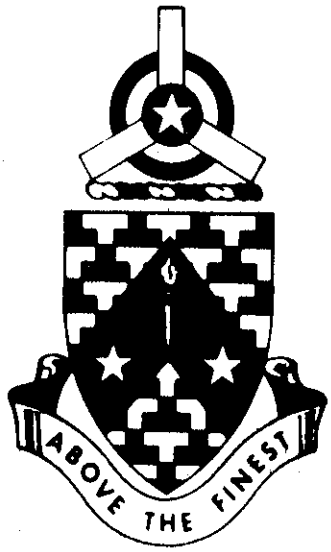
# PROGRAMED TEXT

HOVERING

AM-39

Part II




FEBRUARY 1969

UNITED STATES ARMY

PRIMARY HELICOPTER SCHOOL

FORT WOLTERS, TEXAS

# PROGRAMED TEXT

**PROGRAM TEXT**

**FILE NO:** AM-39
Part II

**PROGRAM TITLE**
HOVERING

**POI SCOPE:** Explanation of procedures and fundamentals involved in performing hovering maneuvers.

**INSTRUCTOR REFERENCES:**

Helicopter Flight Training Manual, USAPHS, Fort Wolters, Texas

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**DATE:**

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**DATE:**

February 1969

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February 1969

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**PROGRAMED TEXT** **PROGRAM TITLE:**

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# PREFACE

This program has been designed to teach you the fundamental helicopter attitude, altitude, and heading control necessary to perform hovering maneuvers. The required physical coordination of control movements should come as a by product of your expansion and application of these fundamentals.

Start with frame 1 and work each frame in succession. Each frame will usually ask you a question. The correct answer is printed on the top of the next frame. If you were incorrect, turn back and restudy the information before continuing on to the next frame. When you have finished the text, complete the self evaluation exercise. Now begin by studying the performance objectives on page iv.

# PERFORMANCE OBJECTIVES

At the completion of this programed text, the student will be able to correctly identify and select the general helicopter attitudes and primary control requirements needed to accomplish hovering, hovering turns, take off to a hover, and landing from a hover in accordance with the Helicopter Primary Flight Training Manual.

FRAME 1

The hovering maneuver requires the helicopter pilot to hold the helicopter over a fixed spot, at a three foot altitude. To accomplish a hover, the pilot must smoothly coordinate all the controls to maintain a

1. three foot altitude.
2. no horizontal movement.
3. no turning motion.
4. constant operating RPM.

A change in one control will almost always require a coordinated correction on one or more of the other controls.

---

Which is not a characteristic of a hover?

a. Constant operating RPM.
b. Remain over a fixed spot.
c. Varying altitude.
d. A constant heading.

ANSWER: c. When the aircraft weight is light on the skids.

---

FRAME 10

After adjusting the pedals and cyclic, continue the slow upward pressure on the collective until a three foot hover has been reached. During the climb, hold your fixed position over the ground with cyclic to insure a vertical ascent. Maintain RPM with throttle and keep a constant heading with pedals.

---

To insure a vertical ascent, you should

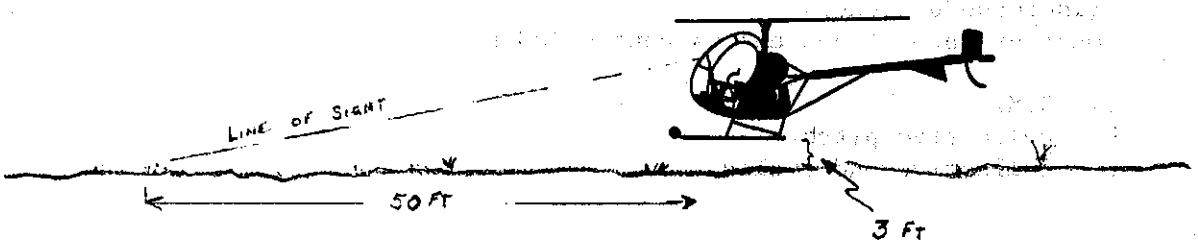
a. use a smooth, rapid pressure on the collective pitch.
b. hold a constant heading.
(c) maintain a level attitude with cyclic.

ANSWER: c. varying altitude.

---

FRAME 2

Hovering altitude is maintained by use of the collective pitch, coordinated with the throttle to maintain a constant RPM. By directing your vision toward a point approximately 50 feet in front of the helicopter you will be able to detect a change in altitude. When the helicopter starts to settle, you will notice objects on the ground become level with your line of sight; and when the helicopter starts to rise, your line of sight will become steeper.

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The collective pitch is the primary control used to maintain hovering height.

a. True
b. False

Visual reference to ground objects near your line of sight are aids to detecting changes in hovering altitude.

a. True
b. False

ANSWER: c. maintain a level attitude with cyclic.

---

FRAME 11

LANDING FROM A HOVER

To accomplish a landing from a hover, you must establish a stationary 3 foot hover over the touchdown spot. Direct your vision to a point about 50 feet to the front. Begin the descent by applying a slight downward pressure on the collective pitch to establish a constant rate of descent. As you descend, adjust the throttle to maintain RPM and apply right pedal to maintain heading. Since you are decreasing collective pitch, you will need less power to maintain RPM. To prevent over revving, reduce throttle. With the reduction of throttle you will need to apply right pedal pressure to keep the nose from turning to the left due to reduced torque.

---

A smooth downward pressure on the collective will cause a slight _____ in RPM.
(increase/decrease)

A constant rate of descent is controlled by

a. RPM.
b. collective pitch.
c. collective and cyclic.

ANSWER: a. True
a. True

---

FRAME 3

When you notice the helicopter settle, apply a slight upward pressure on the collective pitch, and if necessary squeeze on throttle to maintain the proper RPM and add left pedal to counteract for increased torque.


---

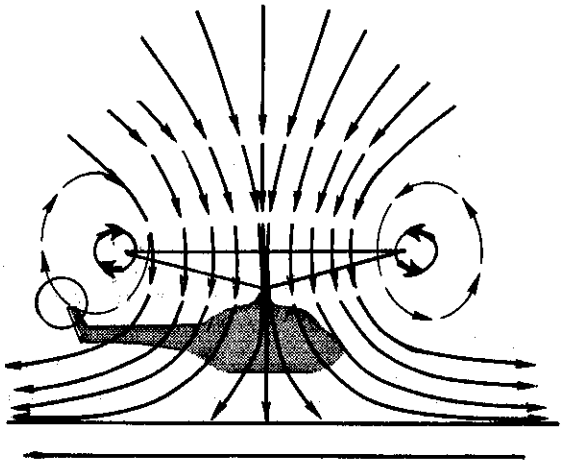
To correct the height of the above helicopter hovering, you would apply a slight _____ pressure on the _____ while _____ throttle to maintain RPM, and add _____ pedal to counteract for decreased torque.
(upward/downward) (collective) (decreasing/increasing) (right/left)

ANSWER: increase; collective pitch.

---

FRAME 12

As the helicopter reaches a point 4 to 6 inches above the ground, it will tend to stop because of increased ground effect beneath the helicopter. The diagram below shows flow of air through rotor system at a hover. Do not over control the cyclic at this point.



To land after encountering the area of maximum ground effect (4 to 6 inches) requires -

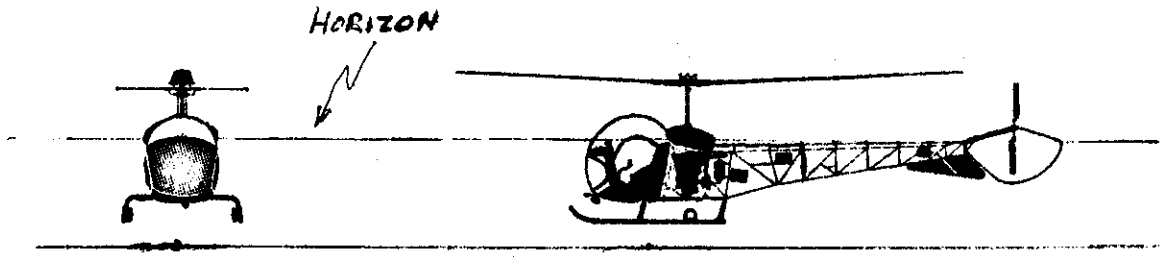
a. moving the cyclic to decrease lift.
b. continuing downward pressure on the collective and the helicopter will land.
c. add collective and move to another landing area.

ANSWER: downward, collective pitch, decreasing, right

---

FRAME 4

The helicopter will remain over a fixed spot on the ground if a level attitude is maintained with cyclic. Both lateral and longitudinal attitude changes are detected by movement of the console, or other cockpit references, in relation to the horizon and objects well forward of the helicopter.

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The basic reference attitude used for lateral and longitudinal cyclic corrections is the _____ attitude.

All nose up, nose down and lateral attitude changes are detected by a

a. relationship of cockpit references to the horizon.
b. line of sight to objects directly in front of the helicopter.
c. reference point 90° to heading.

ANSWER: b. continuing downward pressure on the collective and the helicopter will land.

---

FRAME 13

Upon initial contact with the ground, continue to lower the collective pitch, making necessary cyclic, pedal, and throttle corrections until the skids are firmly on the ground. After the collective is in the full down position, tip the main rotor away from the tail boom by a slight forward pressure on the cyclic, then you may reduce the throttle to idle RPM.

---

After the helicopter is firmly on the ground, but before the collective pitch is fully bottomed, you are required to

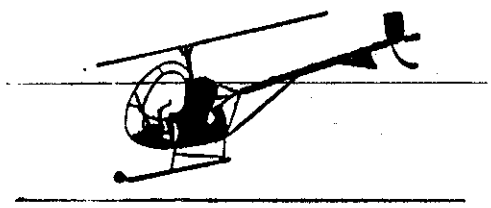
a. maintain operating RPM.
b. reduce RPM to the idle speed.

ANSWER: level attitude
a. relationship of cockpit references to the horizon.

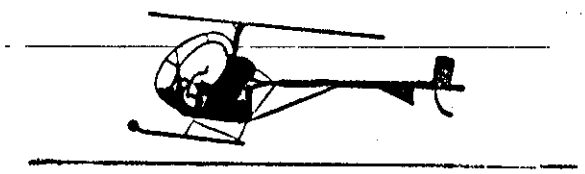
---

FRAME 5

If the level attitude changes to a nose low attitude, the helicopter will start to move forward.



Correct by slight aft cyclic pressure until back to level attitude, then relax aft pressure and helicopter will drift to a stop.



To return to level hovering flight, the attitude must be corrected by applying slight _____ (aft, forward, left, right) cyclic pressure.

There is a time lag between the time of an attitude change and the beginning of movement. In order to hover without movement, you must detect changes from the level attitude and correct back to the level attitude before the helicopter starts its movement.

To maintain a stationary hover, the student must develop a rapid cross-check to enable him to quickly detect attitude changes and correct them, while maintaining a constant operating RPM and heading.

ANSWER: a. maintain operating RPM.

---

FRAME 14

Hovering maneuvers can be accomplished with precision only when corrections are small, smooth, and coordinated. Abrupt control movements cause overcontrolling, which is the most common fault of student pilots when learning to hover.


---

To accomplish precision hovering work you must

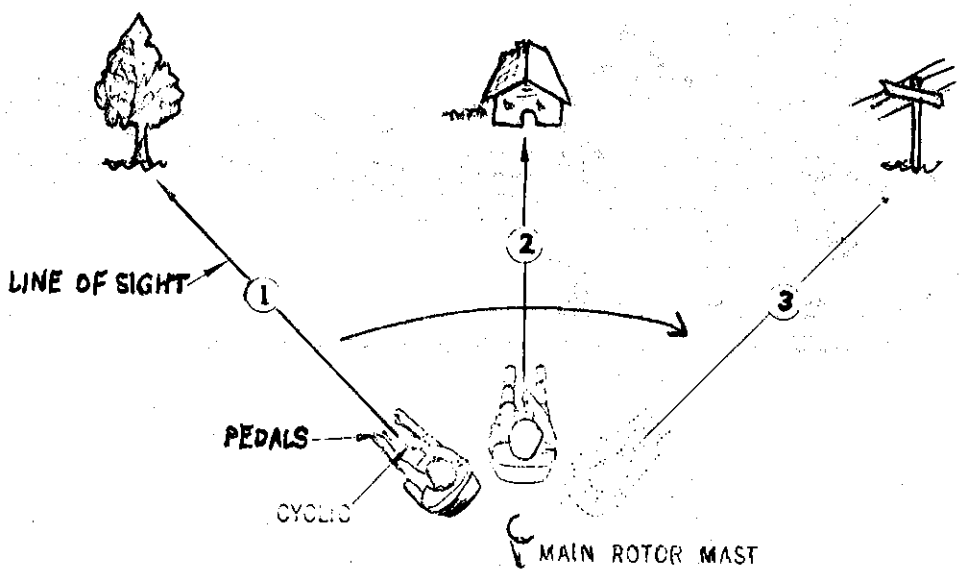
a. use abrupt control movements.
(b) use small pressure control movements.
c. use smooth, uncoordinated control movements.

ANSWER: forward

---

FRAME 6

All turning motion, at a hover, is controlled by the use of the anti-torque pedals. By using pressure and counterpressure on the pedals, you can maintain alignment with selected reference points on or near the horizon.

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You are hovering, facing the tree (1) and desire to turn to face the telephone pole (3). This turn requires an application of

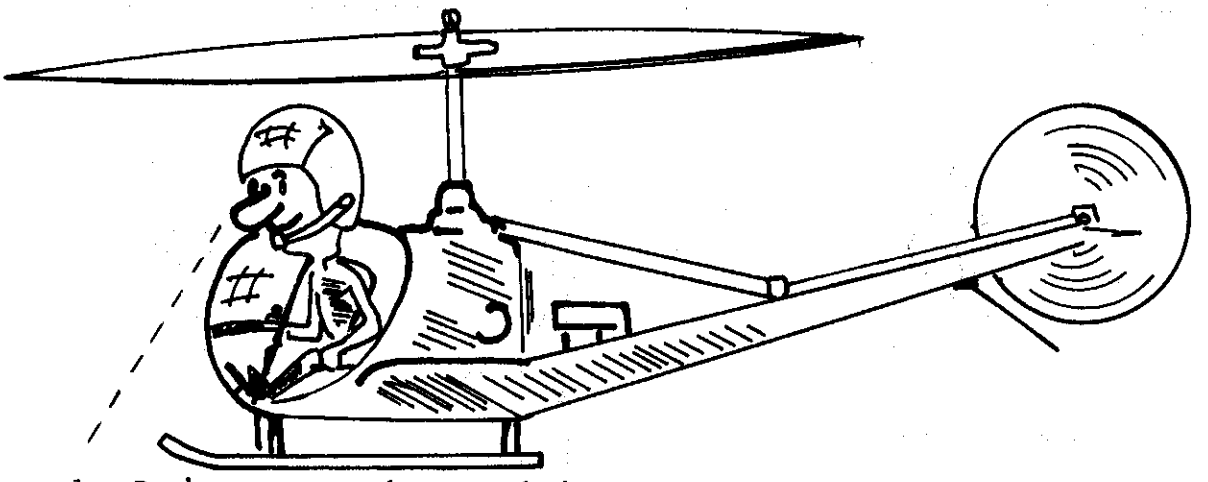
a. forward cyclic.
b. right cyclic.
c. right pedal.
d. left pedal.

ANSWER: b. Use small pressure control movements.

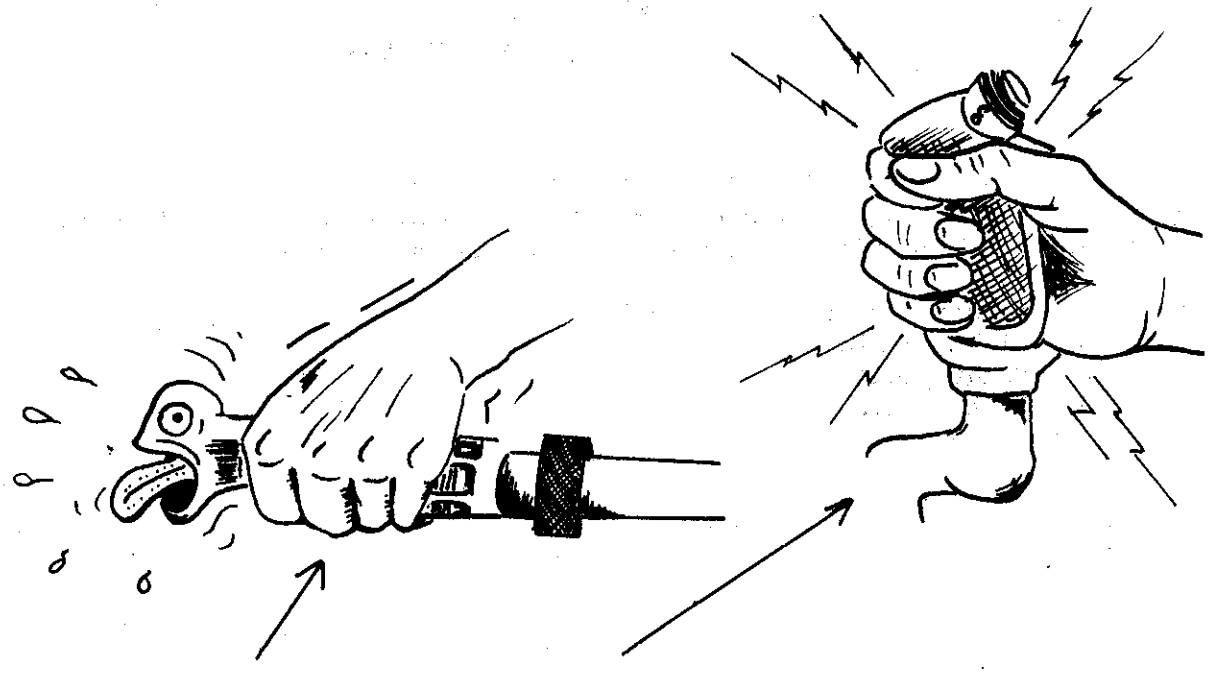
---

FRAME 15

To avoid overcontrolling, the student should concentrate on the following:



1. Don't <u>stare</u> at the ground, keep your eyes moving.



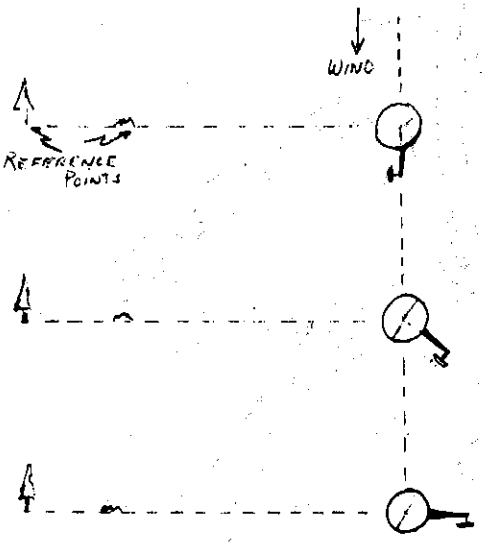
2. Relax your grip.

ANSWER: c. Right pedal

FRAME 7

HOVERING TURNS

Hovering turns are 90 degree turns, performed while the helicopter is held over a spot on the ground. Slight cyclic pressures into the wind will be required to prevent drifting off the spot. Normally, to maintain operating RPM, an increase of throttle will be required for left turns and a decrease of throttle for right turns.




TO EXECUTE A HOVERING TURN

1. Select reference points 90° in the direction of turn then apply pedal to initiate a slow turn, adjust throttle as necessary.

2. Maintain a constant rate of turn with pedal pressures; counter drift with cyclic pressures into the wind.

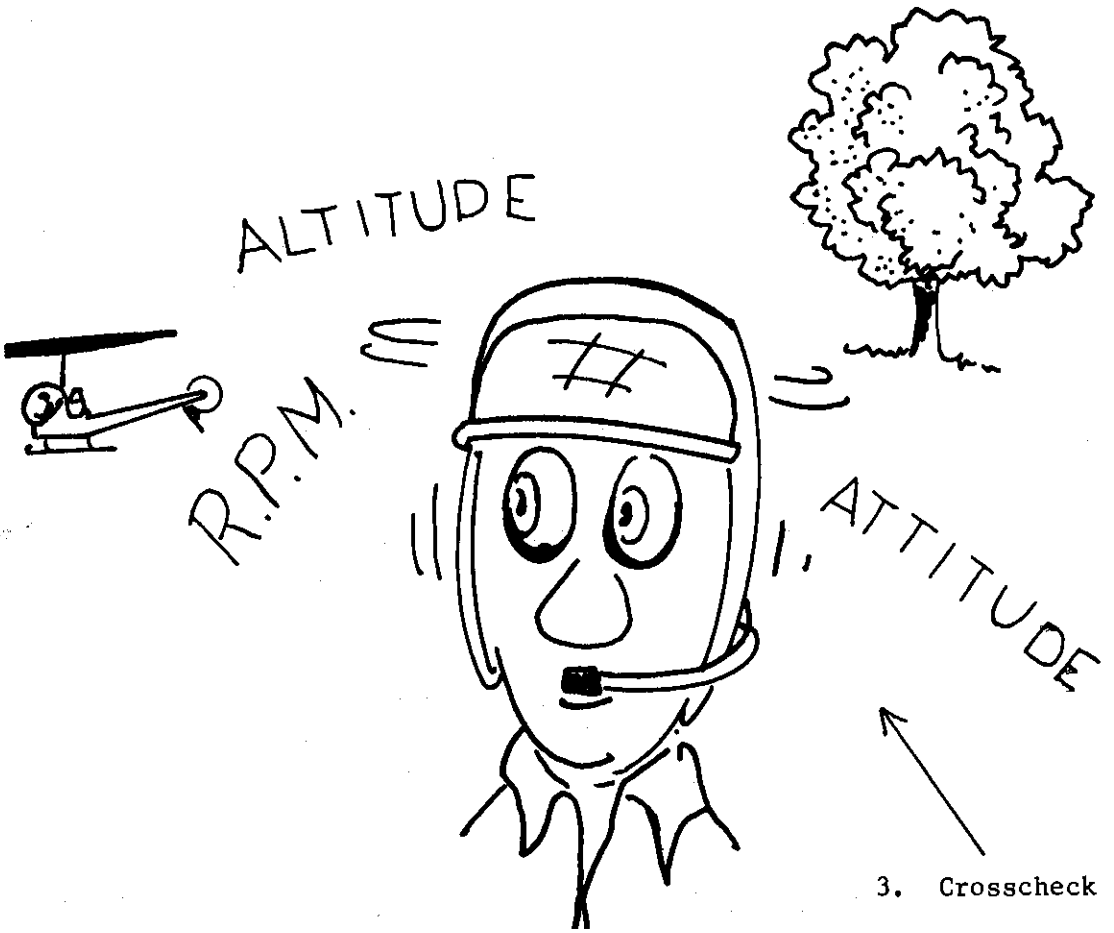
3. Apply opposite pedal to stop the turn aligned with the reference points.

Which is not a function of the pedals during hovering turns?

a. counteract torque.
b. correct for drift.
c. control rate of turn.
d. initiate and stop turns.

To maintain RPM during a turn to the left, you would

a. have to decrease throttle.
b. have to increase throttle.
c. not have to alter throttle position.




Which is a major fault of students when learning to hover?

a. Looking well forward of the helicopter
(b) Overcontrolling
c. Good crosscheck
d. Relaxed grip

ANSWER: b. correct for drift.
b. have to increase throttle. (An increase of left pedal requires more power.)

---

FRAME 8

TAKE OFF TO A HOVER

Prior to initiating a takeoff to a hover, check all directions to be sure you are clear of any obstructions. Begin with the collective in the full down position and adjust throttle to operating RPM. Direct your vision about 50 feet to the front and pick out a near and far object to aid in holding a constant heading during the take off.

Prior to takeoff to a hover, you should

a. check for obstructions prior to takeoff.
b. select a near and far object to line up with.
c. look approximately 50 feet in front of the helicopter.
d. all of the above.

ANSWER: b. overcontrolling

---

REMEMBER, CONSTANTLY CROSSCHECK ALL VISUAL REFERENCE POINTS AND HOVER THE HELICOPTER BY MAINTAINING A CONSTANT ATTITUDE. FLY BY PRESSURES ON THE CONTROLS, AND NOT MOVEMENT OF CONTROLS. A SERIES OF SMALL CORRECTIONS ARE BETTER THAN ONE LARGE CORRECTION.

NOW TURN TO PAGE 18 AND COMPLETE THE SELF EVALUATION EXERCISE.

ANSWER: d. all of the above.

---

FRAME 9

Begin the takeoff by applying a smooth, slow, upward pressure on the collective pitch until the helicopter is light on the skids. At this point the helicopter may turn or skid over the ground. Adjust the pedals to correct the heading, and adjust the cyclic to stop all skidding, before breaking ground.

At what point during takeoff will you get the first indication of a need to adjust your controls?

a. as you apply upward pressure on the collective pitch.
b. as you break ground.
c. when the aircraft weight is light on the skids.

STOP! TURN BACK TO PAGE 2 FOR FRAME 10.

SELF EVALUATION EXERCISE

HOVERING, HOVERING TURNS, TAKEOFF TO AND LANDING FROM A HOVER

1. During take off to a hover, which controls normally require adjustment just prior to breaking ground?

   a. pedals.
   b. cyclic and pedals.
   c. cyclic and collective.
   d. collective and pedals.

2. During hovering maneuvers, where do you normally direct your vision?

   a. approximately 20 feet directly in front.
   b. toward a stationary object.
   c. approximately 50 feet to the front.
   d. toward the ground near the front of the helicopter.

3. When making a hovering turn to the left, you will need to

   a. decrease collective pitch.
   b. increase throttle.
   c. decrease throttle.
   d. increase collective pitch.

4. Hovering maneuvers are performed at a

   a. 3 foot altitude.
   b. 4 foot altitude.
   c. 5 foot altitude.
   d. 2 foot altitude.

5. The basic attitude used for making all cyclic corrections is the

   a. horizontal attitude.
   b. level attitude.
   c. flight attitude indicator.
   d. lateral attitude.

6. The nose up, nose down and lateral attitude changes are detected by

   a. relation of the rotor disk to the horizon.
   b. relation of the cockpit references to the horizon.
   c. relationship of the skids to the level ground.
   d. relation of the cyclic to the cockpit console.

7. Which is not a characteristic of hovering flight?

   a. No horizontal movement.
   b. Nose low attitude.
   c. Constant heading.
   d. Operating RPM.

8. During hovering turns, drift is controlled by use of

   a. pedals.
   b. collective.
   c. cyclic.
   d. pedals and throttle.

9. During landing from a hover, where would you expect to have the most control problems?

   a. As the skids touch the ground.
   b. At 4 to 6 inches above the ground.
   c. When the descent is initiated.
   d. After touchdown while positioning the collective to the full down position.

10. A decrease in throttle will normally require

   a. an increase of collective to maintain RPM.
   b. an increase of right pedal to hold a heading.
   c. forward pressure on the cyclic to maintain attitude.
   d. an increase of left pedal to hold a heading.

11. Which is a common student error during hovering flight?

   a. Squeezing the controls too tightly.
   b. Jerky and abrupt control movements.
   c. Looking at the ground to close to the helicopter.
   d. All of the above.

12. While holding a correct hovering position, you detect a nose low attitude and a steeper line of sight to point 50 feet in front of the helicopter. You would expect the helicopter to

   a. stay in a fixed position.
   b. begin to move forward at a higher than normal altitude.
   c. be higher than normal without any horizontal movement.
   d. be lower than normal and begin to move forward.

13. During landing from a hover, you initiate the descent with proper collective pitch and throttle movements. If you make no other control corrections, the helicopter would

a. hold its position.
b. slowly descend and turn to the left.
c. slowly descend and turn to the right.
d. slowly descend with no turning movement.

14. During hovering turns, the rate of turn is controlled with

a. pedal pressures.
b. collective pitch.
c. cyclic pressure.
d. cyclic and throttle pressures.

15. What is the most common student fault when learning to hover?

a. Using control pressures.
b. Over confidence.
c. Attitude.
d. Over controlling.

## ANSWERS TO SELF EVALUATION EXERCISE

1. b
2. c
3. b
4. a
5. b
6. b
7. b
8. c
9. b
10. b
11. d
12. b
13. b
14. a
15. d

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