ROTORCRAFT-HELICOPTER WRITTEN TEST GUIDE

FLIGHT INSTRUCTOR

1967

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SUBJECT: ROTORCRAFT-HELICOPTER WRITTEN TEST GUIDE -- FLIGHT INSTRUCTOR

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1. PURPOSE. This Advisory Circular is being issued to give guidance to applicants preparing for the aeronautical knowledge requirement for a flight instructor certificate with a helicopter rating.

2. HOW TO GET THIS PUBLICATION.

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      Rotorcraft-Helicopter Written Test Guide --
      Flight Instructor
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Edward C. Hodson
Acting Director
Flight Standards Service

PREFACE

The Flight Standards Service, Federal Aviation Administration, has issued this Rotorcraft-Helicopter Flight Instructor Written Test Guide, to assist applicants who are preparing for this test. It was prepared by the same Federal Aviation Administration specialists who developed the tests currently in use. Its purpose is to guide prospective applicants towards a clear understanding of the requirements, reference material, tests, and procedures. A study outline, list of study materials, and sample test with answers and explanations are presented.

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CHAPTER 1. NATURE OF THE WRITTEN TEST

1. INTRODUCTION. This study guide was prepared by the Flight Standards Service of the Federal Aviation Administration to assist applicants who are preparing for the Flight Instructor Rotorcraft-Helicopter Written Test. It was prepared by the same personnel who are responsible for developing the test.

   This guide is not offered as a quick and easy way to obtain the necessary knowledge for passing the written test. There is no quick and easy way to obtain the background of experience, knowledge, and skill that the professional flight instructor should acquire in order to provide the high quality of training necessary to transform today's student into tomorrow's proficient pilot. Rather, the intent of this guide is to define the scope and narrow the field for study, insofar as possible, to the basic knowledge requisite to obtaining a flight instructor certificate.

2. CERTIFICATE REQUIREMENTS. The general qualifications for a flight instructor certificate require of the applicant a combination of aeronautical experience, knowledge, and skill. An applicant for a flight instructor certificate with a rotorcraft rating should carefully review the applicable sections of Federal Aviation Regulations, Part 61, for detailed information on these qualifications.

3. TYPE OF TEST. The Flight Instructor Rotorcraft-Helicopter Written Test is necessarily comprehensive because the flight instructor should be knowledgeable in many areas. He should know not only "what" to do and "how" to do it; he should know also "why" a maneuver or procedure is performed in a certain way or order; what the results may be if the maneuver or procedure is not performed properly; and what elements of performance should be carried over from each training maneuver and procedure into the student's future day-to-day flying to ensure the safest possible pilot. It is generally accepted that a pilot with much knowledge but little skill is not adequately equipped for day-to-day flying. Today the pilot who is skillful in only the manipulative techniques of flying and lacking in aviation knowledge is not a very skillful airman with safety as his watchword.

   In addition to his aviation qualifications, the flight instructor should be a teacher. He should have an understanding of the learning process, the basic teaching principles, and the general application of these principles to teach his students effectively. There is much truth in the saying, "If there is no learning, there is no teaching."

The helicopter flight instructor test is divided into two sections: Section 1, "Fundamentals of Flight Instruction" and Section 2, "Performance and Analysis of Flight Training Maneuvers." A detailed outline of the subject areas covered in each section appears later in this guide.

The time required for the test is approximately 4 hours. Test items are of the objective, multiple-choice type, and each can be answered by the selection of a single item as the correct choice. This method conserves the applicant's time and the scorer's time, and eliminates the element of individual judgment in determining grades.

4. TAKING THE TEST. In addition to being an exercise in the application and use of aeronautical knowledge, a test is also an exercise in communication since it involves the use of written language. Communication between individuals through the use of such abstract symbols as words is indeed a complicated process; so complicated, in fact, that at times communication may either break down or mislead if care is not exercised. The same word often means different things to different people. Carefully read the information and instructions in the written test.

Always bear in mind the following facts when you are taking the test:

a. The test items are not trick questions. Each statement means exactly what it says. Read each test item stem and each alternate response carefully, but do not look for hidden meanings. The correct statement does not concern exceptions to the rule; it refers to the general rule. However, the incorrect responses are often based on the exceptions.

b. First, carefully read the test item stem before you look at the alternate responses listed below it. Be sure that you understand the question or statement in the stem. Then decide what the correct answer should be or work out the problem to obtain the answer. Finally, look through the list of alternate responses or phrases and select the one that says the same thing as your answer. Be sure that the one you select answers the test item completely.

c. Only one of the alternate responses given is completely correct. The others may be answers that result from incorrect procedure (in a problem, for example) or from lack of knowledge pertaining to the test item, or from popular misconceptions. Understand the test item and then select the response you consider to be the best answer.

d. If you find that you have considerable difficulty with a particular test item, do not spend too much time on it, but continue with the test and answer those test items which are less difficult. Then go back and reconsider the test items you have passed over. This procedure will enable you to use the total time available to maximum advantage in demonstrating your knowledge and understanding of the subject.

CHAPTER 2. STUDY OUTLINE FOR THE FLIGHT INSTRUCTOR ROTORCRAFT-HELICOPTER WRITTEN TEST

SECTION 1. FUNDAMENTALS OF FLIGHT INSTRUCTION

5. FLIGHT INSTRUCTOR'S HANDBOOK, AC 61-16. Applicants should familiarize themselves with the following pertinent chapters of this Handbook:

NOTE: All specific references and examples in this Handbook are based on airplanes; however, the general material is applicable to flight instructors in other aircraft categories.

a. Fundamentals of Teaching and Learning (Chapter I).

b. Effective Teaching Methods (Chapter II).

c. Aeromedical Information Important to Flight Instructors (Chapter IV).

d. The Flight Training Syllabus (Chapter VI).

e. Flight Instructor Responsibilities (Chapter VII).

SECTION 2. PERFORMANCE AND ANALYSIS OF FLIGHT TRAINING MANEUVERS

6. AERODYNAMICS AND PRINCIPLES OF FLIGHT.

a. Aerodynamic terms and definitions.

b. Forces acting on a helicopter in flight.

c. Angle of attack and rotor blade pitch angle.

d. Turns.

(1) Forces acting on an aircraft in a normal turn.

(2) Change of lift in a turn.

(3) Change of drag in a turn.

(4) Change of load factor in a turn.

(5) Slipping and skidding.

e. Rotor torque.

f. Gyroscopic precession.

(1) Principles.

(2) Relationship of cyclic control movements, rotor blade pitch changes, and resulting rotor reaction.

g. Rotor blade stall.

h. Functions of the controls and cyclic trim.

7. FLIGHT TRAINING MANEUVERS AND PROCEDURES.

a. Know how and when to introduce maneuvers and procedures.

b. Know the correct technique for the maneuvers and procedures.

c. Be able to recognize and analyze common student errors.

d. Be familiar with effective methods of correcting student errors.

e. Know the required maneuvers and procedures for the flight instructor flight test as given in FAR 61.173(b)(2).

f. Be familiar with additional maneuvers that may be required in various operations such as

(1) Shallow approaches.

(2) Steep approaches to a hover.

(3) Slope takeoffs and landings.

(4) Maximum performance takeoffs.

g. Know and understand the flight maneuvers and procedures that should be taught to private and commercial pilot applicants.

h. Know and understand the aeronautical knowledge that should be taught to private and commercial pilot applicants.

8. USE OF PILOT INFORMATION PUBLICATIONS.

a. Airman's Information Manual -- Know how to use and interpret data contained in this important publication, such as:

(1) Air navigation radio aids.

(2) Airport and air navigation lighting and marking aids.

(3) Altimetry.

(4) Good operating practices.

(5) Radiotelephone phraseology and techniques.

(6) Safety of flight.

(7) Notices to Airmen (NOTAMS).

(8) Airport Directory.

(9) Airport/Facility Directory.

b. Helicopter Flight Manual -- Be able to interpret and use material in this manual.

(1) Know and understand the reason for each operating limitation and possible consequences if exceeded.

(2) Know how to determine empty or basic weight and compute useful load and gross weight.

(3) Know how to compute moments from weights and center-of-gravity arms.

(4) Know how to interpret weight and balance data to determine that the helicopter is properly loaded.

(5) Know flight load factor limitations and airspeed limitations.

(6) Be able to use and interpret performance charts as required for:

(a) Takeoff data.

(b) Climb data.

(c) Landing distance data.

(d) Cruise performance data.

(7) Be able to use and interpret such charts as

(a) Height vs. velocity chart.

(b) Variation of V_{ne} (never-exceed speed) with altitude and RPM chart.

(c) Loading chart.

(d) Center-of-gravity chart.

(e) Airspeed calibration chart.

(f) Hovering ceiling chart.

c. Federal Regulations governing aviation.

(1) National Transportation Safety Board, Safety Investigation Regulations, Part 320 -- Rules Pertaining to Aircraft Accidents, Incidents, Overdue Aircraft and Safety Investigations.

(2) Federal Aviation Regulations.

(a) Part 1 - "Definitions and Abbreviations."

(b) Part 61 - "Certification: Pilots and Flight Instructors."

(c) Part 91 - "General Operating and Flight Rules."

9. HAZARDS TO HELICOPTER FLIGHT.

a. Retreating blade stall.

b. Settling with power.

c. Ground resonance.

d. Abnormal vibrations.

e. Transitioning from powered flight to autorotation.

f. Antitorque system failure.

10. CRITICAL CONDITIONS FOR HELICOPTER FLIGHT.

a. Hot weather operations.

b. High elevation operations.

c. Tall grass operations.

d. Water operations.

e. High density altitude operations.

f. Confined area operations.

11. AIRFRAME AND POWERPLANT. Have a working knowledge of:

a. Airframe structures and components.

b. Control systems.

c. Rotor systems.

d. Fuel and fuel systems.

e. Swash plate assembly.

f. Transmission systems.

g. Clutch systems.

h. Hydraulic boost system.

i. Oil system.

j. Electrical system.

k. Carburetion and fuel injection.

l. Ignition system.

m. Engine instruments.

12. OTHER AREAS OF IMPORTANCE.

a. Flight Instruments.

(1) Altimeter.

(a) Know the effect of nonstandard temperature and pressure on the indications of the altimeter.

(b) Understand how to obtain the pressure altitude.

(c) Understand how to apply altimeter settings to the Kollsman window of the altimeter.

(d) Be able to interpret the indications of the altimeter.

(2) Airspeed Indicator -- Know the airspeed limitations that are reflected by markings on the face of the instrument.

(3) Magnetic Compass.

(a) Know how to read correctly and use to maintain direction.

(b) Know and understand the inherent errors.

b. Aircraft stability -- static and dynamic.

c. Vibrations associated with the main rotor, tail rotor and engine.

d. Be able to use and interpret pertinent charts, such as:

(1) Density altitude chart.

(2) Load factor chart.

e. Carburetor icing.

(1) Favorable conditions for formation.

(2) Symptoms.

(3) Use of carburetor heat.

f. Know the effects of snow, ice, and frost on an airfoil, and realize the importance of removal prior to flight.

g. Dangers associated with aircraft wake turbulence (i.e. wing-tip and rotor-tip vortices; propeller, jet engine, and helicopter rotor wash).

(1) Conditions and circumstances most conducive to such turbulence.

(2) How to avoid these dangers.

(3) Procedure to use if inadvertently encountered.

h. Fuel contamination.

(1) Causes.

(2) Precautions to take.

i. Factors affecting performance.

(1) Density altitude.

(a) Elevation.

(b) Temperature.

(c) Moisture.

(d) Atmospheric pressure.

(2) Gross weight.

(3) Wind.

j. Collective pitch-throttle coordination.

k. Precautionary rules.

APPENDIX 1. RECOMMENDED STUDY MATERIALS

The applicant for the Rotorcraft Flight Instructor rating will find the publications listed below helpful to him in his preparation for the test.

The list identifies source material essential to preparing for the test but does not include all available material on the subjects. Other excellent textbooks, audiovisual training aids, and instruction materials useful in preparing for the test are available at bookstores and libraries.

It is the responsibility of each applicant to obtain the study materials appropriate to his needs.

NOTE: References listed were available at the time this publication went to press.

SECTION 1. LIST OF APPROPRIATE STUDY MATERIALS

1. AIRMAN'S INFORMATION MANUAL. This publication has been designed as a pilot's operational manual for use primarily within the conterminous United States. It is divided into three basic parts, each of which may be purchased separately.

   PART 1 -- Basic Flight Manual and ATC Procedures. (Annual Subscription: $2.00 domestic; $2.50 foreign.) This part is issued quarterly and contains basic fundamentals required to fly in the National Airspace System; adverse factors affecting Safety of Flight; Health and Medical Facts of interest to pilots; Emergency Procedures, and other topics.

   PART 2 -- Airport Directory. (Annual Subscription: $2.00 domestic; $2.50 foreign.) This part is issued semiannually and contains a Directory of all Airports, Seaplane Bases, and Heliports in the conterminous United States, Puerto Rico, and the Virgin Islands which are available for transient civil use. It includes all of their facilities and services, except communications, in codified form.

   PARTS 3 and 3A -- Operational Data and Notices to Airmen. (Annual Subscription: $9.00 domestic; $11.25 foreign.) Part 3 is issued every 28 days and includes an Airport/Facility Directory listing all major airports with communications; a tabulation of Air Navigation Radio Aids and their assigned frequencies; a Sectional Chart Bulletin, which updates Sectional charts cumulatively; and other information.

   Part 3A is issued every 14 days and contains Notices to Airmen considered essential to the safety of flight.

2. FLIGHT INSTRUCTOR'S HANDBOOK, AC 61-16 (60¢). This revised handbook is one of the primary sources of information and guidance for pilots preparing for the flight instructor certificate and is also valuable as a reference text for certificated flight instructors. It is basically a book which deals with accepted theories and practices applicable to teaching and the learning process. As such, it is the primary reference text when preparing for the "Fundamentals of Instruction" section of the Flight Instructor Written Test.

3. BASIC HELICOPTER HANDBOOK, AC 61-13 (75¢). This text covers basic flight information which includes load factor principles, aerodynamics and principles of flight, weight and balance, aircraft performance, function of the controls and other components, Helicopter Flight Manual contents, and hazards to and critical conditions for helicopter flight. In addition, it provides information and direction in the introduction and performance of helicopter flight training maneuvers. Thus, it serves as a text for student pilots, pilots improving their qualifications or preparing for additional ratings, and flight instructors who are teaching.

4. FEDERAL AVIATION REGULATIONS:

   a. Part 1 -- Definitions and Abbreviations (25¢).

   b. Part 61 -- Certification: Pilots and Flight Instructors (60¢).

   c. Part 91 -- General Operating and Flight Rules (60¢).

   d. Part 27 -- Airworthiness Standards - Normal Category Rotorcraft (45¢). Certain sections of this manual will prove most useful as a source of detailed information on the requirements pertaining to aircraft characteristics, performance, operation, operating limitations, and rotorcraft flight manuals.

5. NATIONAL TRANSPORTATION SAFETY BOARD SAFETY INVESTIGATION REGULATIONS, Part 320 (5¢). This NTSB publication deals with procedures required in dealing with accidents, incidents, and overdue aircraft in the United States and outlying areas.

6. HELICOPTER FLIGHT MANUALS, OWNER'S MANUALS AND TRAINING MANUALS. Aircraft manufacturers issue Flight and/or Owner's Manuals for each aircraft model. They also often issue Training Manuals for their aircraft. These may be obtained from individual aircraft manufacturing companies or from local dealers and distributors.

7. HOW TO OBTAIN STUDY MATERIALS. All study materials listed (except in paragraph 6) may be obtained by remitting check or money order to:

   U. S. Government Printing Office
   Superintendent of Documents
   Washington, D. C. 20402

APPENDIX 2. SAMPLE TEST

The following test items are only samples to indicate the general form of those used in the test. They are included for one purpose--to familiarize you with the type of test items you may expect to find on FAA tests. Ability to answer these sample items does not indicate that you are fully prepared to take the test since all topics on which you will be tested are not included.

You should concentrate on the section of this study guide entitled, "Study Outline for the Flight Instructor Rotorcraft-Helicopter Written Test. A knowledge of all the topics mentioned in this outline--not just the mastery of the sample test items--should be used as the criterion for determining that you are properly prepared to take the FAA written test. Proper preparation requires considerable time, effort, and the guidance of a competent instructor.

Correct answers to the sample test items, along with an explanation of each test item, are in this Appendix, pages 7 through 10. In some sample test items, reference will be made to certain illustrations. These illustrations will be found in Appendix 3 of this guide. They are representative of illustrations which may be found in the written test and with which the applicant should be familiar.

SECTION 1. FUNDAMENTALS OF FLIGHT INSTRUCTION

TEST ITEM 1. Motivation is a key factor in learning. In properly motivating students, a flight instructor should remember that

1- students are innately able to evaluate their proficiency and rate of progress and will instinctively tend to arrive at correct self-concepts if properly motivated.
2- it is best to emphasize long-range goals more than short-range goals.
3- positive motivations are characteristically more effective than negative motivations.
4- all of the above statements are considered true.

TEST ITEM 2. Worry and emotional difficulties which are sometimes associated with flight training are usually a result of

1- personality problems of the student affected.
2- inadequacies in the training course or flight instructor.
3- personality conflicts between student and instructor.
4- the type of maneuvers, or the phase of training with which the student is concerned at the time the difficulties arise.

TEST ITEM 3. The flight instructor's first step in teaching is to

1- gain the student's confidence.
2- determine whether the student really wants to learn to fly.
3- teach the student to fly straight and level.
4- require the student to complete a short verbal or written quiz to test his ability to assimilate instruction.

TEST ITEM 4. If a student shows slow progress in learning to perform normal landings because of lack of confidence, his flight instructor should

1- continue the instruction on the landings but in a more energetic manner so that the student will apply himself with greater diligence.
2- use praise to a greater extent after each landing attempt.
3- assign him goals that are less difficult.
4- point out the student's errors by exaggerated demonstrations of the errors.

TEST ITEM 5. Flight instructors should understand that plateaus or slumps in a student's rate of learning

1- seldom occur, and when they do, are most likely to occur when the student reaches the advanced phase of instruction.
2- seldom occur and then only during the pre-solo stage.
3- are normal situations and are more likely to occur as the student advances to more complicated maneuvers.
4- occur frequently because students will not practice maneuvers that they do not enjoy.

TEST ITEM 6. On which of the following is the teaching success of a flight instructor considered to be most dependent?

1- Personality of the instructor.
2- Presentation by the instructor.
3- Flying ability and flight experience.
4- Proper planning of lessons.

TEST ITEM 7. Lesson plans or course syllabuses should be

1- followed exactly if maximum benefit is to be derived from their use.
2- adapted to the learning situation and changed when necessary.
3- used primarily by inexperienced instructors.
4- used primarily by those instructors who must teach students who have already received part of their flight training from another instructor.

TEST ITEM 8. The responsibilities of today's flight instructor are very real and very complex. The instructor can best live up to these responsibilities by

1- requiring a high standard of proficiency in his students.
2- establishing his effectiveness as an instructor on the basis of an objective evaluation of his own flying proficiency.
3- discouraging from further instruction those students who do not have a natural physical and mental capacity to fly.
4- a keen analysis of his students and a deep personal interest in their welfare.

TEST ITEM 9. The most effective level of communication (teaching) normally occurs when an instructor provides the student with

1- all facts and knowledge pertaining to a learning problem.
2- appropriate facts and knowledge in a manner which assures that the student receives it accurately.
3- appropriate facts and knowledge in a manner which assures student understanding.
4- facts and knowledge in such a way that his behavior is properly affected.

TEST ITEM 10. In what way is a negative self-concept likely to affect a student? A negative self-concept may introduce psychological factors which

1- can affect unfavorably a student's ability to receive perceptions and inhibit his ability to perform after perceiving.
2- can affect unfavorably a student's ability to receive perceptions but, once he perceives, will have no effect on his ability to do or perform.
3- will have negligible effect on a student's ability to receive perceptions or on his ability to perform.
4- will result in a student being less "on the defensive."

SECTION 2. PERFORMANCE AND ANALYSIS OF FLIGHT TRAINING MANEUVERS

TEST ITEM 11. In explaining the terms "high density altitude" and "low density altitude" to your students, you should emphasize that the term "low density altitude" conditions refers to those conditions that result in

1- thin air and improved performance.
2- thin air and reduced performance.
3- dense air and improved performance.
4- dense air and reduced performance.

TEST ITEM 12. Ground resonance is most likely to occur

1- during engine warm-up with minimum collective pitch.
2- during the final stage of a completely autorotative landing.
3- with the landing gear lightly in contact with the ground surface.
4- during running landings.

TEST ITEM 13. If altitude is gained during the performance of rapid decelerations (quick stops), it is primarily because

1- of the induced lift of the rotor system produced by the flare.
2- the maneuver was initiated at too high an airspeed.
3- rotor RPM is allowed to increase too much as the collective stick is lowered.
4- back cyclic stick pressure is increased too rapidly for the rate of decrease of the collective stick.

TEST ITEM 14. What is the chief advantage of a running takeoff?

1- The additional speed can be quickly converted to altitude.
2- It can be used when density altitude is low.
3- It requires less power than would be required to take off from a hover with the same load.
4- It can be used to accomplish a takeoff regardless of aircraft weight and density altitude.

TEST ITEM 15. Which of the following will cause a decrease in coning?

1- Decrease in lift; decrease in centrifugal force.
2- Increase in lift; increase in centrifugal force.
3- Decrease in lift; increase in centrifugal force.
4- Increase in lift; decrease in centrifugal force.

TEST ITEM 16. The forward speed (V_{ne} - Never-exceed speed) of a helicopter is limited by

1- solidity ratio.
2- lateral controllability or retreating blade stall.
3- centrifugal twisting moment of the rotor blades.
4- available horsepower of the engine which may be converted to torque.

TEST ITEM 17. If a helicopter is loaded so that the center of gravity is forward of allowable limits, which of the following characteristics would it possess during flight?

A. Forward cyclic stick travel would be limited.
B. Aft cyclic stick travel would be limited.
C. The pilot may have difficulty hovering headed into a strong wind.
D. The pilot may have difficulty hovering in a calm wind.
E. The pilot may have difficulty slowing to a hover or flaring for an autorotative landing.
F. The pilot may not have sufficient forward cyclic stick available to hold the nose down in case the helicopter is inadvertently accelerated to a high airspeed.

1- A, C, and F.
2- B, D, and E.
3- B, D, and F.
4- A, C, and E.

TEST ITEM 18. During a running takeoff in a crosswind, which of the following best describes control technique?

1- Heading is maintained with pedals; direction of movement (ground path or track) is maintained with cyclic.
2- Heading is maintained with cyclic; direction of movement (ground path or track) is maintained with pedals.
3- Pedals control both heading and direction of movement.
4- Cyclic stick controls both heading and direction of movement.

TEST ITEM 19. As the cyclic stick is moved to the right, the decrease in angle of attack of the rotor blades is greatest in position (refer to Appendix 3, Fig. 6)

1- D and the increase in angle of attack is greatest in position B.
2- B and the increase in angle of attack is greatest in position D.
3- C and the increase in angle of attack is greatest in position A.
4- A and the increase in angle of attack is greatest in position C.

TEST ITEM 20. Between which of the following two points will the helicopter turn the greatest number of degrees?

(Refer to Appendix 3, Fig. 7)

1- A and B.
2- B and C.
3- D and E.
4- None of the above since it turns the same amount in all three segments.

SECTION 3. ANSWERS AND EXPLANATIONS TO SAMPLE TEST ITEMS

TEST ITEM 1 (Ans. 3). The Flight Instructor's Handbook, AC-61-16, states, "Negative motivations. . . are not characteristically as effective in promoting efficient learning as are positive motivations."

TEST ITEM 2 (Ans. 2). The Flight Instructor's Handbook, AC 61-16, states, "Worries and emotional upsets which result from the course at hand can be remedied. Such occurrences are usually evidence of inadequacies on the part of the course or of the instructor concerned."

TEST ITEM 3 (Ans. 1). The Flight Instructor's Handbook, AC 61-16, states, "The flight instructor's first step in teaching is to gain the student's confidence."

TEST ITEM 4 (Ans. 3). The Flight Instructor's Handbook, AC 61-16, states, "A student whose slow progress is found to be due to lack of confidence should be assigned subgoals which can be achieved easily."

TEST ITEM 5 (Ans. 3). The Flight Instructor's Handbook, AC 61-16, states "Temporary random plateaus in the learning rate are not necessarily serious, and can be expected with any student. . . . .Slumps or plateaus in the rate of learning are more likely to occur as a student advances to more complicated operations. . . . ."

TEST ITEM 6 (Ans. 4). The Flight Instructor's Handbook, AC 61-16, states, "Teaching success depends more upon lesson planning than it does on presentation, personality, flying ability, or experience."

TEST ITEM 7 (Ans. 2). The Flight Instructor's Handbook, AC 61-16, states, "Any practical flight training syllabus must be flexible, and should be used primarily as a guide. The order of training can and should be altered, when necessary, to suit the progress of the student and the exigencies of special circumstances."

TEST ITEM 8 (Ans. 4) The Flight Instructor's Handbook, AC 61-16, states, "Only by a keen analysis of his students, and a continuing deep interest in them, can he live up to his responsibilities and be an effective flight instructor."

TEST ITEM 9 (Ans. 4). The Flight Instructor's Handbook, AC 61-16, states, "Communication at the understanding level goes far beyond the receipt of information; ideas must be comprehended. Understanding is a higher type of communication than is the mere acquisition of facts. To be effective, however, the flight instructor must go beyond this level of communication. Effective communication requires that information be provided in such a way that it affects the behavior of the student."

TEST ITEM 10 (Ans. 1). The Flight Instructor's Handbook, AC 61-16, states, "Negative self concepts inhibit the perceptual processes by introducing psychological barriers which tend to keep the student from receiving them and then perceiving what the instructor intends. They may even inhibit the ability to properly implement that which is perceived. That is, they affect unfavorably the "ability to do." Learners who view themselves positively, on the other hand, are less defensive. . . . ."

TEST ITEM 11 (Ans. 3). The Basic Helicopter Handbook, AC 61-13, states, ". . .those conditions that result in dense air--low elevations, low temperatures, low moisture content, or some combination thereof--would be referred to as low density altitude conditions. . . . .The most favorable conditions for performance are the combination of a low-density altitude, light gross weight. . . ."

TEST ITEM 12 (Ans. 3). The Basic Helicopter Handbook, AC 61-13, states, ". . .ground resonance occurs when the helicopter makes contact with the ground during landing or while in contact with the ground during an attempted takeoff."

TEST ITEM 13 (Ans. 4). The Basic Helicopter Handbook, AC 61-13, states, "The rearward movement of the cyclic stick must be exactly timed to the lowering of the collective pitch. If rearward cyclic stick is applied too fast, the helicopter will start to climb; if rearward cyclic stick is applied too slowly, the helicopter will descend."

TEST ITEM 14 (Ans. 3). The Basic Helicopter Handbook, AC 61-13, states, "A running takeoff is used when conditions of load and/or density altitude prevent a sustained hover at normal hovering altitude."

TEST ITEM 15 (Ans. 3). The Basic Helicopter Handbook, AC 61-13, states, "Coning is the upward bending of the blades caused by the combined forces of lift and centrifugal force. . . . .centrifugal force acting outward. . . . .and lift acting upward. . . ." Therefore, when lift is decreased or centrifugal force is increased, coning will decrease.

TEST ITEM 16 (Ans. 2). The Basic Helicopter Handbook, AC 61-13, states, ". . . for any given angle of attack, lift increases as the velocity of the airflow over the airfoil increases. It is apparent that the lift over the advancing blade half of the rotor disc will be greater than the lift over the retreating blade half during horizontal flight. . . . . unless some compensation is made. It is equally apparent that the helicopter will roll to the left unless some compensation is made. . . . . A tendency for the retreating blade to stall. . . .is a major factor in limiting. . . .airspeed. . . . . The stall of a rotor blade limits the high airspeed potential of a helicopter."

TEST ITEM 17 (Ans. 2). The Basic Helicopter Handbook, AC 61-13, states, "The pilot will recognize this condition (CG forward of allowable limits) after coming to a hover following a vertical takeoff. The helicopter will have a nose-low attitude and an excessive rearward displacement of the cyclic stick will be required to maintain a hover in a no-wind condition if hovering flight can be maintained at all. Flight under this condition should not be continued since. . . . .the pilot may find it impossible to increase the pitch attitude sufficiently to bring the helicopter to a stop. Also, in case of engine failure and the resulting autorotation, sufficient cyclic control may not be available to flare properly for the landing."

TEST ITEM 18 (Ans. 1). The Basic Helicopter Handbook, AC 61-13, states, "Maintain a straight ground track with lateral cyclic control and heading with antitorque pedals until a climb is established."

TEST ITEM 19 (Ans. 1). The Basic Helicopter Handbook, AC 61-13, states, ". . .as the cyclic stick is displaced forward, the angle of attack is decreased as the rotor blades pass the 90° position to the pilot's right (C in the illustration) and is increased as the blades pass the 90° position to the pilot's left (A in the illustration). Because of gyroscopic precession, maximum downward deflection of the rotor blades is forward and maximum upward deflection is aft, causing the rotor disc to tilt forward in the same direction as cyclic stick displacement. A similar analysis could be made for any direction of displacement of the cyclic stick." A similar analysis for a right displacement of the cyclic stick gives the greatest decrease in angle of attack at D and the greatest increase at B.

TEST ITEM 20 (Ans. 2). The Basic Helicopter Handbook, AC 61-13, states "In addition to varying the angle of bank to correct for drift in order to maintain the proper radius of turn, the helicopter must also be flown with a drift correction angle (crab) in relation to its ground track, except, of course, when it is on direct upwind or downwind headings or there is no wind. One would normally think of the fore and aft axis of the helicopter as being tangent to the ground track pattern at each point. However, this is not the case. During the turn on the upwind side of the reference line (side from which the wind is blowing), the nose of the helicopter will be crabbed toward the outside of the circle. During the turn on the downwind side of the reference line (side of the reference line opposite to the direction from which the wind is blowing), the nose of the helicopter will be crabbed toward the inside of the circle. In either case, it is obvious that the helicopter is being crabbed into the wind just as it is when trying to maintain a straight ground track. The amount of crab depends upon the wind velocity and how nearly the helicopter is to a crosswind position. The stronger the wind, the greater the crab angle at any given position for a turn of a given radius. The more nearly the helicopter is to a crosswind position, the greater the crab angle." By noting the amount and direction of crab in the illustration (Appendix 3, Fig. 7), you should easily see that the helicopter will turn the greatest number of degrees between positions B and C of those listed in the alternate responses.

APPENDIX 3. SUPPLEMENTAL MATERIALS

All of the charts and illustrations presented in Appendix 3 are of value to the student preparing for the test for the Flight Instructor Certificate. Every chart or illustration can be related to topics covered in the Study Outline. Even more important is the fact that each chart or illustration is either directly or indirectly related to charts, illustrations, and test items that may appear in the actual test.

SECTION 1. HELICOPTER FLIGHT MANUAL EXCERPTS

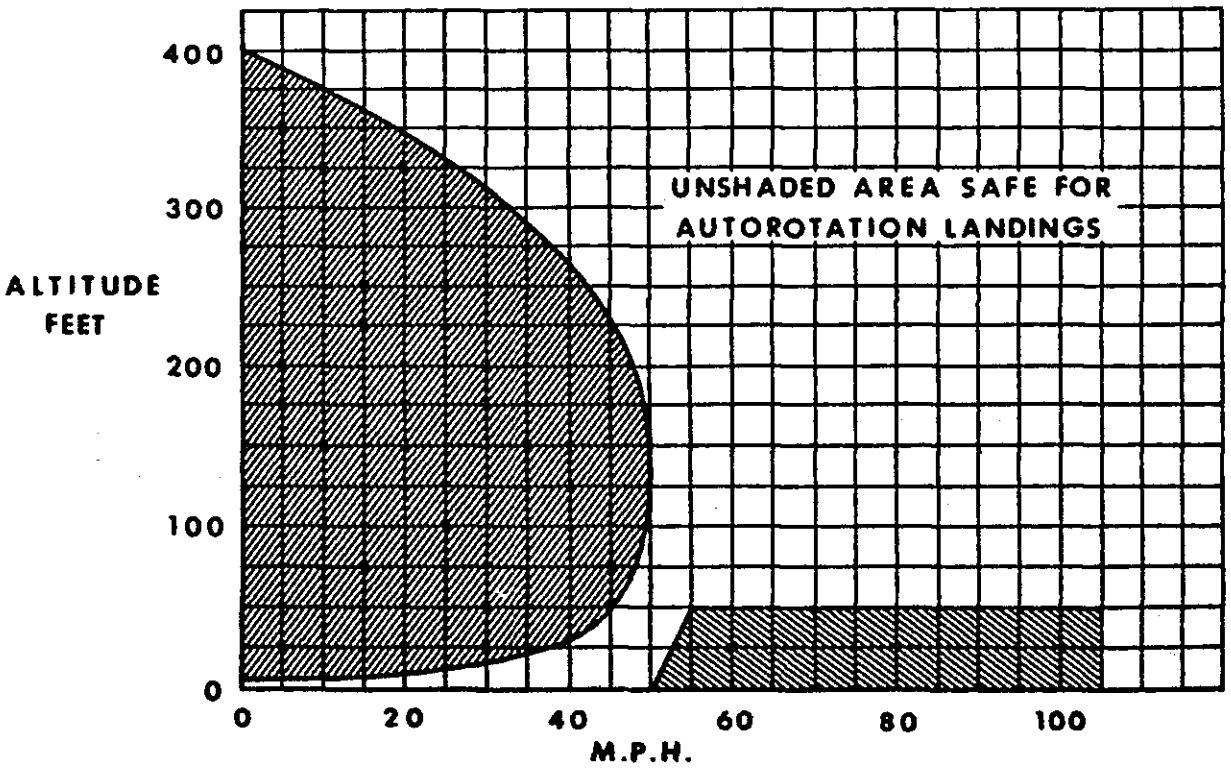
HOVERING CEILING - PRESSURE ALTITUDE FT. (3200 RPM)

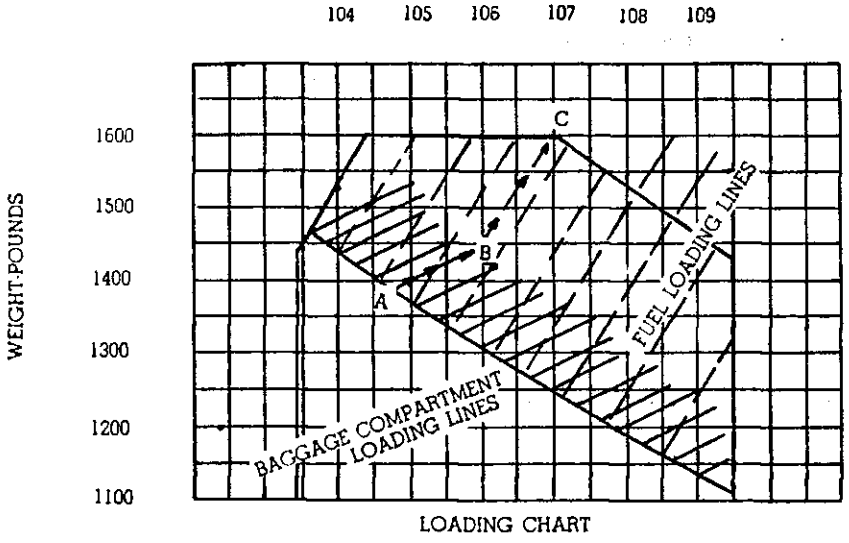
Gross Weight Pounds	Temperature °F	Temperature °C	DRY AIR In Ground Effect **	DRY AIR Out of Ground Effect	80% RELATIVE HUMIDITY In Ground Effect **	80% RELATIVE HUMIDITY Out of Ground Effect
2150	-13	-25	12450	7500	12350	7400
	23	- 5	11750	6900	11600	6750
	59	15	11000	6100	10350	5500
	95	35	10300	5400	8050	3050
2500	-13	-25	8850	3800*	8800	3750*
	23	- 5	8200	3050*	8050	2850*
	59	15	7450	2250*	6800	1550*
	95	35	6750	1500*	4600	-
2850	-13	-25	5850	-	5800	-
	23	- 5	5000	-	4900	-
	59	15	4150	-	3400	-
	95	35	3300	-	1350	-

NOTES:

* 2 Minute Power Rating

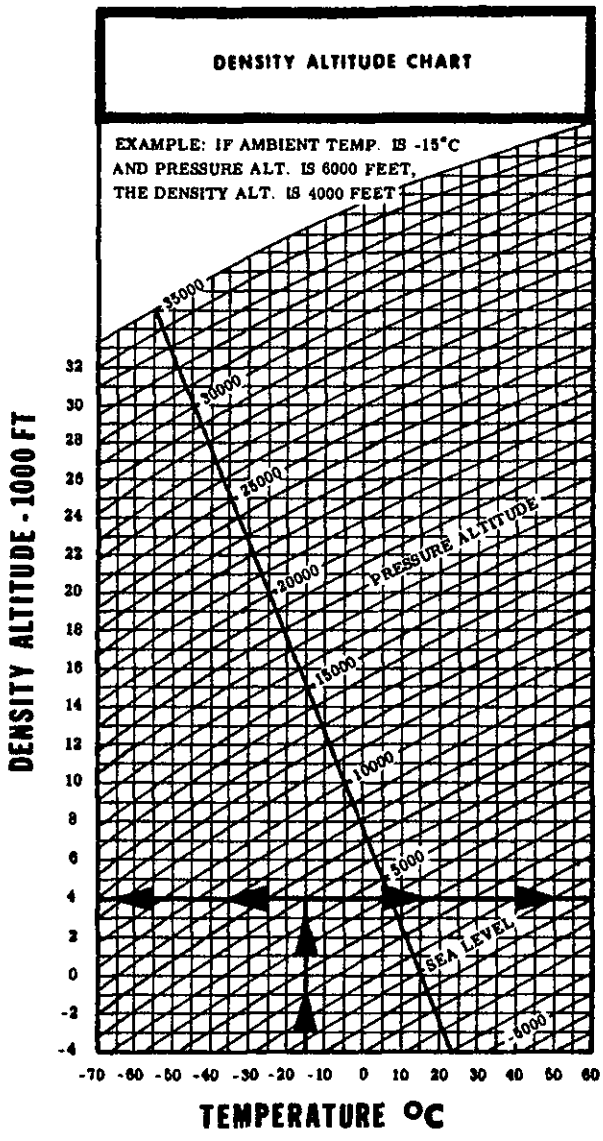
** Based on 2 foot skid height



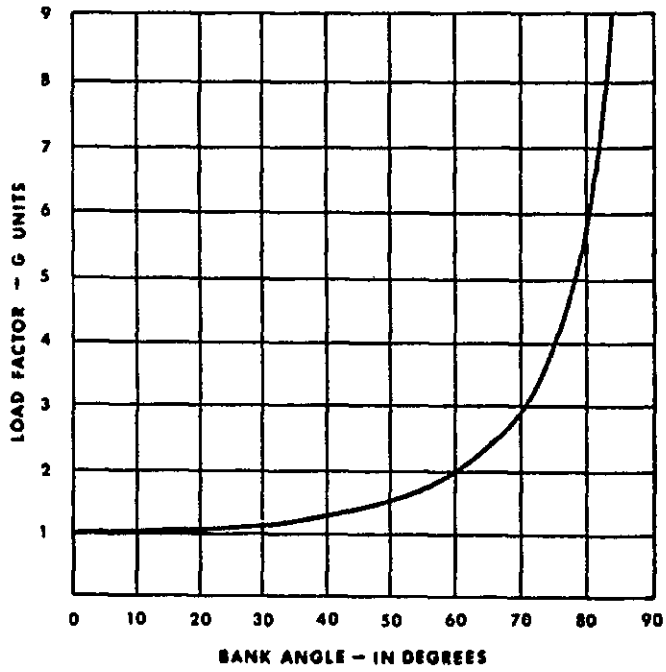


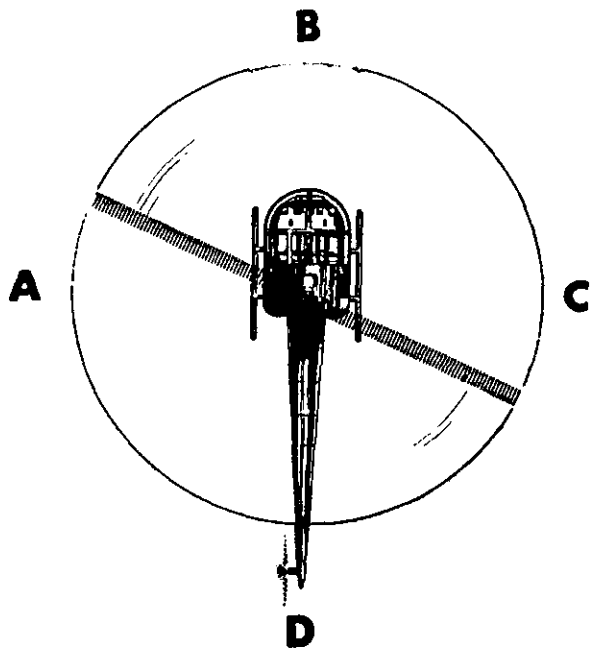
LOADING CHART

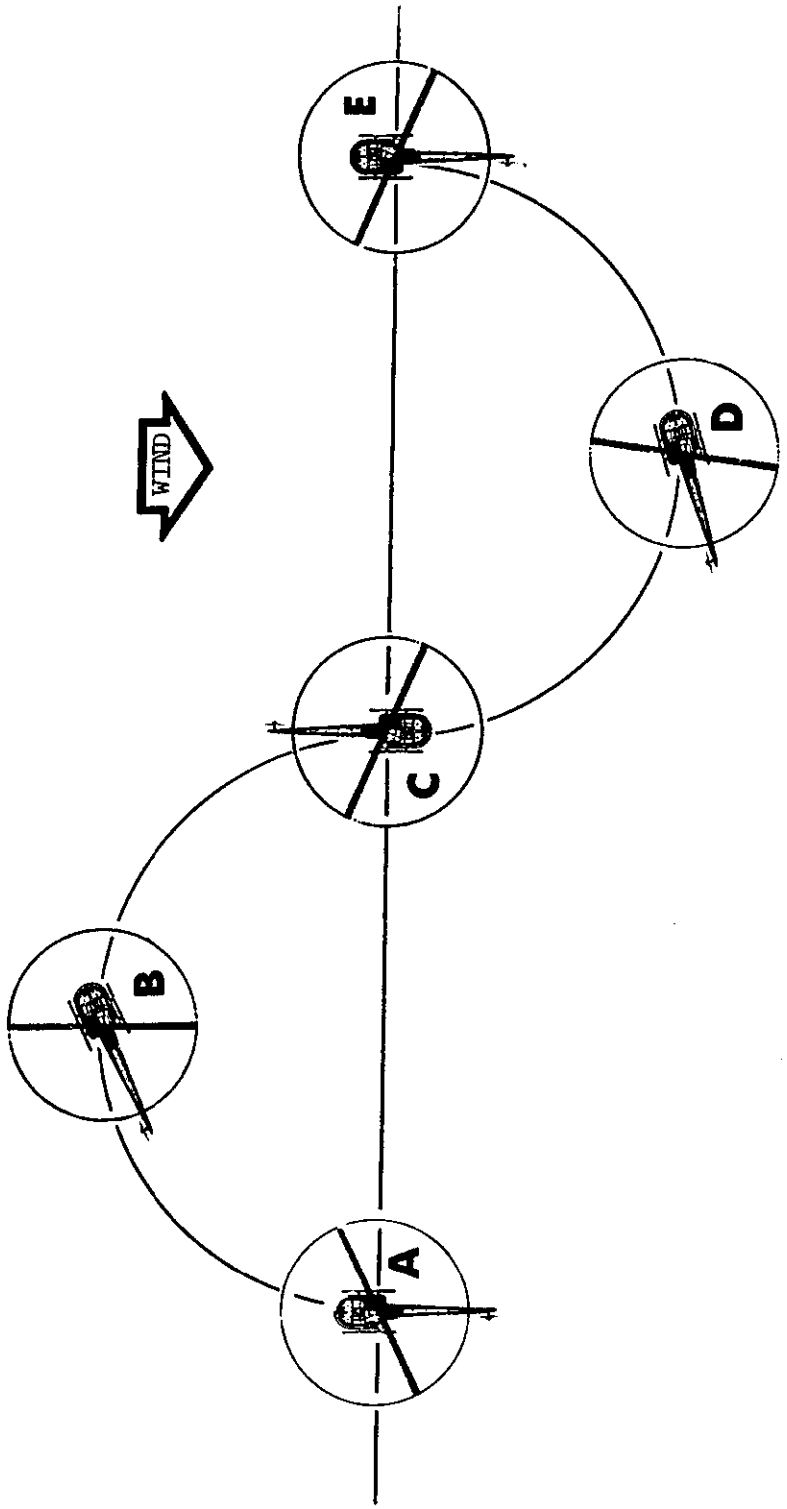
SECTION 2. MISCELLANEOUS ILLUSTRATIONS



LOAD FACTOR CHART







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