their sails

9) Before the flight, verify weight and balance; being too heavy can lead to a "lack of strength"

10) Pay particular attention to the "competition feathery" : a collision can result in serious damage