PROGRAMED TEXT

INTRODUCTION TO HELICOPTER ATTITUDE INSTRUMENT FLYING

JULY 1966

DEPARTMENT OF ROTARY WING TRAINING

UNITED STATES ARMY AVIATION SCHOOL

FORT RUCKER, ALABAMA

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TITLE: Introduction to Helicopter Attitude Instrument Flying	POI NO. 1-B-F18 FILE NO. 54-98-1
POI SCOPE: Contrast of attitude instrument flying and visual flying, instrument interpretation, instrument crosscheck, and basic techniques of attitude instrument flight.	
INSTRUCTOR REFERENCES: TM 1-215, "Rotary Instrument Instructor Guide," and "Rotary Wing Basic Instrument Standardization Guide."	
MATERIALS ISSUED TO STUDENTS: Programed text for introduction to helicopter attitude instrument flying, self-test, and answer sheet.	
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TABLE OF CONTENTS

PREFACE

This programed text is designed primarily to introduce helicopter attitude instrument flying to students in the helicopter instrument flying course and to initial entry students in the instrument phase.

To achieve the fullest benefit from this text, students should have completed the instruction on operation and use of flight instruments.

This text has been programed according to approved teaching methods, and thus will present to you just the right information to allow you to learn at your best rate of speed.

This publication is in two forms: one section is in the linear method where you read frames consecutively, and the next section is in the branching method where you do not necessarily read the frames consecutively. When using the branching method, the next page or frame that you read will always depend upon how well you understand the material just presented.

PERFORMANCE OBJECTIVES

Upon completion of this text, without notes or references, you should be able to:

a. Define instrument interpretation, instrument crosscheck, pitch, roll, yaw, and attitude functions of flight instruments.

b. Select the correct answer when comparing intuition versus actual aircraft attitude.

c. List the pitch attitude instruments.

d. List the roll attitude instruments.

e. Indicate instrument indications for variations in pitch and roll attitudes.

f. Identify the maneuvers depicted in diagrams or pictures of the instruments.

g. Compare aircraft attitude with the correct aircraft control.

SECTION I

The first section of this text is presented in a linear approach. Read each frame carefully, then provide the required response. If your initial response was correct, go on to the next frame. If your initial response was incorrect, re-read the frame before continuing. Beginning on page 1, follow the top column of frames to page 10, then return to page 1 to begin the second column, etc.

Now, turn to page 1.

1. Instrument interpretation means to interpret or evaluate the flight instruments to determine the attitude of the aircraft.

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10. A knowledge of pitch attitude, roll attitude, and yaw is helpful in attaining good instrument interpretation. The pitch attitude of the aircraft is the angular relationship between the longitudinal axis of the aircraft and the actual horizon.

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19. The banking or rolling attitude of the aircraft is the angular relationship of the lateral axis of aircraft to the actual horizon.

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28. Yaw is the movement of the aircraft around the vertical axis.

Go on to page 3.

PITCH ATTITUDE

ROLL ATTITUDE

YAW

2. Instrument interpretation means to understand or evaluate the flight instruments to determine the attitude of the aircraft.

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11. The pitch attitude of the aircraft is the angular relationship between the longitudinal axis of the aircraft and the actual horizon.

---

20. The banking or rolling attitude of the aircraft is the angular relationship between the lateral axis of the aircraft and the actual horizon.

---

29. Yaw is the movement of the aircraft around the vertical axis.

---

3. interpret or evaluate

---

12. longitudinal; aircraft

---

21. lateral; aircraft

---

30. vertical

---

4. Instrument interpretation means to understand or interpret the flight instruments to determine the attitude of the aircraft.

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13. The pitch attitude of the aircraft is the ~~lateral~~ longitudinal relationship between the aircraft axis of the longitudinal and the actual horizon.

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22. The banking or rolling attitude of the aircraft is the A relationship between the lateral axis of the aircraft and the actual horizon.

---

31. Yaw is the movement of the aircraft around the vertical axis.

---

5. interpret or evaluate the flight instruments.

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14. angular; longitudinal; aircraft

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23. angular; lateral; aircraft

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32. aircraft; vertical

---

6. Instrument interpretation means to [illegible] or [illegible] the flight instruments to determine the attitude of the aircraft.

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15. The pitch attitude of the aircraft is the [illegible] relationship between the [illegible] axis of the aircraft and the actual horizon

---

24. The banking or rolling attitude of the aircraft is the [illegible] relationship between the [illegible] axis of the aircraft and the actual horizon

---

33. Yaw is the movement of the aircraft around the vertical axis

---

7. interpret or evaluate the flight instruments to determine the attitude

---

16. angular; longitudinal; aircraft; horizon

---

25. angular; lateral; aircraft; horizon

---

34. aircraft; vertical axis

---

8. By definition then, instrument interpretation means interpret & evaluate flight instruments to determine the attitude of aircraft.

17. The pitch attitude of the aircraft is a relationship to the horizontal axis of the aircraft & the horizon.

26. The banking or rolling attitude of the aircraft is a relationship to the lateral axis of the aircraft to the actual horizon.

35. Yaw is movement of aircraft around vertical axis.

9. to interpret or evaluate the flight instruments to determine the attitude of the aircraft. (Return to page 1, item 10.)

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18. the angular relationship between the longitudinal axis of the aircraft and the actual horizon. (Return to page 1, item 19.)

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27. the angular relationship between the lateral axis of the aircraft and actual horizon. (Return to page 1, item 28.)

---

36. the movement of the aircraft around the vertical axis. (Go to the following page.)

SECTION II

The next section of this text is in the form called "branching." Read each frame carefully, then select your answer and turn to the page indicated. If you have selected the correct response you may progress as directed. If you did not select the correct response, you will receive additional information and further instructions. Correct answers will enable you to by-pass many frames and thereby complete the text in less time.

Now, turn to page 11.

Instrument interpretation is closely associated with crosscheck or instrument coverage. Crosschecking means observing or interpreting two or more instruments to determine the attitude and performance of an aircraft. Although no specific method of crosschecking is recommended, those instruments which give the best information for controlling the aircraft in any given maneuver, should be used.

Based on what you have learned, would you say that intuition would be helpful in crosschecking?

1. Yes. Turn to page 13.

2. No. Turn to page 12.

ANSWER TO SELF-TEST QUESTION NO. 5:

Observing or interpreting two or more instruments to determine the attitude of the aircraft.

YOUR ANSWER: NO.

Very good. Utilizing intuition can get an aviator into serious trouble. A person's senses act primarily on the basis of gravity and provide reliable information while on the ground. When in flight, the aviator experiences acceleration and centrifugal forces that affect these senses exactly as gravity does, thus providing misleading information.

While crosschecking the instruments, the aviator learns and perfects a technique of combating the ill effects of the illusions.

Turn to page 14.

ANSWER TO SELF-TEST QUESTION NO. 14:

a. Straight climb.

YOUR ANSWER: YES.

You are way off. Intuition can give you a false indication of aircraft attitude. Cross-checking enables the aviator to repeatedly prove that his intuition is wrong; thus, he develops the habit of checking the instruments before changing the attitude of the aircraft.

As experience is gained in relying on instruments, distracting impressions of the mind become easier to overcome, the aviator must learn to ignore confusing sensory information and rely only on the objective evidence provided by the aircraft's instrumentation.

Turn to page 11 and select another answer.

ANSWER TO SELF-TEST QUESTION NO. 6:

True.

Remember, instrument interpretation means to interpret or evaluate the flight instruments to determine the attitude of the aircraft. Now, let's talk about the pitch attitude instruments.

The altimeter gives an indirect reading of pitch attitude in level flight. At a given power setting the altimeter reading should remain constant, and any movement of the altimeter needle may be considered as an immediate indication of a change or need for a change in pitch attitude.

If there is no change in power and altitude is being lost, the nose is _____.

1. Low, page 17.

2. High, page 15.

ANSWER TO SELF-TEST QUESTION NO. 1:

To interpret or evaluate the flight instruments to determine the attitude of the aircraft.

YOUR ANSWER: HIGH.

You're joking! If altitude is being lost, the nose is low. If altitude is being gained, the nose is high. In either case, corrective action to return the aircraft to level flight should be promptly initiated.

Now, turn to page 16. Study the diagram and go on to page 17.

ANSWER TO SELF-TEST QUESTION NO. 14:

b. Level turn.


ALT
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ALT
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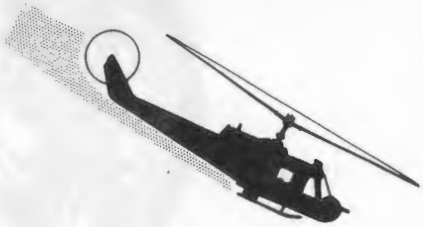


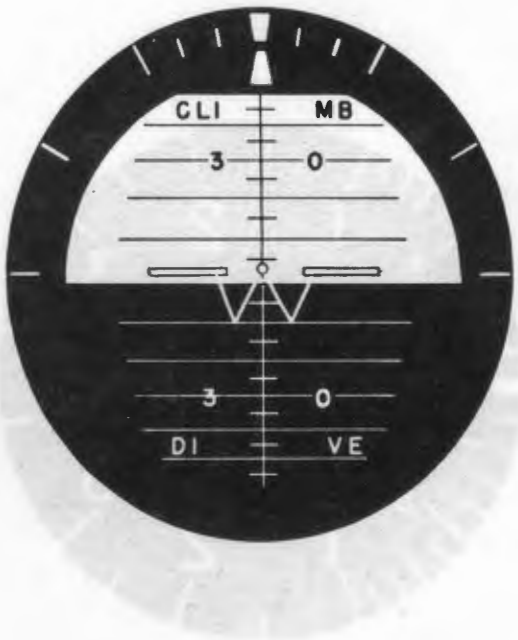
YOUR ANSWER: LOW.

Absolutely correct. With no change of power in level flight, any change in altitude gives an indication of pitch attitude change. The attitude indicator is used in conjunction with the altimeter as an aid in pitch control. The attitude indicator gives a direct and immediate indication of any change in pitch attitude of the aircraft.

With the instrument properly set for level flight, and it is noted that the miniature aircraft is above the horizon bar, is the nose of the aircraft high or low?

1. High, page 18.

2. Low, page 19.



ANSWER TO SELF-TEST QUESTION NO. 14:

c. Descending turn (left).

YOUR ANSWER: HIGH.

You've got it. Using the attitude indicator, the nose of the aircraft can be placed in approximately the correct position for any desired pitch attitude.

The vertical speed indicator is used in conjunction with the altimeter and the attitude indicator to aid in pitch control. If the instrument is reading zero when in level flight, any movement of the needle from the zero position indicates a change in pitch attitude. (See diagram below.)

If the air is smooth, what is your interpretation of pitch attitude if the needle indicates a rate of climb?

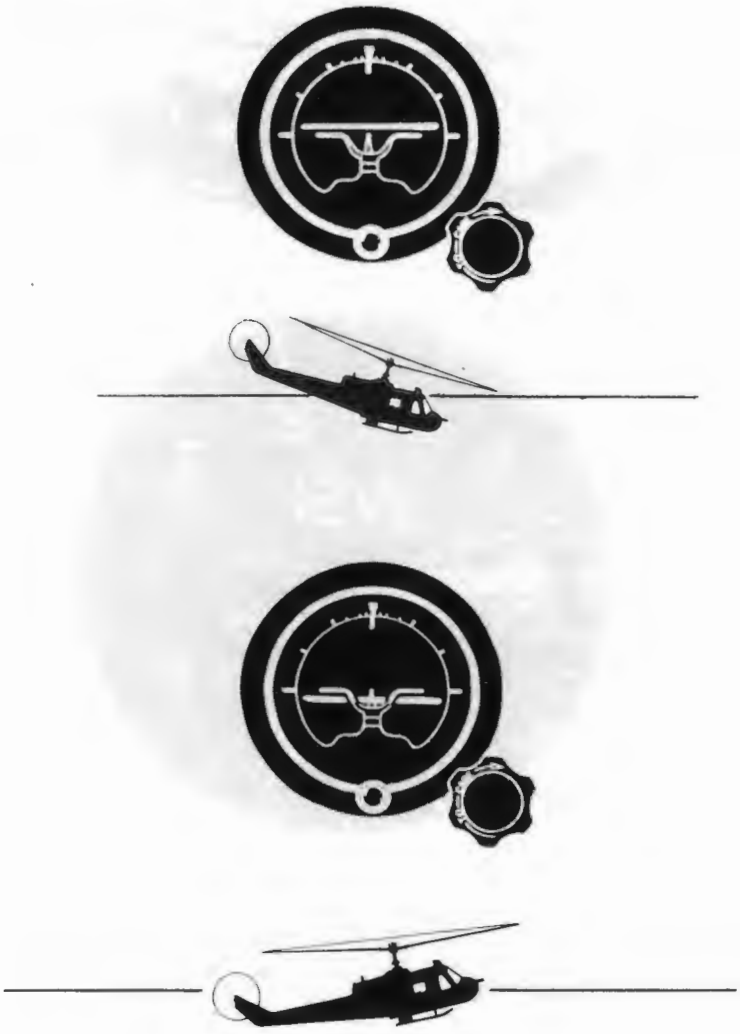
Nose high, page 21.

Nose low, page 20.

YOUR ANSWER: LOW.

Wrong. In visual flight, the proper pitch attitude is attained by raising or lowering the nose in relation to the actual horizon. In instrument flight, the attitude indicator supplants the actual horizon. If the nose of the aircraft is above the horizon, then the miniature aircraft will be above the horizon bar of the attitude indicator.

Study diagram below and then please turn to page 18.



YOUR ANSWER: NOSE LOW.

Come now! Remember, we are talking about pitch attitude. If the needle indicates a climb, then the nose of the aircraft is high. In fact, if immediate corrective pressure is applied to return the needle to zero, the altimeter usually will indicate no change in attitude.

Study the diagram and go on to page 21.

ANSWER TO SELF-TEST QUESTION NO. 2:

The angular relationship between the longitudinal axis of the aircraft and the actual horizon.

YOUR ANSWER: NOSE HIGH.

You are 100 percent correct. An increase in altitude will follow if no corrective action is taken; pitch attitude can also be verified by crosschecking the altimeter and attitude indicator.

The airspeed indicator gives an indirect reading of the pitch attitude. With a given power setting and the correct altitude, the aircraft is in level flight and the airspeed remains constant.

If the airspeed increases, the nose is:

High, page 22.

Low, page 23.

THE AIRSPEED INDICATOR AS A PITCH INDICATING INSTRUMENT

YOUR ANSWER: HIGH.

You're guessing. If the airspeed increases, the nose is low and should be raised. Any time the nose is lowered, an increase in airspeed will follow. A rapid change in airspeed indicates a large change in pitch; a slow change in airspeed indicates a small change in pitch.

Go back to page 21; read again and select another answer.

ANSWER TO SELF-TEST QUESTION NO. 14:

d. Climbing turn (left).

YOUR ANSWER: LOW.

Correct. A nose-low attitude will certainly cause the airspeed to increase if no corrective action is taken. If the nose is high, the airspeed will decrease requiring that the nose be lowered.

In review, remember that the four pitch attitude instruments are: altimeter, attitude indicator, vertical speed indicator, and airspeed indicator.

Regardless of which instrument shows a deviation, a correction must be applied with a continuing crosscheck to determine the effectiveness of the correction in maintaining a constant pitch attitude.

Now, turn to page 24.

ANSWER TO SELF-TEST QUESTION NO. 7:

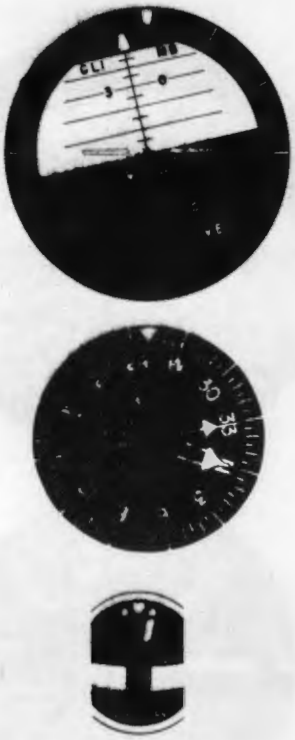
Attitude indicator, airspeed indicator, altimeter, and vertical speed indicator.

Earlier, we defined the banking or rolling attitude of an aircraft as the angular relationship of the lateral axis of the aircraft to the actual horizon. To maintain a straight course in visual flight, the aircraft must be kept level with the actual horizon. Instruments which indicate banking or rolling attitude are: attitude indicator, heading indicator, and turn-and-slip indicator. Which instrument gives an immediate indication of turning?

Attitude indicator, page 25.

Heading indicator, page 27.

Turn-and-slip indicator, page 26.



YOUR ANSWER: ATTITUDE INDICATOR.

No. The attitude indicator shows pitch and roll attitude directly. Of course, if a bank is indicated, a turn will follow; however, it does not give an immediate indication of turning.

Go back to page 24 and select a better answer.

ANSWER TO SELF-TEST QUESTION NO. 10:

a. Above.

b. Climb.

c. Low.

YOUR ANSWER: TURN-AND-SLIP INDICATOR.

No. The turn-and-slip indicator is a roll, rate, and trim instrument. The needle indicates the rate of turn; the ball of the indicator shows the quality of control coordination. It is also an aid in roll control. The question was, "Which instrument gives an immediate indication of turning?"

Pick another answer on page 24 and try again.

ANSWER TO SELF-TEST QUESTION NO. 9:

Roll, rate, and trim.

YOUR ANSWER: HEADING INDICATOR.

Absolutely. The heading indicator gives an immediate indication of turning. When available, the heading indicator is an important bank instrument during straight flight.

The banking attitude is shown directly on which of the following instruments?

1. Heading indicator, page 30.
2. Attitude indicator, page 29.
3. Turn-and-slip indicator, page 28.

ANSWER TO SELF-TEST QUESTION NO. 3:

Angular relationship between lateral axis of aircraft and actual horizon.

YOUR ANSWER: TURN-AND-SLIP INDICATOR.

Not really. The turn-and-slip indicator indicates rate and quality of turn. The banking attitude is not shown directly on the turn-and-slip indicator.

Try another solution on page 27.

ANSWER TO SELF-TEST QUESTION NO. 4:

The movement of the aircraft around the vertical axis.

YOUR ANSWER: ATTITUDE INDICATOR.

Good thinking. The banking or rolling attitude is shown directly on the attitude indicator. If the aircraft starts to turn, the turn can be stopped by leveling the wings of the miniature aircraft with reference to the horizon bar.

The turn-and-slip indicator is a roll, rate, and trim instrument. Is this a true statement?

Yes, page 32.

No, page 31.

ANSWER TO SELF-TEST QUESTION NO. 11:

a. Attitude indicator.

YOUR ANSWER: HEADING INDICATOR.

Before agreeing or disagreeing, let's review momentarily. We just decided that the heading indicator gives an immediate indication of a turn. Indirectly, it shows bank if the aircraft is in trimmed flight, but the banking attitude is not shown directly on the heading indicator.

Turn back to page 27 and select the right answer.

YOUR ANSWER: NO.

Look at the question again. Roll, rate, and trim. Of course, it is a true statement. The needle shows rate and in trimmed flight with the ball centered; it is an excellent roll (bank) instrument. The ball is the quality control.

Now, turn to page 32.

YOUR ANSWER: YES.

A truer word was never spoken. The needle indicates rate of turn and thus is an aid for roll control. The ball of the indicator shows the quality of control coordination, whether in turning or straight flight. If the ball is off center, the aircraft is yawing (slipping or skidding).

A. SLIPPING

B. SKIDDING

C. BALANCED

All available bank instruments are used to indicate straight flight. In straight-and-level flight, a constant heading can be maintained by reference to the heading indicator and by keeping the wings level with reference to the attitude indicator. Without the heading or attitude indicator, straight flight can be maintained by reference to the turn-and-slip indicator.

As the use of each instrument is learned, should it be included in the crosscheck sequence?

Yes, page 34.

No, page 33.

ANSWER TO SELF-TEST QUESTION NO. 8:

Attitude indicator, heading indicator, and turn-and-slip indicator.

YOUR ANSWER: NO.

How could you say such a thing? Some of the primary reasons for a poorly executed maneuver are: failure to observe the appropriate instruments, omitting an instrument entirely from the crosscheck, placing too much emphasis on a single instrument, and gazing too long at the wrong instrument.

Please go on to page 34.

ANSWER TO SELF-TEST QUESTION NO. 12: Two of the following:

1. Failure to observe the appropriate instrument.
2. Omitting an instrument entirely from the crosscheck.
3. Placing too much emphasis on a single instrument.
4. Gazing too long at the wrong instrument.

YOUR ANSWER: YES.

By all means!

Remember, that proper crosschecking and instrument interpretation are vital, even in visual flight. During instrument flight, the instruments serve a dual purpose: reference of the attitude of the aircraft, and an indication of whether that attitude will produce the desired performance. Control technique is identical to that in visual flight. A good instrument pilot interprets instruments rapidly and accurately.

In straight-and-level flight, which controls are used for maintaining heading, altitude, airspeed, and trim?

Cyclic, page 35.

Collective, page 37.

Cyclic, collective, pedals, page 36.

YOUR ANSWER: CYCLIC.

Yes, up to a point. However, the cyclic only controls heading and altitude and of course changes in pitch attitude affect the airspeed.

Turn back to page 34 and select a better answer.

ANSWER TO SELF-TEST QUESTION NO. 13:

a. Pitch attitude control - 3 cyclic.

b. Roll attitude control - 3 cyclic.

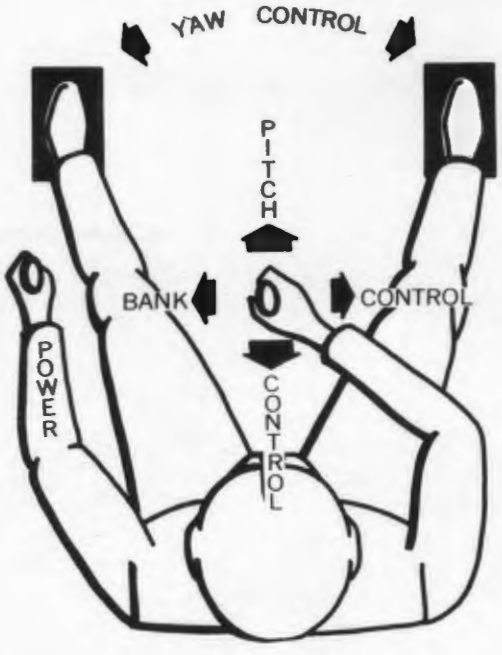
c. Yaw control - 2 pedals.

d. Power control - 1 collective.

YOUR ANSWER: CYCLIC, COLLECTIVE, PEDALS.

Certainly, all controls are needed during straight-and-level flight; heading and altitude are maintained with cyclic control, airspeed with power, and trim with pedals. Power is used to adjust variations of altitude only if the desired altitude cannot be maintained by varying pitch attitude without exceeding ±10 knots airspeed. (100 feet altitude variation or greater: use power adjustment.)

Turn to page 38.



POWER, PITCH, AND BANK CONTROL

YOUR ANSWER: COLLECTIVE.

Only partly right; collective in straight-and-level flight is used to control airspeed. It certainly isn't used for heading or trim control.

Try again by selecting the correct answer on page 34.

BASIC MANEUVERS

The maneuvers described in this section are designed to develop proficiency in the attitude control of rotary wing aircraft. Basic instrument maneuvers are those taught to obtain proficiency in crosschecking, instrument interpretation, and control techniques.

Turn to page 39.

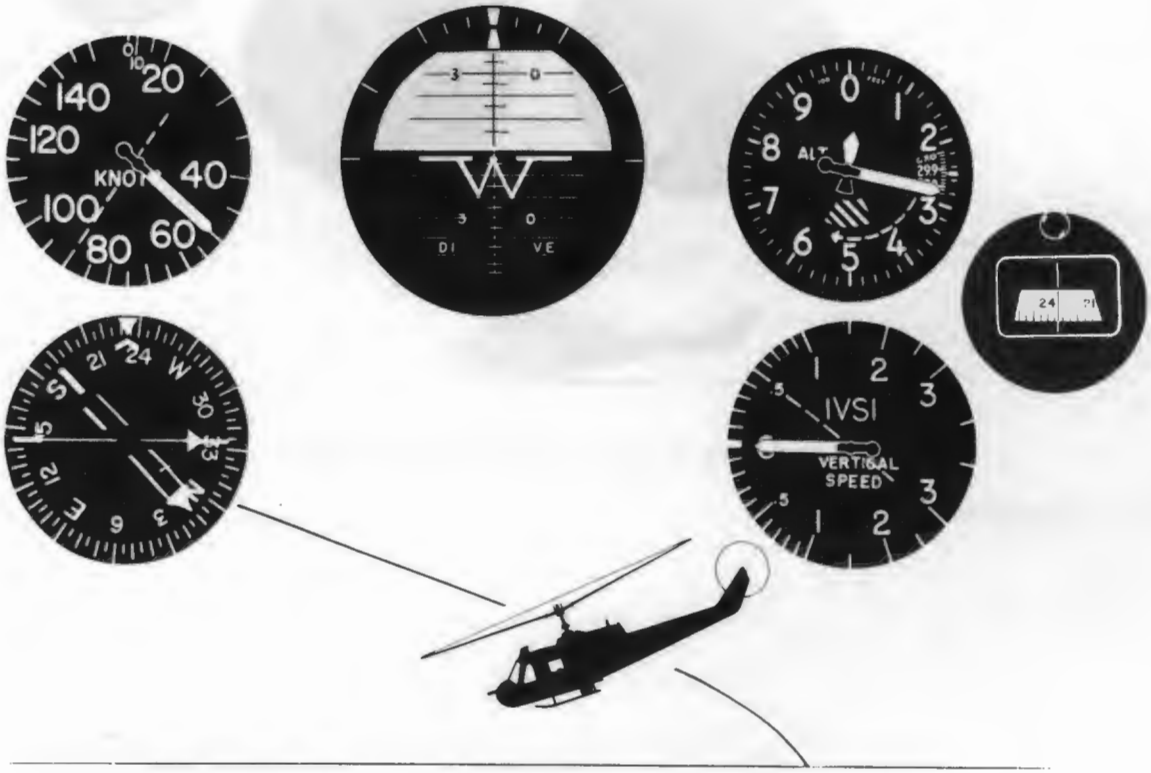
INSTRUMENT SETTINGS BEFORE TAKEOFF

Turn to page 40.

An instrument takeoff is a takeoff that is performed utilizing the helicopter instruments to maintain attitude control and is accomplished when weather conditions are such that no outside visual references are available. A rapid crosscheck must be started at the time the aircraft leaves the ground and should include all available instruments. During the initial climb-out, minor corrections for heading should be made with _____ only.

Pedals, page 42.

Cyclic, page 41.



FLIGHT INSTRUMENTS DURING TAKEOFF

YOUR ANSWER: CYCLIC.

Not so. If the cyclic is used to correct for heading, during initial climb-out prior to reaching sufficient airspeed for coordinated flight, overcontrolling may result.

Turn to page 42.

YOUR ANSWER: PEDALS.

True. Pedals are used for minor correction until sufficient airspeed is attained to transition to coordinated flight.

A straight climb. Heading remains constant while altitude is changed. During the climb, the heading, attitude, airspeed, and rate of climb are maintained with cyclic control; trim is maintained with pedals. Since a 5-knot change in airspeed will change the rate of climb, power is used to adjust the rate of climb only if the desired airspeed is exceeded by ±5 knots.

During the climb, power (collective) is always used to adjust the rate of climb.

True, page 43.

False, page 44.

STRAIGHT CLIMB

YOUR ANSWER: TRUE.

Have you been reading the frames? We just told you that since a 5-knot change in airspeed will change the rate of climb, power is used to adjust the rate of climb only if the desired airspeed is exceeded by ±5 knots. "Airspeed changes in this case are made with cyclic."

Shall we try again? Go to page 44.

YOUR ANSWER: FALSE.

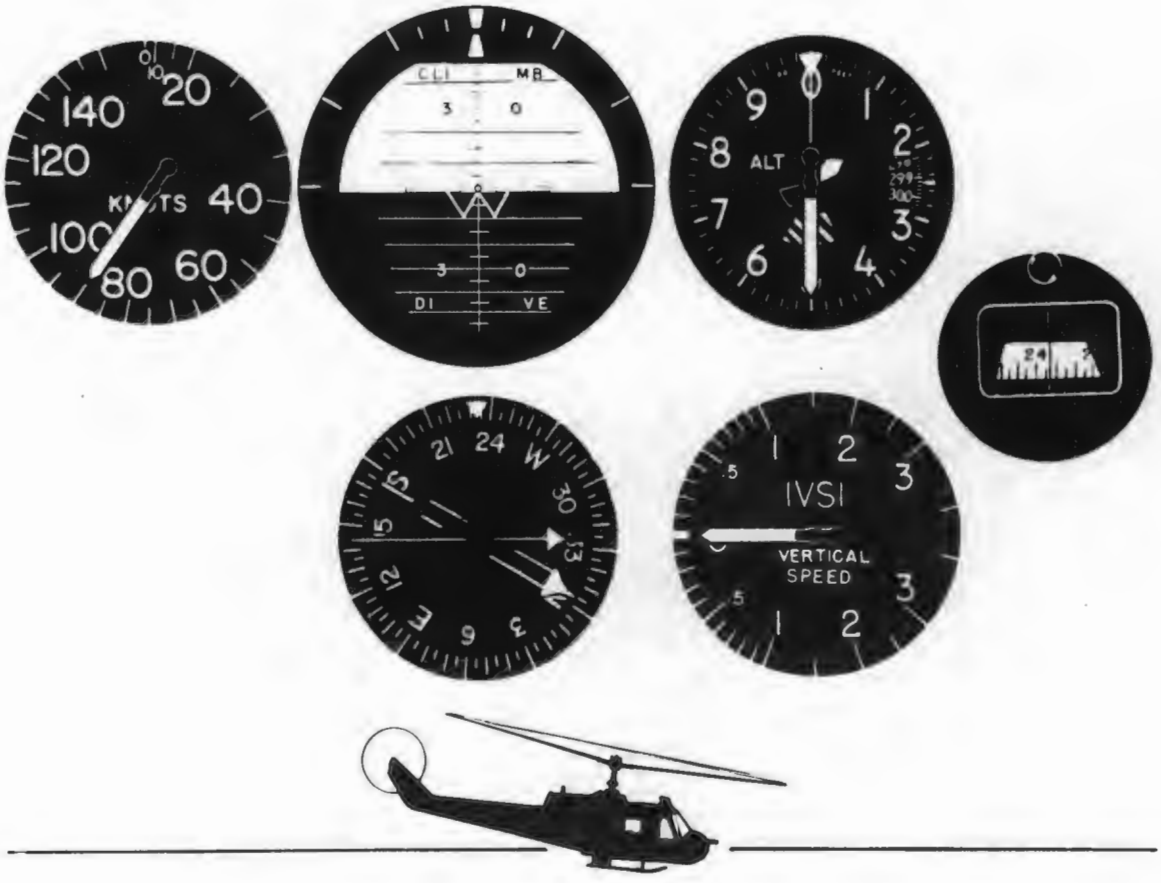
That certainly is a false statement. Cyclic is used to adjust rate of climb by varying airspeed ±5 knots. If it requires more than ±5-knot pitch attitude variation, then power is adjusted.

Straight and level: heading, altitude, and airspeed constant. During straight-and-level flight, heading and altitude are maintained with cyclic control, airspeed with power, and trim with pedals.

Cyclic control is used for minor variations of altitude.

Yes, page 46.

No, page 45.



YOUR ANSWER: NO.

You missed. Remember, in straight climbs we use cyclic to make small changes in pitch attitude to change rate of climb. Why wouldn't this work in straight-and-level flight to help maintain altitude?

Go back and read page 44 and then select another answer.

YOUR ANSWER: YES.

Of course it is. Power is used to adjust minor variations of altitude only if the desired altitude cannot be maintained by varying pitch attitude, without exceeding ±10 knots speed.

Straight descent: heading remains constant while altitude is changed. The attitude of the helicopter in the descent will be the same as in the climb. During the descent, the heading, attitude, airspeed, and rate of descent are maintained with cyclic control; trim is maintained with pedals. Power is used to adjust rate of descent only if the desired airspeed is exceeded by ±5 knots. Select the statements below of common errors in a straight descent.

1. Failure to maintain heading, page 47.
2. Failure to establish desired rate of descent, page 48.
3. Failure to maintain proper trim, page 50.
4. All of the above, page 49.

STRAIGHT DESCENT

YOUR ANSWER: FAILURE TO MAINTAIN HEADING.

OK, we'll buy that; however, it is only partly correct. Put yourself in the helicopter in a descent, eyeball the gauges, and then think of some errors you might make.

Go back to page 46 and select a better answer.

YOUR ANSWER: FAILURE TO ESTABLISH DESIRED RATE OF DESCENT.

True, but is this the best answer? Failure to establish the desired rate of descent will certainly cause problems throughout the maneuver.

Go back to page 46 and try for a better answer.

YOUR ANSWER: ALL OF THE ABOVE.

You've hit the nail on the head. These errors and others can cause problems in many of the basic maneuvers. Of course, these common errors can be overcome with practice.

Level turns. Altitude and airspeed remain constant; heading is varied. In the performance of the maneuver, rate of turn and altitude are maintained with cyclic control, airspeed with power, and trim with pedals. Look at the instruments below. Which one gives you an immediate indication of a turn?

Attitude indicator, page 52.

Turn-and-slip indicator, page 51.

Heading indicator, page 53.

LEVEL TURN

YOUR ANSWER: FAILURE TO MAINTAIN PROPER TRIM.

This could definitely be a problem. Good trim indicates quality of control coordination in any maneuver (no yaw or slip). We'll accept this answer; but, go back to page 46 and see if there isn't a better answer.

YOUR ANSWER: TURN-AND-SLIP INDICATOR.

In our discussion earlier, we decided that the turn-and-slip indicator was a roll, rate, and trim instrument. The needle indicates rate of turn and the ball indicates trimmed or coordinated flight. The clue to the question is immediate. For the time being, take our word for it and decide your answer is wrong. Go back to page 49 and try again.

YOUR ANSWER: ATTITUDE INDICATOR.

Are you sure? The attitude indicator gives you a direct reading of attitude; however, it does not give you an immediate indication of a turn. You can do better, so try again.

Go back to page 49 and pick the right answer.

YOUR ANSWER: HEADING INDICATOR.

Let's see now. If the heading indicator is moving, we are turning, so our definition then is, that the heading indicator does give an immediate indication of turning. Since you're right, let's move on to steep turns.

A steep turn is any turn greater than standard rate; for practice however, a 4-minute turn needle should indicate a 3-needle width turn deflection on the turn-and-slip indicator.

The techniques of entry and recovery for steep turns are the same as for any turn maneuver.

1. True, page 55.

2. False, page 54.

STEEP TURN

YOUR ANSWER: FALSE.

Now wait a minute! What could be different about it? The instruments and controls are the same, so the techniques are the same. The angle of bank and rate of turn is greater, but that doesn't change how we use the controls or instruments. Take our word for it that the techniques of entry and recovery are the same as for any turn maneuver.

Now, turn to page 55.

YOUR ANSWER: TRUE.

Correct. The techniques of entry and recovery are the same for any turn maneuver. Rate of turn and altitude are maintained with cyclic control, airspeed is maintained by power, and trim with pedals. A climbing turn is a combination of a climb and a turn and consists of a climb of 500 feet during a turn of 180° in 60 seconds. During a climbing turn, the rate of turn and rate of climb are controlled by _____. Select correct answer.

1. Rate of turn) - Cyclic, page 57.
   Rate of climb)

2. Rate of turn - Cyclic, page 56.

   Rate of climb - Power, page 56.

CLIMBING TURN

YOUR ANSWER: RATE OF TURN - CYCLIC.
RATE OF CLIMB - POWER.

Well you are partly right. Rate of turn is controlled by cyclic. Rate of climb, however, during the climbing turn is controlled by the cyclic by varying pitch attitude. Power is used to adjust the rate of climb only if the pitch attitude variation requires more than a ±5-knot airspeed variation.

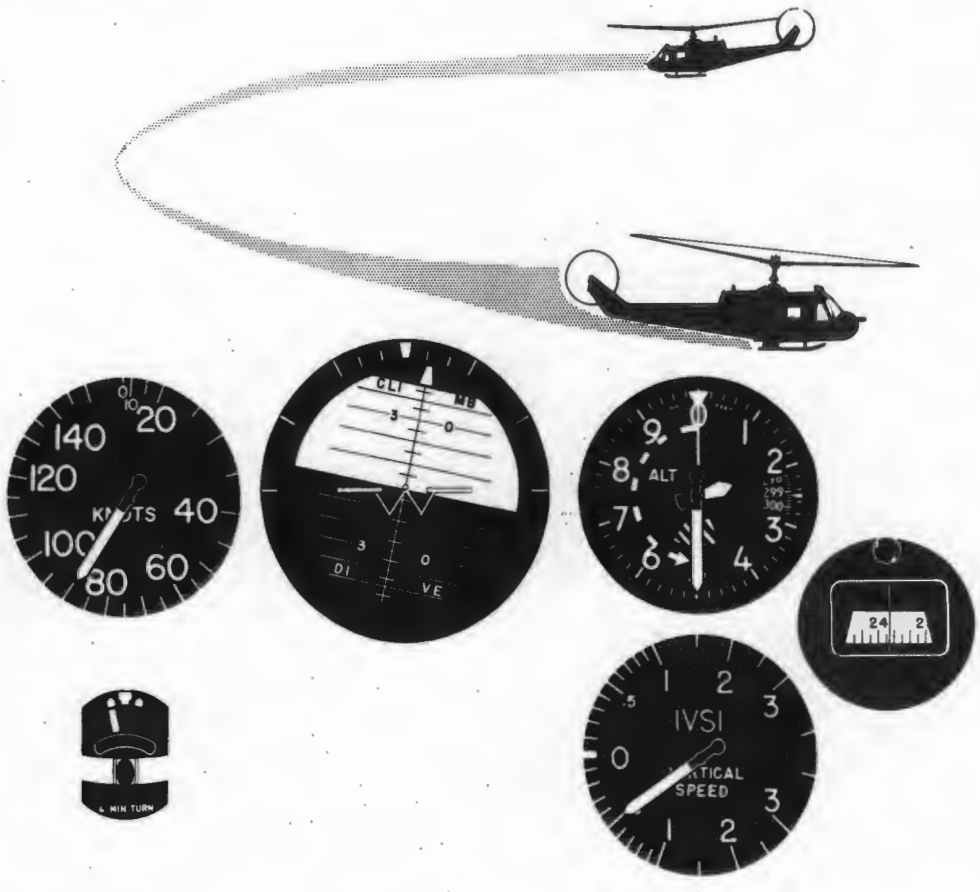
Go on to page 57.

YOUR ANSWER: RATE OF TURN) - CYCLIC.
RATE OF CLIMB)

True. During the climbing turn, the rate of turn, rate of climb, and airspeed are maintained with cyclic control, and trim with pedals. Power is used to adjust the rate of climb only if the desired airspeed is exceeded by ±5 knots. (The ±5 knots is used for minor pitch correction during climbs and descents.) A descending turn is a combination of a descent and a turn, and consists of a descent of 500 feet while turning 180° in 60 seconds. Control techniques during a descending turn are the same as those for climbing turns.

True, page 59.

False, page 58.



YOUR ANSWER: FALSE.

You missed this one. During the descending turn, the rate of turn, rate of descent, and airspeed are maintained with cyclic control, and trim with pedals. Power is used to adjust the rate of descent only if the airspeed is exceeded by ±5 knots.

Go on to page 59.

YOUR ANSWER: TRUE.

Certainly, the clue, of course, is the word "during." Earlier we discussed descents and level turns. The control techniques for these maneuvers are merely combined to make a descending turn. The same is true for climbing turns (climbs and level turns). Once the descending turn is started, the same control techniques are then used as those for a climbing turn.

Turn to page 60.

Let's briefly review what has been covered.

1. Instrument interpretation - evaluating or interpreting flight instruments to determine attitude.
2. Pitch attitude, roll attitude, and yaw.
3. Crosscheck - observing or interpreting two or more instruments to determine aircraft attitude.
4. Comparison of intuition versus crosscheck.
5. Instrument indications of attitude.
6. Basic maneuvers - definitions and instrument illustrations.

Turn to page 61.

SELF-TEST

1. Define instrument interpretation.

2. Define pitch attitude.

3. Define roll attitude.

4. Define yaw.

5. Define crosscheck.

6. Intuition can give you a false indication of aircraft attitude. (True - False)

7. List four pitch attitude instruments.

   a.

   b.

   c.

   d.

8. List three roll attitude instruments.

   a.

   b.

   c.

9. The turn-and-slip indicator is a _____, _____, and _____ instrument.

10. During straight-and-level flight, the nose of the helicopter rises. What indication is reflected on the following instruments?

    a. Attitude indicator - miniature aircraft is _____ the horizon bar.

        (1) Above.

        (2) Below.

    b. Vertical speed indicator - needle is showing rate of _____.

        (1) Climb.

        (2) Descent.

    c. Airspeed indicator - airspeed is _____.

        (1) High.

        (2) Low.

11. During straight-and-level trimmed flight, the aircraft rolls or banks to the right. What instrument gives a direct indication of bank?

    a. Attitude indicator.

    b. Heading indicator.

    c. Turn-and-slip indicator.

12. Write two reasons for a poorly executed maneuver.

    a.

    b.

13. Match terms in left column with correct control in right column.

a.	Pitch attitude control	(1)	Collective
b.	Roll attitude control	(2)	Pedals
c.	Yaw control	(3)	Cyclic
d.	Power control		

14. Study the diagrams on pages 64, 65, 66, and 67; indicate on the answer sheet, the maneuver that the diagrams are depicting.

a.

b.

c.

d.

QUESTIONS NO.	ANSWERS ON PAGE
1	15
2	21
3	28
4	29
5	12
6	14
7	24
8	33
9	27
10	26
11	30
12	34
13	36
14a	13
14b	16
14c	18
14d	23

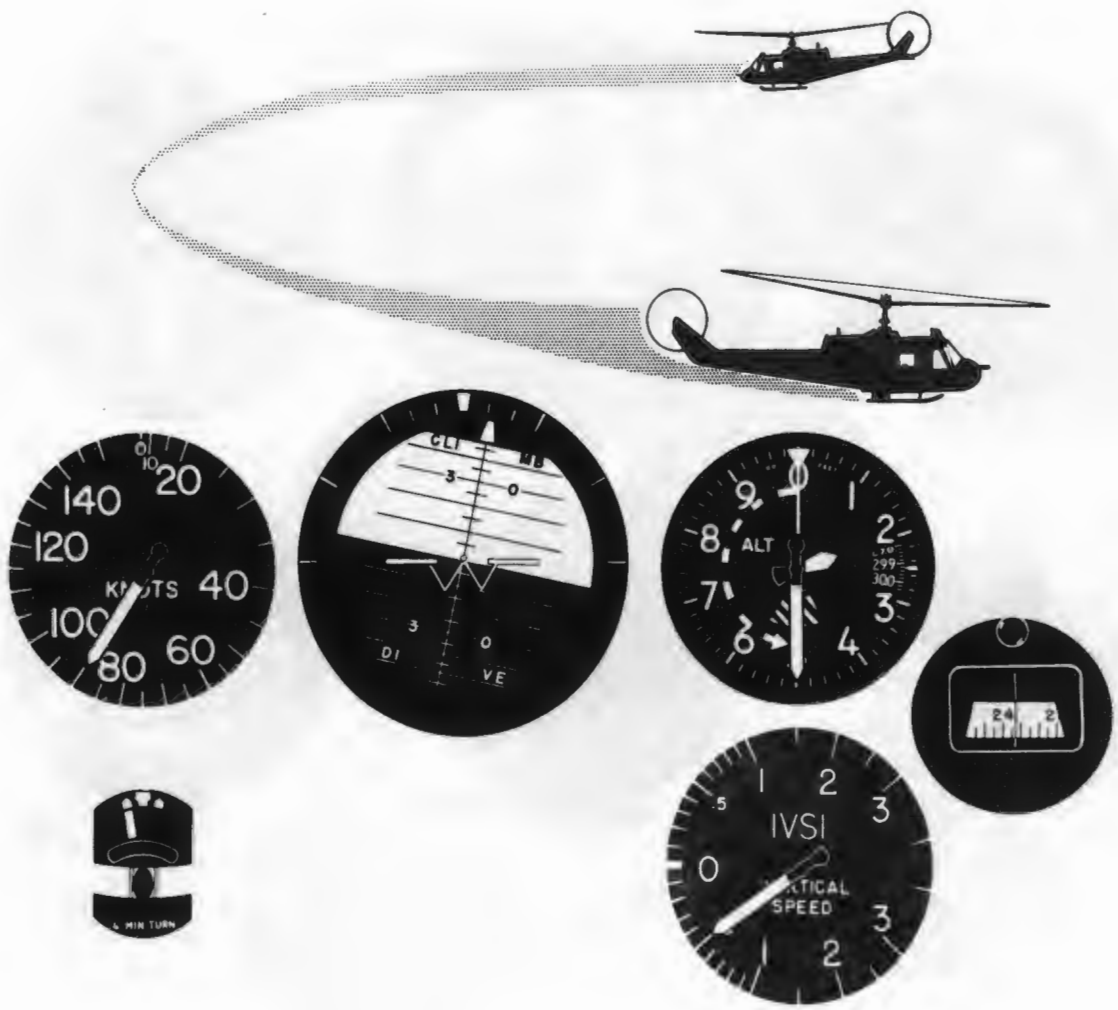
a.

Turn to page 65.

b.

Turn to page 66.

c.



Turn to page 67.

d.