AC 61-31B
Change 1

GYROPLANE PILOT

WRITTEN TEST GUIDE

PRIVATE
and
COMMERCIAL

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Revised 1976

CHANGE

AC NO: 61-31B CHG 1
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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

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SUBJECT: GYROPLANE PILOT WRITTEN TEST GUIDE - PRIVATE AND COMMERCIAL

1. PURPOSE. This change transmits revised material for Advisory Circular 61-31B.

2. PRINCIPAL CHANGES. Advisory Circular page dated 4/14/76, paragraph 4, has been revised to reflect current address. Item 2 on page 10 is replaced; the sequence of illustrations for instruments A and B on pages 11 and 12 has been reversed; and the Pressure Altitude and Density Chart on page 17 has been corrected for the duplication of 28.1 in. Hg and 28.5 in. Hg.

PAGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
Advisory Circular Page	4/14/76	Advisory Circular Page	5/13/77
9 - 12	1976	9	1976
17 and 18	1976	10-12	5/13/77
		17 and 18	5/13/77

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Initiated by: AFS-590/AFS-820

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ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SUBJECT: GYROPLANE PILOT WRITTEN TEST GUIDE - PRIVATE AND COMMERCIAL

1. PURPOSE.

   a. This test guide was developed to assist applicants who are preparing for the Private or Commercial Pilot Certificate with a Rotorcraft-Gyroplane Rating under the provisions of the Federal Aviation Regulations (FAR) Part 61.

   b. This guide describes the type and scope of required aeronautical knowledge covered in the written tests, lists reference material available, and explains how these publications can be obtained.

   c. Included in the guide are study questions and illustrations which are representative of those used in the private and commercial gyroplane written tests.

2. CANCELLATION. Advisory Circular 61-31A, dated 9 Jun 72, is cancelled.

3. HOW TO GET THIS PUBLICATION. Copies of this publication may be obtained from:

   U.S. Department of Transportation
   Federal Aviation Administration
   Publications Section, TAD-443.1
   Washington, D.C. 20590

4. COMMENTS REGARDING THIS PUBLICATION should be directed to the:

   U.S. Department of Transportation
   Federal Aviation Administration
   Flight Standards National Field Office
   P.O. Box 25082
   Oklahoma City, Oklahoma 73125

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Private and Commercial Pilot Rotorcraft-Gyroplane Written Test Guide

Introduction

There is no quick and easy way to obtain the experience, knowledge, and skill that are required of a Private or Commercial pilot. These essentials are attained through conscientious study and practice over a period of time. Therefore, in a continuing effort to provide guidance and assistance to applicants who are preparing for the written tests, the Flight Standards Service of the Federal Aviation Administration has developed this test guide. By using the guide, applicants should be able to intelligently direct their study plan.

Certification

The certification process requires the applicant to pass a written test and a pilot flight test appropriate to the certificate sought. Review the applicable sections of Federal Aviation Regulations, Part 61, for specific information pertaining to certification.

Requirements for retaking the test after failure are also prescribed in Part 61.

The Written Tests

The Rotorcraft-Gyroplane tests are designed to integrate technical information of several subjects into test items which relate to a successfully planned and executed cross-country flight. The tests, which are single section, require the applicant to employ all pertinent flight information and to apply his knowledge of air traffic rules, weather, navigation, radio, operation of aircraft and engines, etc., in planning a safe, efficient flight.

There are 50 test items in the Private Pilot Test, and 3 hours 30 minutes are allowed for taking this test. The Commercial Pilot Test contains 60 test items and 4 hours are allowed for taking this test. All test items are of the objective, multiple-choice type, and each item can be answered by the selection of a single response as the correct choice. That is, the correct response of one test item does not depend upon, nor influence, the correct response of another test item.

Taking the Tests

The tests may be taken at General Aviation District Offices of the Federal Aviation Administration and at other designated places.

When reporting for the written test, be prepared to present to the person administering the test proof of your eligibility, as well as documentary evidence of your identity. *Normally, you will not be permitted to begin the test unless there is sufficient time to complete it.*

The equipment needed for taking the test includes a straight edge, a plotter or protractor, and a computer (preferably one with a wind vector face). It is also desirable to have a pair of dividers for accurate measurement.

Consider the following points while taking the tests:

1. Test items should be answered in accordance with the latest regulations and procedures.

2. Read the information, instructions, and each test question carefully. Do not try to solve the problem before understanding the question. Be sure the objectives of the test item are fully understood, then work the problem or analyze the choices and select the answer believed to be the most correct.

3. Do not consider a complicated problem a "trick" question; each question has a specific objective. There are no trick questions. The

questions and answers mean exactly what is stated and refer to the general rule, rather than the exception to the rule.

4. There is only one correct and complete answer to each item. The alternate answers are derived from incorrect computations, or based upon common misconceptions, or lack of knowledge about the subject.

5. If you find that you have considerable difficulty with a particular test item, do not spend too much time on it. Go on to the questions that you can answer readily, then return to the difficult items.

6. If you have solved a computer-type problem correctly, your answer will be closer to the correct answer than to any of the other choices. The correct answer is an average of solutions obtained by using several types of computers.

7. When marking the test answer sheet, be sure that the number of the question matches the number on the answer sheet, and that you mark only one answer block per question. An answer block for a test question that is left blank, a partially erased answer block, or more than one answer block marked is scored as wrong. Carefully check your answer sheet for errors before turning it in.

Reference Materials

The following list of publications and materials is provided for the benefit of individuals who wish to prepare for the Private or Commercial Gyroplane Pilot Written Test. In addition, there are many excellent textbooks and other reference materials produced commercially that may be obtained from the publishers, various bookstores, and fixed-base operators engaged in flight training.

A. *Advisory Circulars*

1. AC 00-6A, *Aviation Weather.* Provides a text for pilots and other flight operations personnel whose interest in meteorology is primarily in its application to flying. (GPO)

2. AC 00-45, *Aviation Weather Services.* Supplements AC 00-6A, in that it explains the use and interpretation of reports, forecasts, weather maps, and prognostic charts in detail. It is an excellent source of study for pilot certification examinations. (GPO)

3. AC 61-13A, *Basic Helicopter Handbook.* Primarily provides information for the applicant who is preparing for a pilot's certificate with a helicopter rating. However, much of the information is also pertinent to gyroplanes. (GPO)

4. AC 90-23D, *Wake Turbulence.* Alerts pilots to the hazards of wake turbulence, which trails behind aircraft in flight, and recommends related operational procedures. (Free)

5. AC 91-15, *Terrain Flying.* Designed primarily for the private pilot with an airplane rating. However, the gyroplane pilot should find this booklet beneficial since it contains observations, opinions, warnings, and advice from veteran pilots regarding flight over various types of terrain. (GPO)

6. AC 91-23, *Pilot's Weight and Balance Handbook.* Provides a text on aircraft weight and balance. It progresses from an explanation of basic fundamentals to the complete application of weight and balance principles. (GPO)

B. *Airman's Information Manual (AIM).* Presents in five parts information necessary for planning and conducting flights within the National Airspace System. Besides providing frequently updated airport and NAVAID data, AIM includes instructional and procedural information, and is designed for use in the cockpit.

To better serve the needs of the individual pilot, each part is available on an annual subscription basis.

Part 1. *Basic Flight Manual and ATC Procedures.* Issued quarterly. (GPO)

Part 2. *Airport Directory.* Issued semiannually. (GPO)

Part 3. *Operational Data and Notices to Airmen.* Issued every 56 days. (GPO)

Part 3A. *Notices to Airmen.* Issued every 14 days. (GPO)

Part 4. *Graphic Notices and Supplemental Data.* Issued quarterly. (GPO)

C. *Federal Aviation Regulations (FAR).*

Part 1, Definitions and Abbreviations (GPO).

Part 61, Certification: Pilots and Flight Instructors (GPO).

Part 71, Designation of Federal Airways, Area Low Routes, Controlled Airspace and Reporting Points (GPO).

Part 91, General Operating and Flight Rules (GPO).

Part 135, Air Taxi Operators and Commercial Operators of Small Aircraft (GPO).

D. *National Transportation Safety Board Regulation (NTSB), Part 830.* Deals with procedures required in the notification and reporting of accidents and lost or overdue aircraft within the United States, its territories, and possessions. (Free)

E. *VFR/IFR Pilot Exam-O-Grams.* Provide concise information about certain concepts and procedures that are critical to aviation safety. Lists of current Exam-O-Grams appear on pages 19 and 20. (Free)

How to Obtain Study Materials

The study materials listed, except for free Advisory Circulars and Exam-O-Grams, may be obtained by remitting a check or money order to the address given below.

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

To obtain the latest information regarding FAR prices, number of changes, and ordering information, send for a free copy of "Advisory Circular 00-44, Status of Federal Aviation Regulations" from the address given below. Free FAA publications may also be obtained from this office.

U.S. Department of Transportation
Publications Section, TAD-443.1
Washington, D.C. 20590

If you are presently on one of FAA's Advisory Circular mailing lists, you will automatically receive AC 00-44. If not, and you wish to be placed on the mailing list to receive revised copies as issued, send your name and address to:

U.S. Department of Transportation
Distribution Unit, TAD-482.3
Washington, D.C. 20590

NOTE: To receive the latest information on how to obtain the Airman's Information Manual, free Advisory Circulars, and other FAA material, consult the Advisory Circular Checklist, AC 00-2. A copy of this checklist (which is updated every four months) may be obtained free of charge by sending your request to:

U.S. Department of Transportation
Publications Section, TAD-443.1
Washington, D.C. 20590

National Transportation Safety Board Regulation, Part 830, may be obtained free of charge upon request from:

National Transportation Safety Board
Publications Unit
Washington, D.C. 20594

Exam-O-Grams may be obtained free of charge (one copy per each request), and names may be added to the mailing list, by writing to:

Department of Transportation
FAA Aeronautical Center
Flight Standards Technical Division
Operations Branch, AAC-240
P.O. Box 25082
Oklahoma City, Oklahoma 73125

STUDY OUTLINE

PRIVATE OR COMMERCIAL PILOT

Rotorcraft-Gyroplane Knowledge Areas

I. *Federal Aviation Regulations*

A. Parts 1; 71: Definitions/Controlled Airspace.

1. Air commerce.
2. Airport traffic area.
3. Ceiling.
4. Commercial operator.
5. Flight visibility.
6. Interstate air commerce.
7. Major alterations.
8. Major repair.
9. Pilot in command.
10. Second in command.
11. Federal airway.
12. Control area.
13. Control zone.
14. Terminal control area.

B. Part 61: Certification: Pilots and Flight Instructors.

1. Required certificates/ratings.
2. Certificates and ratings issued.
3. Expired pilot certificates/reissuance.
4. Carriage of narcotic drugs/marihuana.
5. Duration of pilot certificates.
6. Duration of medical certificates.
7. General limitations.
8. Pilot logbooks.
9. Operations during medical deficiency.
10. Second-in-command qualifications.
11. Recent experience: pilot in command.
12. Piliot in command proficiency check.
13. Falsification, reproduction, alteration.
14. Change of address.
15. Private pilot privileges/limitations.
16. Commercial pilot privileges/limitations.

C. Part 91: General Operating Rules—Subpart A.

1. Responsibility of pilot in command.
2. Pilot in command—more than one pilot.
3. Preflight action.
4. Flight crewmembers at stations.
5. Interference with crewmembers.
6. Careless or reckless operation.
7. Liquor and drugs.
8. Dropping objects.
9. Fastening of safety belts.
10. Portable electronic devices.
11. ATC transponder equipment requirements.
12. Civil aircraft: certificates required.
13. Aircraft airworthiness.
14. Aircraft operating limitations/markings.
15. Instrument and equipment requirements.

D. Part 91: General Flight Rules—Subpart B.

1. Waivers.
2. Operating near other aircraft.
3. Right-of-way rules.
4. Aircraft lights.
5. Complying—ATC clearances/instructions.
6. ATC light signals.
7. Minimum safe altitudes; general.
8. Altimeter settings.
9. Flight plan; information required.
10. Operation—in vicinity of airport.
11. Operation—airport with control tower.
12. Operation—airport without control tower.

13. Flight in terminal control areas.
14. Temporary flight restrictions.
15. Flight test areas.
16. Restricted and prohibited areas.
17. Basic VFR weather minimums.
18. Special VFR weather minimums.
19. VFR crusing altitude or flight level.
20. ATC transponder test/inspection.

E. Part 91: Maintenance, Preventive Maintenance, and Alterations—Subpart C.

1. General maintenance and alterations.
2. Maintenance required.
3. Carrying persons after repair/alteration.
4. Inspections/progressive inspections.
5. Altimeter system tests/inspections.
6. Maintenance records/transfer of records.
7. Rebuilt engine maintenance records.
8. ATC transponder test/inspection.

II. *National Transportation Safety Board Regulation—Part 830*

A. General.

1. Applicability.
2. Definitions.

B. Initial Notification of Aircraft Accidents, Incidents, and Overdue Aircraft.

1. Immediate notification.
2. Information to be given in notification.

C. Preservation of Aircraft Wreckage, Mail, Cargo, and Records.

D. Reporting of Aircraft Accidents, Incidents, and Overdue Aircraft.

III. *FAA Advisory Circular System*

A. Series 00—General.

B. Series 20—Aircraft.

C. Series 60—Airmen.

D. Series 70—Airspace.

E. Series 90—Air Traffic Control and General Operations.

F. Series 150—Airports.

G. Series 170—Air Navigation Facilities.

IV. *Airman's Information Manual*

A. Part 1: Basic Flight Manual and ATC Procedures.

1. Glossary of aeronautical terms.
2. Airport lighting/marking/aids.
3. Air navigation radio aids.
4. Visual approach slope indicator.
5. Controlled/uncontrolled airspace.
6. Operating at nontower airports.
7. Special use airspace—prohibited, restricted, intensive student jet training area (ISJTA), alert areas.
8. Automatic terminal information service.
9. ATC departure/en route/arrival procedures.
10. Radar traffic information service.
11. Terminal radar program for VFR aircraft.
12. Aeronautical advisory stations (UNICOM).
13. Radiotelephone phraseology/technique.
14. Traffic/wind direction indicators.
15. Obtaining weather information/briefing.
16. Flight plan.
17. Medical facts for pilots.
18. Good operating practices.

B. Part 2: Airport Directory.

1. Obtaining airport/heliport data.
2. FSS/weather service telephone numbers.

C. Part 3: Operational Data and Special Notices.

1. Obtaining radio facility/FSS data.
2. Special notices/special operations.

D. Part 3A: Notices to Airmen.

1. NOTAMS.
2. FDC NOTAMS.

E. Part 4: Graphic Notices and Supplemental Data.

1. Terminal radar service areas.
2. Terminal area graphic notices.
3. Restrictions to en route navigation aids.
4. VOR receiver checkpoints.
5. Parachuting jumping areas.
6. Olive branch routes.

V. *Aviation Weather, AC 00-6A.*

A. The Earth's Atmosphere.
   1. Composition.
   2. Vertical structure.
   3. The standard atmosphere.
   4. Density and hypoxia.

B. Temperature.
   1. Temperature scales.
   2. Heat and temperature.
   3. Temperature variation.

C. Atmospheric Pressure and Altimetry.
   1. Atmospheric pressure.
   2. Altimetry.

D. Wind.
   1. Convection.
   2. Pressure gradient force.
   3. Coriolis force.
   4. The general circulation.
   5. Friction.
   6. The jet stream.
   7. Local and small scale winds.
   8. Wind shear.
   9. Wind, pressure systems, and weather.

E. Moisture, Cloud Formation, and Precipitation.
   1. Water vapor.
   2. Change of state.
   3. Cloud formations.
   4. Precipitation.
   5. Land and water effects.

F. Stable and Unstable Air.
   1. Changes within upward and downward moving air.
   2. Stability and instability.

G. Clouds.
   1. Identification.
   2. Signposts in the sky.

H. Airmasses and Fronts.
   1. Airmasses.
   2. Fronts.
   3. Fronts and flight planning.

I. Turbulence.
   1. Convective currents.
   2. Obstructions to wind flow.
   3. Wind shear.
   4. Wake turbulence.

J. Icing.
   1. Structural icing.
   2. Induction system icing.
   3. Instrument icing.
   4. Icing and cloud types.
   5. Other factors in icing.
   6. Ground icing.
   7. Frost.

K. Thunderstorms.
   1. Where and when?
   2. They just don't happen.
   3. The inside story.
   4. Rough and rougher.
   5. Hazards.
   6. Thunderstorms and radar.
   7. Do's and don'ts of thunderstorm flying.

L. Common IFR Producers.
   1. Fog.
   2. Low stratus clouds.
   3. Haze and smoke.
   4. Blowing restrictions to vision.
   5. Precipitation.
   6. Obscured or partially obscured sky.

VI. *Aviation Weather Services, AC 00-45*

A. The Aviation Weather Service Program.
B. Surface Aviation Weather Reports.
C. Pilot and Radar Reports.
D. Aviation Weather Reports.
E. Surface Analysis.
F. Weather Depiction Chart.
G. Radar Summary Chart.
H. Significant Weather Prognostics.
I. Winds and Temperatures Aloft.
J. Freezing Level Chart.
K. Stability Chart.
L. Severe Weather Outlook Chart.
M. Constant Pressure Charts.
N. Constant Pressure Prognostics.

VII. *Basic Helicopter Handbook, AC 61-13A.*

A. General Aerodynamics
   1. Airfoil.
   2. Chord line.
   3. Relative wind.
   4. Pitch angle.
   5. Angle of attack.
   6. Lift.

7. Drag (airfoil).
8. Stall.
9. Lift and angle of attack.
10. Lift and velocity of airflow.
11. Lift and air density.
12. Lift and weight.
13. Thrust and drag.

B. Aerodynamics of Flight
1. Powered flight.
a. Forces acting on the gyroplane.
b. Torque.
c. Gyroscopic precession.
d. Dissymmetry of lift.
e. Blade flapping.
f. Coning.
g. Axis of rotation.
h. Coriolis effect.
i. Retreating blade stall.
2. Power-Off Flight.
a. Rotor RPM during descent.
b. Flare during landing.

C. Loads and Load Factors.
1. Lift components of a turn.
2. Loads.
3. Load factor.

VIII. *Function of the Controls (Manufacturer's Gyroplane Manual)*

A. Rotor Spin-up Lever Control.
B. Throttle Control.
C. Rotor Spin-up Lever-Throttle Coordination.
D. Rudder Pedals.
E. Control Stick.
F. Propeller Control.

IX. *Gyroplane Operations*

A. General.
1. Preflight/postflight safety practices.
2. Use of proper grade/type fuel.
3. Fuel system operation.
4. Fuel contamination-prevention/elimination.
5. Rotor and engine operating limitations.
6. Gyroplane operating limitations.

B. Engine.
1. Reciprocating engine principles.
2. Engine starting/shutdown.
3. Detonation cause/effect.
4. Carburetor/fuel injection principles.
5. Carburetor ice — cause/detection/elimination.
6. Manifold pressure versus RPM.
7. Interpreting engine instruments.
8. Emergency — engine/systems/equipment/fire.

C. Weight and Balance.

D. Gyroplane Performance.
1. Effect of high density altitude on gyroplane performance.
a. Takeoff.
b. Rate of climb.
c. Landing.
2. Effect of gross weight on gyroplane performance.
3. Effect of wind on gyroplane performance.
4. Practical methods for predicting gyroplane performance.
a. Manifold pressure and payload.
b. Payload and wind.
c. Service ceiling and gross weight.

E. Some Hazards of Gyroplane Flight.
1. Retreating blade stall.
2. Ground resonance.
3. High rates of descent.
4. Flight in the region of reverse command.
5. Abnormal rotor vibrations.
6. Height-velocity curve.
7. Wake turbulence.
8. Midair collisions.

F. Precautionary Measures and Critical Conditions.
1. General precautionary rule.
2. Rotor RPM operating limits.
3. Extreme attitudes and overcontrolling.
4. Flight technique in hot weather.
5. Effect of altitude on instrument readings.
6. High density altitude pilot technique.
7. Carburetor icing.
a. Conditions favorable for carburetor icing.
b. Indications of carburetor icing.
c. Carburetor air temperature gage.
d. Use of carburetor heat.
e. Fuel injection.

G. Flight Maneuvers.

1. Taxiing.
2. Takeoffs/approaches/landings.
3. Power-off landings.

X. *Flight Instruments and Systems*

A. Attitude Indicator Operation/Errors.
B. Heading Indicator Operation/Errors.
C. Turn Indicator.
D. Vertical Velocity Indicator Operation/Errors.
E. Airspeed Indicator Operation/Errors.
F. Altimeter Operation/Errors.
G. Vacuum Systems/Instruments.
H. Pitot-static Systems/Instruments.
I. Magnetic Compass Operation/Errors.
J. Altimeter Setting Procedure/Significance.
K. Pressure Altitude Significance/Obtaining.
L. Gyroscopic Principles.

XI. *Radio Communications*

A. VHF/UHF Radio Communications/Phraseology.
B. Position Reporting Procedure.
C. Tower/FSS/En route — Advisories/Instructions.
D. FSS Communications Procedures.
E. Obtaining Emergency Assistance.
F. Lost Procedure When Radio is Inoperative.
G. Use of Proper Communications Frequencies.

XII. *Navigation*

A. General.

1. Section chart interpretation.
2. Relating chart symbols to regulations.
3. Pilotage/recognition of landmarks.
4. Determining courses/distances on charts.
5. Planning traffic pattern.
6. Navigation computer principles.
7. Computing heading/courses.
8. Computing time, distance, speed, fuel.
9. Computing rates of climb/descent.
10. Computing wind direction/speed inflight.
11. Computing off-course corrections.
12. Selecting VFR cruising altitudes.

B. Radio.

1. Characteristics of VOR facilities.
2. Tuning VOR receivers.
3. Identifying VOR stations.
4. VOR interpretation/orientation.
5. Intercepting VOR radials.
6. Tracking VOR radials.
7. Groundspeed checks using VOR radials.
8. VOR frequency interference.
9. VOR test signals/VOR receiver checks.
10. Characteristics of ADF facilities.
11. Computing off-course corrections.
12. Identifying stations used for ADF.
13. A D F/R M I interpretation/orientation.
14. Intercepting, tracking ADF/RMI bearings.

Sample Test Items

The following test item samples are included only for the purpose of acquainting you with the format used in the construction of FAA written tests. These sample items *do not* direct attention to all of the topics on which you will be tested in the official tests. For this reason you should concentrate on the section entitled "Study Outline." A knowledge of all of the topics presented in the outline, not just the ability to answer these few sample test items, should be your goal as you prepare for the written tests in either of the two certification areas.

Some of the following test items refer to certain illustrations located on pages 15 through 18 of this guide. The illustrations are representative of those used in the Private and Commercial Rotorcraft-Gyroplane Written Tests.

Items, Answers and Explanations

1. The National Transportation Safety Board (NTSB) regulation, Part 830, specifically states that the operator of an aircraft which is involved in an aircraft accident shall immediately notify

1—the nearest Flight Service Station.
2—the nearest FAA General Aviation District Office.

3—the nearest field office of the NTSB.
4—the nearest local law enforcement office.

Answer. Response 3. NTSB Part 830 requirement.

2. An aircraft in distress has the right of way over
   1— all other aircraft.
   2— all other aircraft except a glider on final approach.
   3— only those aircraft not engaged in landing or taking off.
   4— all other aircraft except an aircraft towing or refueling other aircraft.

Answer. Response 1. FAR 91.67 currently states, in part, "When a rule of this section gives another aircraft the right of way, he shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

b. In distress. An aircraft in distress has the right of way over all other air traffic."

3. In planning a cross-country flight, you determine that the total distance is 136 nautical miles and that your average groundspeed will be 86 knots. The Gyroplane Flight Manual shows the total fuel capacity is 24.2 gals., with 3.2 gals. unusable. If you start with full fuel tanks and consume 10.5 gals. per hour, how much usable fuel will remain at the completion of the flight?
   1— 4.4 gals.
   2— 6.9 gals.
   3— 7.6 gals.
   4—13.7 gals.

Answer. Response 1. This may be solved arithmetically or by the use of a slide rule computer. At a groundspeed of 86 knots, it will take 1 hour 35 minutes to travel the distance of 136 nautical miles. In 1 hour 35 minutes, at the rate of consumption of 10.5 g.p.h., the amount of fuel used will be 16.6 gals. With 21 gals. usable (24.2−3.2=21), the remaining usable fuel at the end of the flight will be 4.4 gals.

4. Certain maintenance inspections are required by regulations to be performed periodically. Completion of an "annual" inspection and the authorization for the return of the aircraft to service will always be indicated by the
   1—completion of appropriate portions of a Repair and Alteration Form.
   2—notation in the Aircraft and Engine records.
   3—issuance date of the Airworthiness Certificate.
   4—completion date of the 100-hour inspection form.

Answer. Response 2. *Number 2* is correct because FARs stipulate that appropriate entries be made in maintenance records (logbooks) each time inspection or maintenance is done on the aircraft or engine. *Number 1* is incorrect, since the Repair and Alteration Form is used for the description and approval of work done on a repaired or altered aircraft unit. *Number 3* is incorrect because an Airworthiness Certificate is issued when the aircraft is deemed airworthy at the time of manufacture or after substantial alteration or repair. Only when this certificate has been issued within the preceding 12 months will it indicate compliance with annual inspection requirements. *Number* 4 is also incorrect because, although an annual inspection each 12 months will satisfy the requirements of a 100-hour inspection, a 100-hour inspection will not suffice for an annual inspection.

5. Using the Loading and Center of Gravity Charts on pages 15 and 16, you make your weight and balance calculations based on the following conditions:

Item	*(lbs.) Weight*	*(inch lbs./1000) Moment*
1. Basic Gyroplane	1074	85.6
2. Oil—(6 qts.—full oil tank may be assumed for all flights)	11	1.0
3. Baggage	15	?
4. Pilot and passenger (seat aft)	270	?
5. Fuel (20.0 gals. @ 6 lbs./gal.)	120	?
6. Total weight & moment	1490	?

You determine that your load conditions
   1—are within limits.
   2—are not within limits.
   3—are within the load limits for this weight, but are not within the center of gravity limits.
   4—cannot be found with the information given.

Answer. Response 1. In this problem, basic gyroplane weight and moment as given in the test item are the empty weight and moment (this includes unusable fuel). There is no graph for oil on the Loading Chart, so it is a *given* value. You use the loading chart on page 15 to find the moment for the weights given in the problem:

Baggage	0.9
Pilot and Passenger	15.4
Fuel	10.5
Total moment	113.4

You apply weight total and moment total to the Center of Gravity Chart on page 16 and determine that they fall within the envelope.

6. Based on the Aviation Weather Report below, at what approximate indicated altitude (msl) would you expect to find the base of the ceiling at Phoenix Sky Harbor International Airport (the field elevation is 1,128 ft.)?

SA35 31Ø7ØØ
PHX 2 SCT M15 BKN 3Ø OVC 2 TRW– 1ØØ/75/68/Ø6Ø8/998

1—1,500 ft. msl.
2—2,628 ft. msl.
3—3,000 ft. msl.
4—4,128 ft. msl.

Answer. Response 2. Ceiling is defined in Federal Aviation Regulations, Part 1, as the height above the earth's surface of the lowest layer of clouds or obscuring phenomena that is reported as "broken", "overcast", or "obscuration", and not classified as "thin" or "partial." In an Aviation Weather Report, a letter preceding height of cloud layer identifies the ceiling layer and indicates how ceiling height was obtained. Sky cover symbols are given in ascending order and the figures preceding symbols are heights of cloud layers in hundreds of feet above the surface. Therefore, in th example above, 2 SCT M15 BKN 3Ø– OVC means that the cloud layers are at 200 ft., 1,500 ft., and 3,000 ft. above ground level. The M15 BKN identifies the ceiling as a measured 1,500-ft. broken ceiling. To determine the height of the ceiling above mean sea level (msl), you must add 1,500 to the field elevation of the reporting station PHX (Phoenix Sky Harbor International Airport). 1,500 ft.+1,128 ft.=2,628 ft. msl, the correct answer.

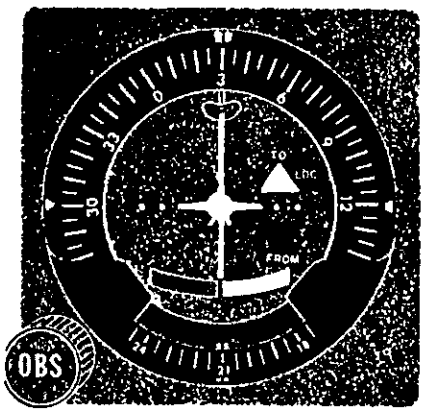
7. Using the temperature and altimeter setting for PHX in the Aviation Weather Report for item 6, you determine the density altitude to be approximately

NOTE: Field elevation at Phoenix Sky Harbor International Airport is 1,128 ft. Also, use the Density Altitude Chart on page 17.

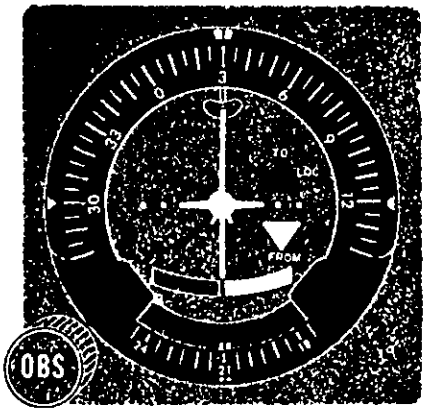
1—sea level.
2—1,072 ft.
3—2,400 ft.
4—3,900 ft.

Answer. Response 3. To work this problem, pressure altitude must be determined before you can determine the density altitude. You are given the altimeter setting (29.98) and the temperature (75° F.) in the PHX Aviation Weather Report. Field elevation, which normally is found on the navigation chart, is given in the "NOTE." With this information you go to the Pressure Altitude and Density Chart (See page 17) to first determine the pressure altitude, then the density altitude. The pressure, 29.98, falls between 29.92 and 30.0, and by interpolation you determine that 56 ft. must be subtracted from 1,128 ft. This gives a pressure altitude of 1,072 ft. You plot 1,072 ft. on the 75° temperature line and determine the density altitude at PHX to be approximately 2,400 ft.

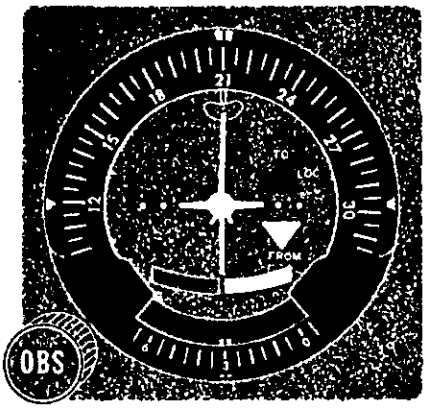
8. If you have tuned to a VOR and have the course selector set to 030, which of the following represents the proper indications of the OMNI illustrations below, assuming you are outbound and on course?



A



B



C

D

Answer. Response B. The proper procedure when flying directly away (following a radial outbound) from a VOR/VORTAC station is to set the course selector to the radial desired, in this case to 030. Therefore, responses C and D would be incorrect. Since the test item states that you are on course (outbound), your TO-FROM indicator would read FROM, and so Response A is incorrect.

9. Using the charts on pages 17 and 18, consider the following conditions with regard to a takeoff:

Field elevation	2,000 ft.
Temperature	90° F.
Gross weight	1,500 lbs.
Surface wind	zero
Altimeter setting	29.10

What is the total takeoff distance required to clear a 50-foot obstacle?

1—1,820 ft.
2—1,980 ft.
3—2,090 ft.
4—2,330 ft.

Answer. Response 4. The takeoff chart on page 18 is based on *pressure altitude.* Pressure altitude may be found by use of the chart on page 17. With an altimeter setting of 29.10, we find that 770 feet must be added to the given field elevation of 2,000 feet. The pressure altitude is then 2,770 feet. Now enter the takeoff chart at 2,770 feet pressure altitude and move horizontally to intersect the 90° F. temperature curve (interpolate) midway between 80° and 100° curves. From this point, move vertically down and read the total takeoff distance to clear a 50-foot obstacle. In this instance, we find it to be 2,330 feet.

10. Acceleration and deceleration errors of the magnetic compass will occur on headings which are

1—northerly and easterly.
2—easterly and westerly.
3—northerly and southerly.
4—southerly and westerly.

Answer. Response 2. When flying on an *easterly* or *westerly* heading, it is important that a constant airspeed be maintained to get an accurate reading on the magnetic compass. If you increase the airspeed, although you are holding the aircraft on a constant heading, the compass will indicate a turn toward *north.* If you decrease the airspeed the compass will indicate a turn toward the *south.*

Additional Questions For Study

Because the following questions are offered for the sole purpose of encouraging study, answers and explanations are not included. Here again, the applicant should be aware that these questions do not cover all those subject areas found on the written tests.

1. How do you file, open, and close VFR and IFR flight plans?
2. Which "Part" of the Airman's Information Manual should you use to determine type fuel, available servicing, and other information for an airport you wish to use?
3. Where can you find information about any "Special Use Airspace" that may be located in the area or along the route where you plan to fly?
4. For navigation purposes, which fact must be determined *first*?
   a. True course or true heading.
   b. Groundspeed or true airspeed.
5. What is ground resonance, and what action should a pilot take if it is encountered?
6. What causes retreating blade stall?
7. What is "region of reverse command," and how can a recovery from this situation best be accomplished?
8. Severe turbulence is most likely to occur in what type clouds?
9. What is a "Squall Line"?
10. What type weather conditions should one expect to be associated with an advancing warm front that contains moist and stable air?
11. What type weather is most likely to develop when the temperature/dewpoint spread is 4° and decreasing?
12. What can a pilot do to greatly assist the weather briefer when requesting weather information by telephone?
13. Who has the responsibility of determining that the gyroplane you plan to fly is in condition for safe flight?
14. Are "Airport Traffic Areas" depicted on aeronautical charts?
15. What are basic VFR weather minimums for operating a gyroplane?
16. What current documents must be in your personal possession any time you are acting as pilot in command?
17. How soon after consuming alcoholic beverages may you act as a crewmember of a civil aircraft?
18. How can you determine the pressure altitude at an airport prior to takeoff?
19. Under what circumstances may a private pilot receive compensation when acting as pilot in command of an aircraft?
20. What is the difference between control zones and control areas?
21. Which is considered to be more susceptible to icing, an engine equipped with a conventional float type carburetor or one equipped with a fuel injector unit?
22. Before takeoff you set the altimeter to the current altimeter setting for that airport. What should the altimeter read?
23. When should lighted position lights be displayed?
24. What altitude should be maintained when operating a gyroplane under VFR in level cruising flight at an altitude of more than 3,000 ft. above the surface and below 18,000 feet msl while on a magnetic course of 0° through 179°?
25. What action should you take if a control tower directs a flashing red light at you while you are on the final approach to land?
26. FARs stipulate that certain recency of experience requirements are mandatory prior to conducting night operations with passengers aboard. What are these requirements?
27. Will a lower-than-standard temperature have any effect on the altimeter?
28. What effect does high ambient temperature have on aircraft performance?
29. What is the difference between pressure altitude and density altitude?
30. What is the most serious type of aircraft structural icing?

31. What are wingtip vortices and how are they generated? What action can a pilot take to avoid wingtip vortices?

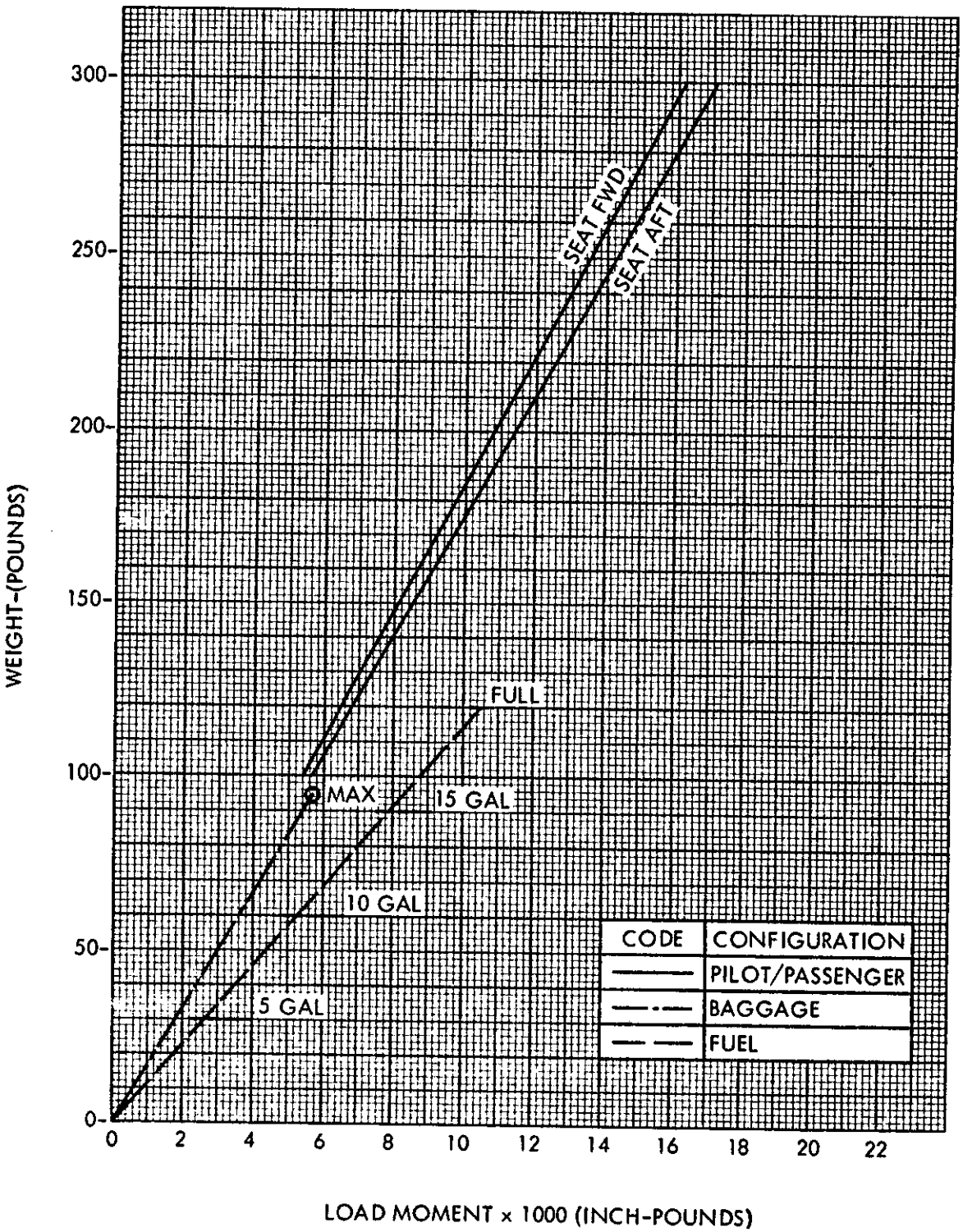
32. What indicated airspeed should be used for landing approaches where there is a high density altitude?

33. What is the relationship between the colored arcs on the airspeed indicator and calibrated airspeed?

34. Does wind affect the gyroplane airspeed?

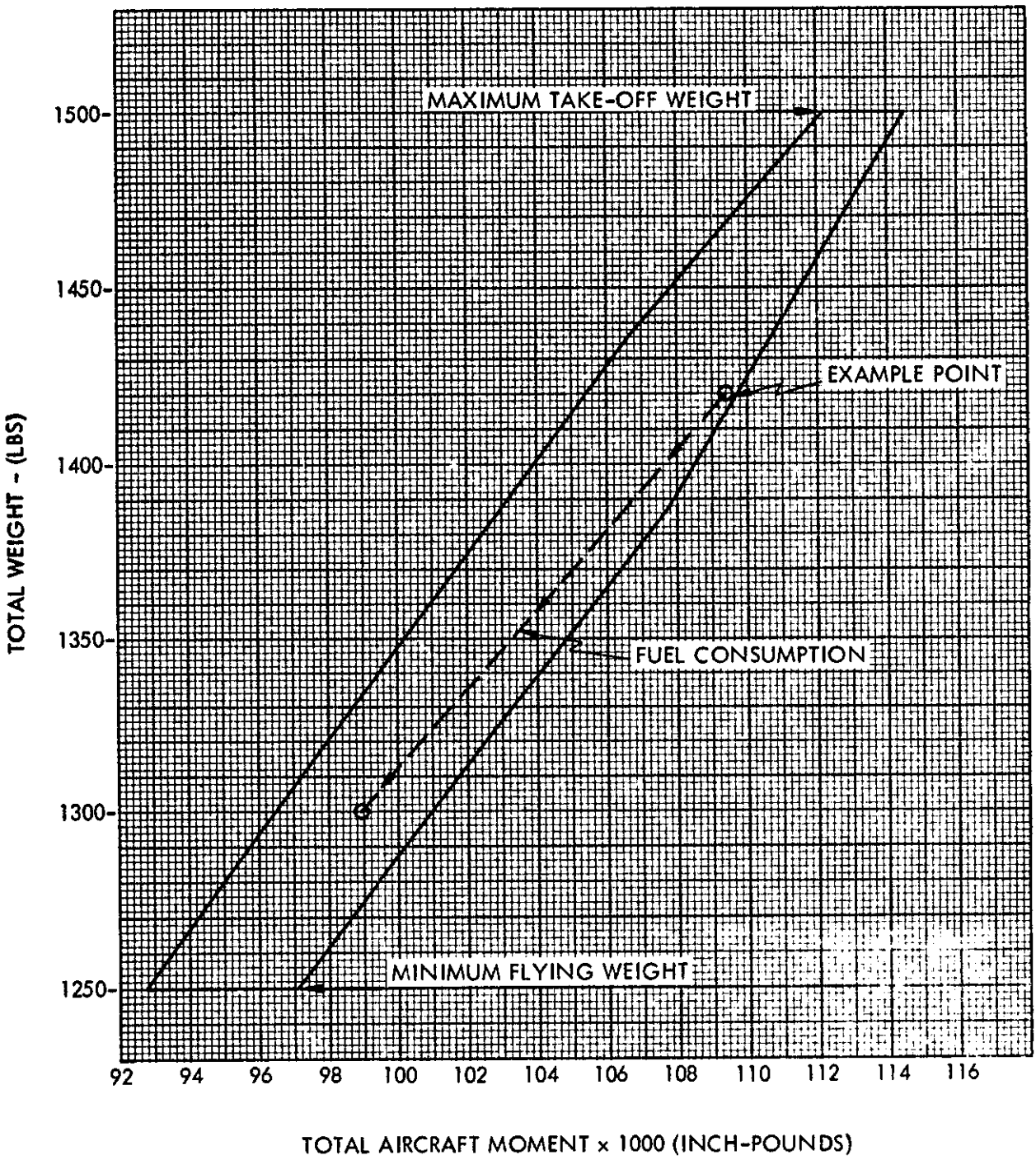
35. Does wind affect the gyroplane groundspeed?

LOADING CHART



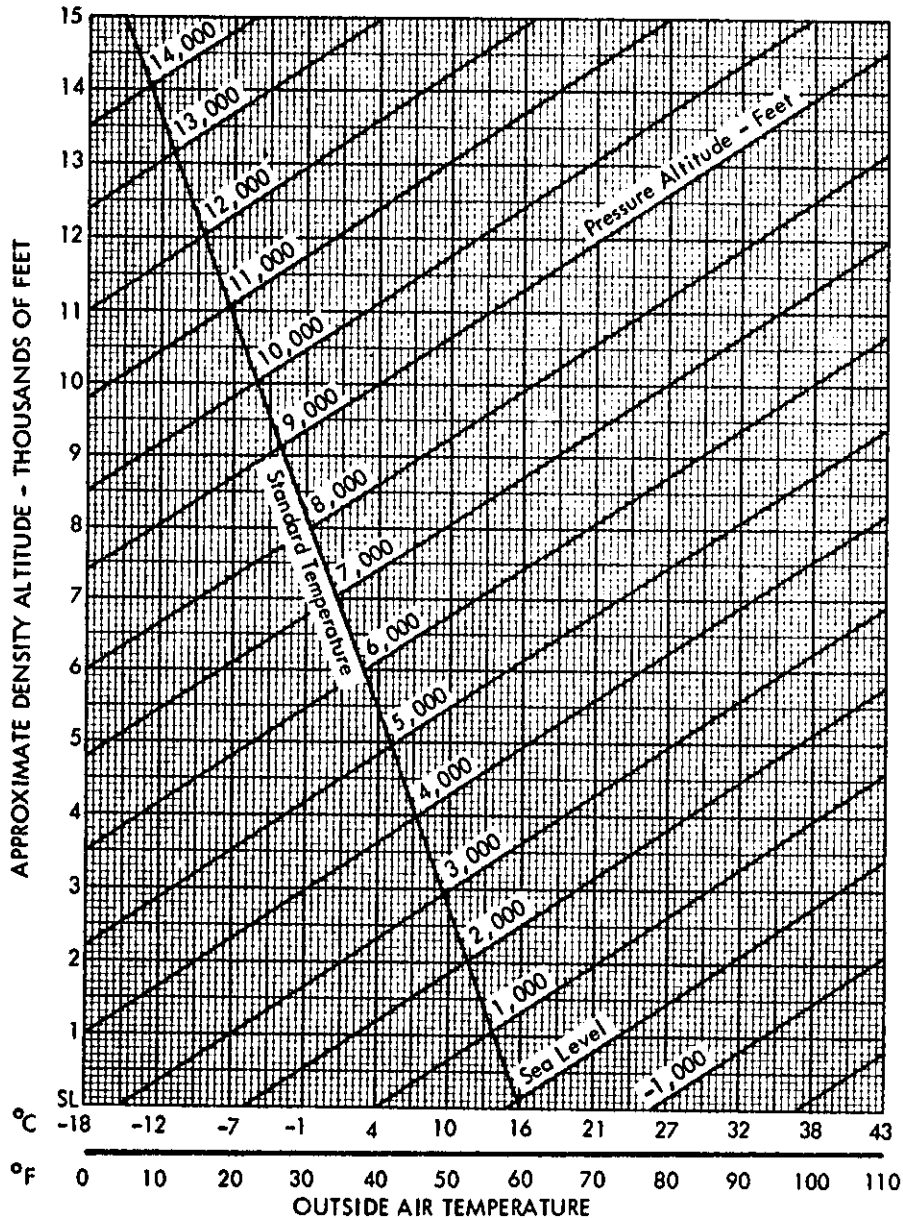
CENTER OF GRAVITY MOMENT ENVELOPE

NORMAL CATEGORY



PRESSURE ALTITUDE AND DENSITY CHART

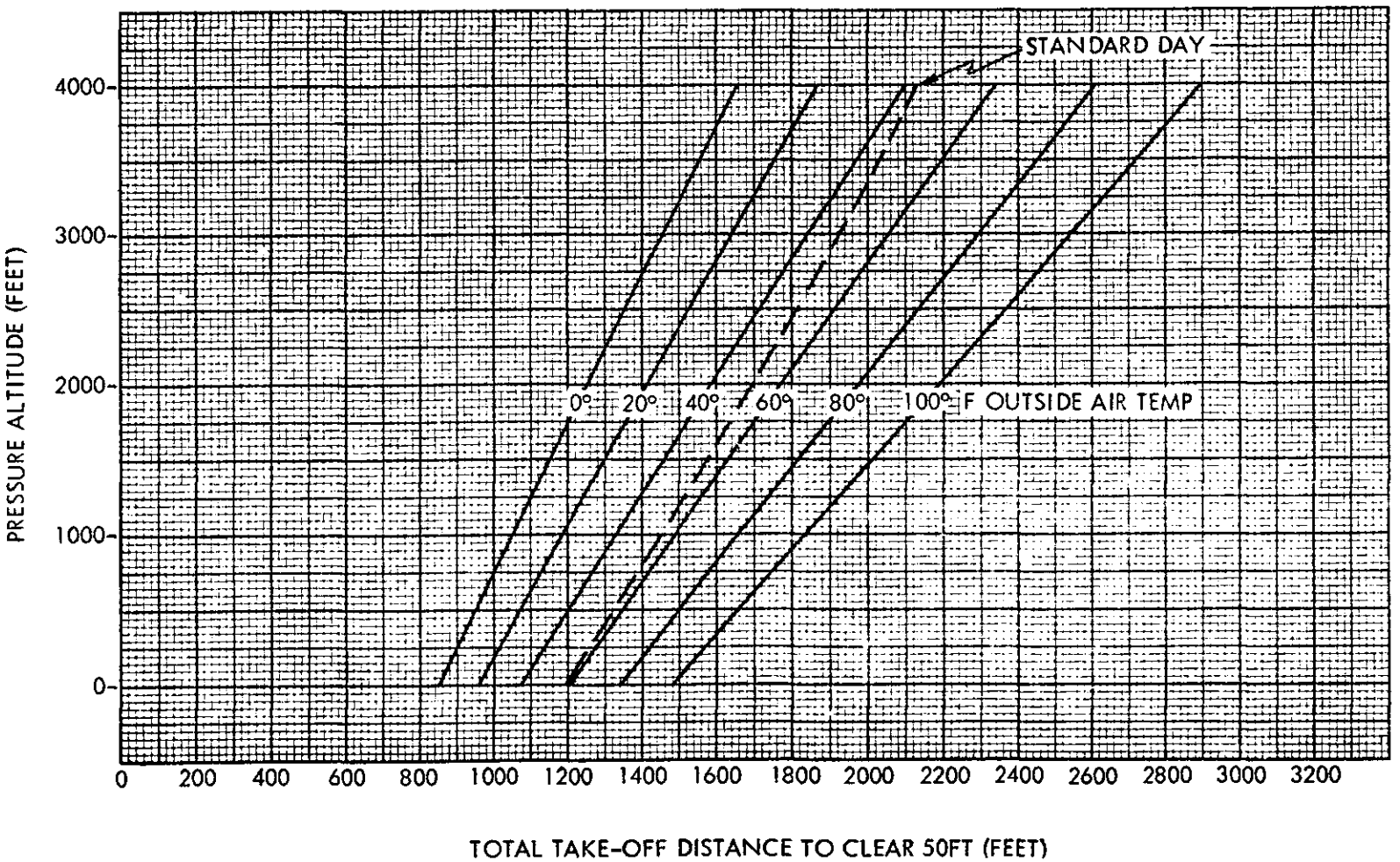
Set Altimeter to 29.92 In. Hg.
When Reading Pressure Altitude



Altitude Setting in Hg.	Altitude Correction For Obtaining Pressure Alt.
28.0	1,825
28.1	1,725
28.2	1,630
28.3	1,535
28.4	1,435
28.5	1,340
28.6	1,245
28.7	1,150
28.8	1,050
28.9	955
29.0	865
29.1	770
29.2	675
29.3	580
29.4	485
29.5	390
29.6	300
29.7	205
29.8	110
29.9	20
29.92	0
30.0	-75
30.1	-165
30.2	-225
30.3	-350
30.4	-440
30.5	-530
30.6	-620
30.7	-710
30.8	-805
30.9	-895
31.0	-965

TOTAL TAKE-OFF DISTANCE TO CLEAR A 50 FT OBSTACLE

WEIGHT 1500 LBS
ZERO WIND
ROTOR PRE-ROTATED TO 450 RPM
SMOOTH HARD SURFACE RUNWAY



DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration

APPENDIX A

VFR PILOT EXAM-O-GRAMS

1/74

Exam-O-Grams are brief and timely explanations of important aeronautical knowledge items. These items include concepts and procedures that are critical to aviation safety, common misconceptions among airman applicants, and areas which cause general difficulty in written tests.

Exam-O-Grams are developed on a continuing basis, only as needs arise, and not on a regularly scheduled basis. They are distributed free (one copy per request) to airman applicants, pilots, ground and flight instructors, educational institutions, airman training centers, flying clubs, and other interested groups and individuals. Exam-O-Grams may be reproduced without further permission from FAA.

VFR EXAM-O-GRAMS

No.	Title and Revision Date
2	VFR Cruising Altitudes - 10/71
4	Preflight Planning for a VFR Cross-Country Flight (Series 1) - 1/74
5	Preflight Planning for a VFR Cross-Country Flight (Series 2) - 10/71
6	Preflight Planning for a VFR Cross-Country Flight (Series 3) - 3/71
15	How to Use VOR (Series 1) - 8/64
16	How to Use VOR (Series 2) - 8/64
17	Common Misconceptions (Series 1) - 10/71
18	Lost Procedures -- Pilotage - 9/64
19	Emergency or Lost Procedures (Radio) - 1/74
20	Ceiling and Visibility - 1/74
21	Flying into Unfavorable Weather - 7/69
22	Potential Midair Collisions - 1/74
23	Interpreting Sectional Charts (Ser. 1) - 11/70
26	Common Misconceptions (Series 2) - 1/74
27	The Effect of Wind on an Airplane - 1/74
28	Factors Affecting Stall Speed - 9/65
29	Potential Midair Collisions (Series 2) - 1/74
33	Use of Performance Charts - 4/66
34	How to Obtain Proper Weather Briefing - 1/74
35	UNICOM Frequencies and Uses - 11/67
36	Commonly Misunderstood Areas of Aeronautical Knowledge (Series 1) - 1/72
37	Commonly Misunderstood Areas of Aeronautical Knowledge (Series 2) - 1/72
38	Mixture Control -- Fuel/Air Ratio - 11/66
39	Simple ADF for VFR Navigation - 8/67
40	Visual Approach Slope Indicator (VASI) - 1/74
41	Controlled Airspace (Series 1) - 10/71
42	Controlled Airspace (Series 2) - 10/71
43	ATIS (Automatic Terminal Information Service) - 1/74
44	How High the Clouds? - 1/74
45	Airspeeds and Airspeed Indicator Markings (Series 2) - 1/69
46	Aviation Weather Reports -- Remarks - 1/74
47	Ground Effect - 1/74
48	Midair Collisions (Series 3) - 1/74
49	Use of Oxygen in General Aviation Aircraft - 1/71
50	Interpreting Sectional Charts (Series 2) - 1/74
51	Interpreting Sectional Charts (Series 3) - 4/71
52	Sky Cover and Ceiling - 4/72
53	Dangers of Wingtip Vortices - 1/74
54	Emergency Locator Transmitters (ELTs)
55	Terminal Radar Service Areas (TRSAs) "STAGE III"
56	Sky Cover Symbols in Weather Reports & Forecasts
57	Flight in the Region of Reversed Command in Relation to Takeoffs & Landings

In this set of Exam-O-Grams the following issues have been deleted: Nos. 1, 3, 7, 8, 9, 10, 11, 12, 13, 14, 24, 25, 30, 31, and 32.

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration

APPENDIX B

IFR PILOT EXAM-O-GRAMS

3/74

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IFR EXAM-O-GRAMS

No.	Title and Revision Date
2	Use and Abuse of Radar - 2/71
5	Aviation Weather Reports and Forecasts - 3/74
6	VFR Operations on an Instrument Flight Plan - 9/69
7	CDI Interpretation - 9/69
8	Minimum IFR Altitudes - 2/71
10	Altimetry - 12/67
11	Communications Procedures for Pilots on Instrument Flight Plans - 2/71
14	VOR Quiz - 8/65
15	The Weather Depiction Chart is for You - 2/74
16	The Low Level Prognostic Chart - 11/73
17	The Radar Summary Chart - 3/74
18	Rate of Turn - 1/67
19	Telephone Weather Briefing - 6/71
21	IFR Weight and Balance Computations - 9/67
22	VOR Receiver Accuracy Check - 2/74
23	Fundamental ADF Procedures - 1/71
24	The Attitude Indicator - 5/70
25	The ATC Transponder - 2/71
26	Runway Marking - 10/71
27	Airport Surveillance Radar (ASR) Approaches - 4/73
28	Category II Taxiway Holding Lines - 7/69
29	When an Alternate Airport is Not Required - 3/70
30	VORTAC Area Navigation - 3/74
31	Is Your Instrument Flight Really Legal? - 11/73
32	Aircraft Performance Charts - 3/71
33	Runway and Displaced Threshold Lighting - 1/72
34	IFR Departure Clearances - 9/71
35	Clearance Delivery Procedures - 1/72
36	Lost Communications Procedures - Altitude Requirements - 1/72
37	Lost Communications Procedures - Route Requirements - 9/72
38	Lost Communications Procedures - Approach Requirements - 3/73
39	Enroute Chart Information - 4/73

Exam-O-Grams Nos. 1, 3, 4, 9, 12, 13, and 20 have been deleted.

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