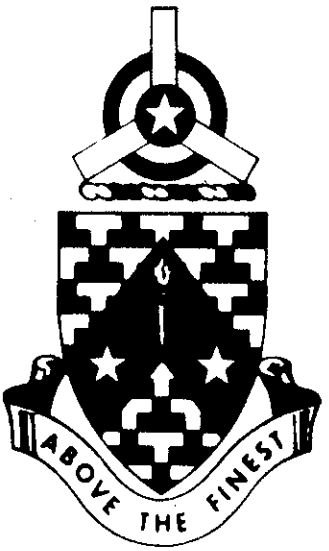
PROGRAMED TEXT

NORMAL TAKEOFF
AND
APPROACH

AM-41



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UNITED STATES ARMY
PRIMARY HELICOPTER SCHOOL
FORT WOLTERS, TEXAS

PROGRAMED TEXT

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FILE NO: AM-41

PROGRAM TITLE

NORMAL TAKEOFF AND APPROACH

POI SCOPE: Explanation of a normal helicopter takeoff and approach.

INSTRUCTOR REFERENCES:

Primary Helicopter Flight Training Manual USAPHS,
Fort Wolters, Texas Sec. III

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TABLE OF CONTENTS

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Normal Takeoff and Approach

CONTENTS	PAGE NUMBER
1. PREFACE	iii
2. PERFORMANCE OBJECTIVES	iv
3. PROGRAM	1
a.	
b.	
c.	
d.	
e.	
4. SELF EVALUATION EXERCISE	17
5. ANSWERS TO SELF EVALUATION EXERCISE	20
6. ITEMS TO BE ISSUED WITH PROGRAM	
7.	
8.	
9.	
10.	

PREFACE

This program is designed to enable you to become familiar with the procedures involved in executing a normal takeoff from a hover and a normal approach to a hover. The proper application of these procedures will enable you to become highly proficient in normal takeoffs and approaches.

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

Upon completion of the program and without the aid of references, you will be able to:

1. Identify the procedures required for initiating a normal takeoff from a hover.

2. Identify the aircraft attitude and control movements during a normal approach to a hover.

3. Identify the initial entry requirements for a normal approach to a hover.

4. Identify the aircraft attitude and control movements during a normal approach to a hover.

NORMAL TAKE-OFF

FRAME 1

A normal take-off is the transition from a hover to a normal climb by a smooth and simultaneous gain of airspeed and altitude.

Prior to take-off

1. Make a clearing turn to insure there are no aircraft close enough to prevent a safe take-off.

2. Select two points along your intended flight path to assist in maintaining the desired ground path.

3. Check cockpit instruments.

The take-off power setting (manifold pressure setting) will be the power setting required for hovering and should be noted prior to take-off.

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1. Prior to takeoff you should check your cockpit instruments

   a. to determine that all instruments are in the green.
   b. to determine your airspeed.

2. The best time to determine the power setting for takeoff would be

   a. while making the clearing turn.
   b. while the helicopter is stabilized at a 3 foot hover.
   c. at any time while hovering.

CONTINUE WITH FRAME 2 PAGE 3

ANSWER: a. observe the relationship between your flight path and the boundaries of the lane.

FRAME 8

You must evaluate the existing wind velocity to determine the airspeed to be used on final. Normal approach airspeed is 40 knots, however, if you have a headwind in excess of 15 knots, your airspeed on the approach should be increased by 5 knots. If the headwind component is more than 20 knots, increase the airspeed by 10 knots. This increase of airspeed should be made on the final leg.

With a headwind of 18 knots, on final approach you should have

a. 40 knots airspeed + 300 feet of altitude.
b. 45 knots airspeed + 300 feet of altitude.
c. 50 knots airspeed + 400 feet of altitude.
d. 45 knots airspeed + 400 feet of altitude.

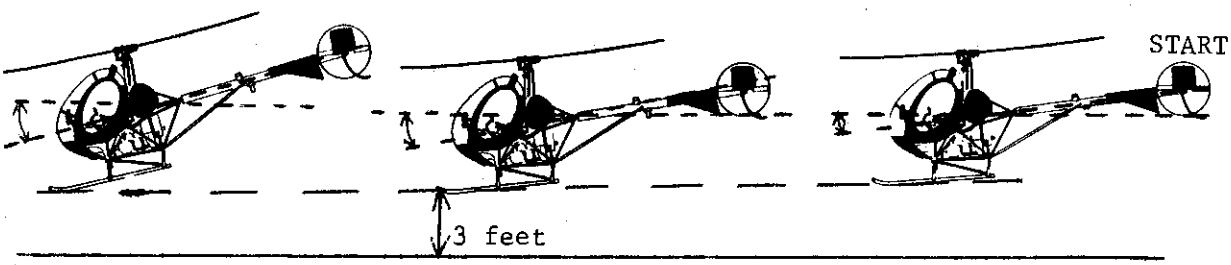
ANSWER: a. to determine that all instruments are in the green.
b. while the helicopter is stabilized at a three foot hover.

FRAME 2

Begin a normal takeoff by rotating the nose of the helicopter slightly lower than the required hovering attitude. The helicopter will begin to move forward slowly.

As the helicopter moves slowly forward, rotate the attitude slightly again (nose lower) which will result in an increased forward speed.

As the forward speed increases again rotate the attitude (nose lower) a slight amount. Maintain this attitude until effective translational lift is obtained. You should maintain your 3 foot hover altitude also.



The normal takeoff is initiated by

a. an application of collective pitch.
b. very slight forward pressure on the cyclic.

The three foot hover altitude is maintained

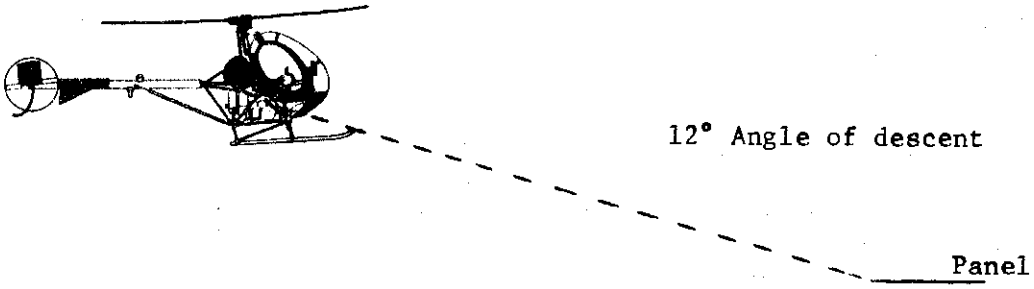
a. until the initial forward movement.
b. until effective translational lift is obtained.

CONTINUE WITH FRAME 3 PAGE 5

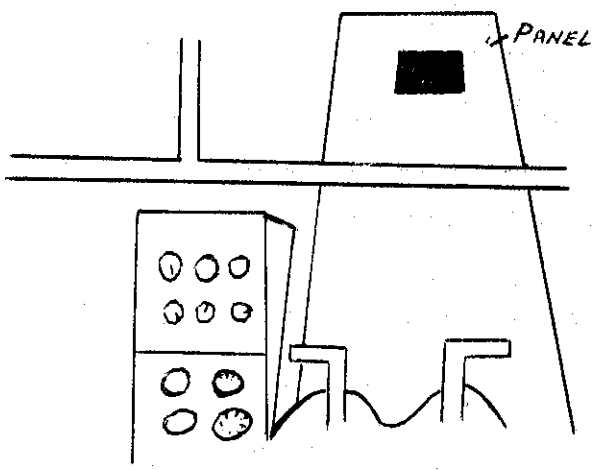
ANSWER: b. 45 knots airspeed and 300 feet of altitude.

FRAME 9

The normal approach is made at an angle of descent 12 degrees.



To determine this 12-degree angle of descent, you use a sight-picture with the helicopter in a 40 knot attitude (normal wind conditions) and the approach panel in the sight picture position on the bubble of the helicopter. (See below). Your instructor will demonstrate the correct sight picture for you by letting you observe the panel relative to your visual reference points in the cockpit. The normal approach sight picture will vary for different height people. You must have the correct attitude to get a good sight picture.



Average sight picture for normal approach (TH-55)

In order to have an accurate sight picture on each approach, the helicopter must

a. be in the proper attitude.
b. be at 45 knots airspeed.

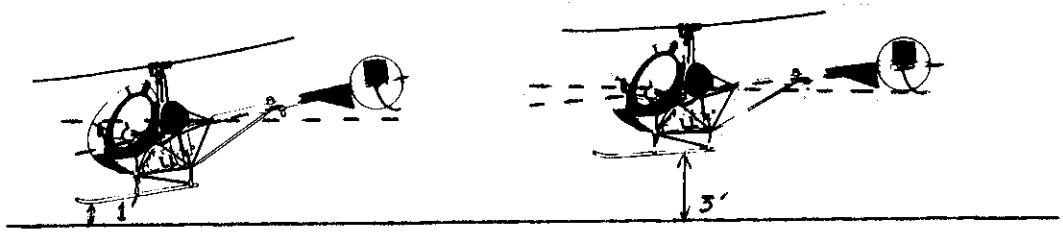
As you proceed on final approach, the panel will slowly move _____ the bubble until it is at the normal sight picture position.

ANSWER: b. very slight forward pressure on the cyclic.
b. until effective translational lift is obtained.

FRAME 3

One objective of a normal takeoff is to use minimum power (hover power) to execute the maneuver.

When the attitude rotation is made at one time rather than in three steps the aircraft will settle toward the ground.



Once the aircraft begins to settle toward the ground on a normal takeoff:

a. more power is required.
b. less power is required.
c. more RPM is needed.

ANSWER: a. be in the proper attitude. If you do not have the proper attitude you will not get the proper approach angle.
a. down.

FRAME 10

In the presolo stage the approach is made in a slip if you have a cross-wind. As you become more experienced, a crab, a slip, or a combination of the two may be used for most of the approach, but a slip must be used for the last 50 feet. Enter the slip just prior to starting the approach by applying cyclic into the wind and opposite pedal to maintain heading.

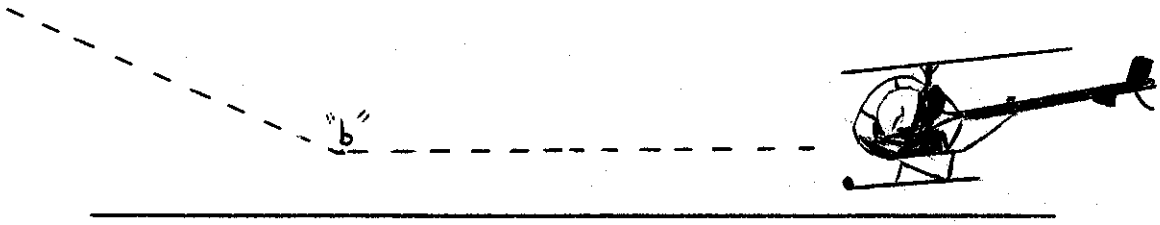
The slip should be established:

a. in ample time to attain the proper sight picture.
b. after the proper sight picture is attained.

ANSWER: a. More power is required. When the hovering altitude is lost on takeoff, the normal tendency is to rapidly increase collective pitch which causes a loss of RPM. The rapid application of collective pitch should be avoided.

FRAME 4

As you accelerate into effective translational lift (at approximately 15 knots at point b, see below) the helicopter will begin to climb and the nose will tend to come up due to increased lift.



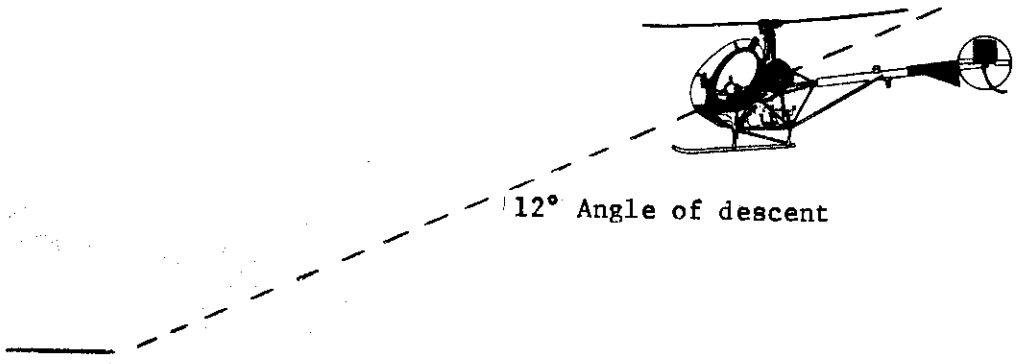
To maintain the takeoff attitude at point b requires:

a. reducing RPM to cruise power.
b. applying forward cyclic to overcome the tendency of the nose to pitch up.
c. holding the cyclic stationary until the aircraft stabilizes.

ANSWER: a. in ample time to attain the proper sight picture.

FRAME 11

When the normal approach sight picture is reached, begin the normal approach by lowering the collective until you feel and observe the helicopter begin to descend. Visualize a straight line to the approach panel and keep the helicopter in this imaginary line or angle of descent by using collective pitch.



If you fall below your desired line of descent, the panel will appear to be:

a. moving up the bubble.
b. moving down the bubble.

The 12 degree line of descent is maintained with:

a. collective pitch
b. cyclic.

ANSWER: b. applying forward cyclic to overcome the tendency of the nose to pitch up.

FRAME 5

After entering translational lift, establish an attitude which will establish a continuous climb and a smooth acceleration to 40 knots. As you begin the climb, adjust manifold pressure to normal climb setting (hover power). Continue to increase airspeed to 40 knots decreasing left pedal as airspeed increases. Try to coordinate airspeed with rate of climb to reach 40 knots at 70 to 100 feet.

In a normal takeoff climb, as your airspeed approaches 40 knots you should:

a. apply a slight amount of aft cyclic to establish a 40 knot attitude.
b. maintain present altitude to establish a 40 knot attitude.
c. decrease collective pitch to establish a 40 knot attitude.

As you begin the climb in a normal takeoff you should:

a. adjust manifold pressure to climb power.
b. apply aft cyclic to overcome tendency of nose pitch up.

ANSWER: a. moving up the bubble.
a. collective pitch.

FRAME 12

As you continue the approach, notice the rate the panel appears to be moving toward you. This is called apparent rate of closure. Your speed over the ground and rate of closure should appear to be that of a brisk walk. You want to keep this same apparent speed all the way to the panel. The proper rate of closure is maintained with the cyclic.

If it appears that your ground speed and rate of closure is faster than a brisk walk:

a. decelerate by applying aft cyclic.
b. decelerate by applying collective.

ANSWER: a. apply a slight amount of aft cyclic to establish a 40 knot attitude. If this is not done, your airspeed will continue to increase above 40 knots.
a. adjust manifold pressure.

FRAME 6

On your climb out, keep the helicopter aligned with the desired ground track. In a crosswind the helicopter is flown in a slip by maintaining heading with pedals and apply lateral cyclic into the wind. At 50 feet place the helicopter in a crab and continue the climb out.

You have the right amount of crab if you are:

a. making good your ground track over the guide points and the helicopter is level laterally.
b. maintaining your RPM and the helicopter is level laterally.
c. maintaining your 40 knots attitude and the helicopter is level laterally.

ANSWER: a. decelerate by applying aft cyclic.

FRAME 13

The proper apparent rate of closure may be reached at almost any point during the descent, dependent upon the wind. In a strong wind the rate may appear to be slow; if this occurs, continue holding the entry speed until the rate appears correct. In a light wind, the rate of closure will seem fast and immediate action is necessary to adjust this rate. Constant adjustment of angle of descent and rate of closure as necessary is made during the approach.

During your approach you notice the panel moving down the bubble and your rate of closure increasing, you should simultaneously:

a. apply forward cyclic and increase collective.
b. apply aft cyclic and decrease collective.
c. apply aft cyclic and increase collective.

ANSWER: a. making good your ground track over the guide points and the helicopter is level laterally.

FRAME 6 (Continued)

Do not destroy the effect of the maneuver by lowering the nose excessively and by applying power to commence a climb out before effective translational lift is reached.

ANSWER: b. apply aft cyclic and decrease collective because you are going above the angle of descent and increasing your forward ground speed.

FRAME 14

The normal approach is a constant decrease in airspeed and altitude. In the last portion of the approach, the helicopter may tend to descend below the proper angle. This is because translational lift is being lost due to a slow airspeed. At this time, additional collective pitch must be continually added to prevent an under-arc. The application of collective pitch should be a smooth continuous pressure coordinated with throttle application and phasing in a left pedal to maintain heading. The termination should be in a level attitude, with no forward movement, three feet above and behind the panel.

The loss of translational lift at the bottom of the approach may cause the helicopter

a. to fall below angle of descent.
b. increase airspeed.
c. move above the angle of descent.

As collective pitch is applied at the bottom of the approach:

a. left pedal must be applied with an increase of throttle.
b. right pedal must be applied with a decrease of throttle.

NORMAL APPROACH

FRAME 7

The purpose of the normal approach is to provide a safe and precise method of terminating the helicopter at a three foot hover and with no forward movement, at a desired location.

Before completing 2/3 of the base leg, establish 40 knots airspeed and an altitude of 300 feet above the ground. Pick out the lane in which you intend to land and the panel you will approach for landing.

On final approach the helicopter should be aligned with the center line of the lane to be used.

In order to check your alignment with the center line of the lane:

a. observe the relationship between your flight path and the boundaries of the lane.
b. check that your compass is on the correct lane heading.

RETURN TO FRAME 8 PAGE 2

ANSWER: a. to fall below angle of descent.
a. left pedal must be applied with an increase in throttle.

FRAME 14 (Continued)

REMEMBER:

Complete all adjustments to ground track, RPM, airspeed, and altitude on the final leg in sufficient time so all of your attention may be given to planning the entry as the panel nears the sight position.

CONTINUE WITH SELF EVALUATION EXERCISE ON NEXT PAGE

SELF EVALUATION EXERCISE

1. You are at the takeoff panel and are about to start moving forward to begin a normal takeoff, prior to this you should have: (Check one)

   a. selected 2 reference points along intended takeoff path.
   b. checked to make sure all engine instruments are in the green.
   c. made a clearing turn and establish hover power setting (manifold pressure).
   d. All of the above.

2. You check your hover power setting while at a stabilized _____ foot hover.

   a. three
   b. four
   c. five
   d. six

3. You need this "Hover Power Setting" (manifold pressure) check to determine:

   a. your helicopter's power.
   b. if pressure is within normal operating limits.
   c. what your climb power setting should be.
   d. the density altitude.

4. You start moving forward to make your normal takeoff. As you leave the takeoff panel you do not allow your collective pitch to increase or decrease. But as you move out of ground effect you find yourself gaining airspeed rapidly, but beginning to settle (or come) to close to the ground. This is probably due to:

   a. hovering a underpowered aircraft.
   b. poor pedal control.
   c. a direct tailwind.
   d. Applying too much forward cyclic.

5. In a normal takeoff at what forward speed (approximately) would you expect to enter effective translational lift?

   a. At 20 knots.
   b. Prior to reaching 10 knots.
   c. At 15 knots.
   d. Anytime after reaching 25 knots.

6. In making a normal take-off a crab should be established upon reaching _____feet of altitude.

a. 40
b. 50
c. 60
d. 70

7. In making a normal take-off you should have:

a. 40 knots at 60 to 100 ft altitude.
b. 60 knots at 70 to 100 ft altitude.
c. 35 knots at 80 to 90 ft altitude.
d. 40 knots at 70 to 100 ft altitude.

8. In making a normal descent to establish the desired "angle of descent" you should be at what airspeed and what altitude:

a. 60 knots 300 ft altitude.
b. 40 knots 400 ft altitude.
c. 30 knots 200 ft altitude.
d. 40 knots 300 ft altitude.

9. The normal approach is made at a _____degree angle of descent.

a. 10
b. 12
c. 13
d. 14

10. To determine when to decrease collective pitch, to begin your normal angle of descent you would:

a. Estimate your distance from landing panel.
b. Decrease your airspeed.
c. Use a predetermined "sight picture".
d. Estimate wind velocity.

11. During the normal approach, how fast should your "apparent rate of closure" be?

a. The rate of a brisk walk.
b. 40 to 25 knots.
c. The rate of a slow walk.
d. Gradually decreasing.

12. The last 50 ft. of the normal approach the aircraft is flown in a:

a. Skid
b. Level attitude
c. Slip
d. Crab

13. As you begin to pass out of effective translation lift the helicopter may tend to descend below the proper angle of descent (under-arc), to retain desired angle you would use the:

a. Cyclic, pedals, throttle.
b. Collective, pedals.
c. Cyclic and collective.
d. Collective, pedals and throttle.

KEY TO SELF EVALUATION EXERCISE

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