AC 143-1D

# Ground Instructor
# Written Test Guide

# Basic-Advanced

1. Motivation

2. Presentations and Explanations

3. Performance and Application

4. Evaluation


U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

# GROUND INSTRUCTOR WRITTEN TEST GUIDE BASIC–ADVANCED

REVISED
1974

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
*Flight Standards Service*

## PREFACE

This test guide was prepared by the Federal Aviation Administration as Advisory Circular AC 143–1D to assist applicants who are preparing for the Ground Instructor Written Test. It supersedes the *Ground Instructor Written Test Guide*, AC 143–1C, issued in 1972.

This guide outlines the scope of the basic aeronautical knowledge requirements for a ground instructor; acquaints the applicant with source material that may be used to acquire this basic knowledge; presents sample test items with answers and explanations, and illustrations representative of those used in the current Ground Instructor Written Test.

Comments regarding this publication should be directed to the U.S. Department of Transportation, Federal Aviation Administration, Flight Standards Technical Division, P.O. Box 25082, Oklahoma City, Oklahoma 73125.

# CONTENTS


| | Page |
|---|---|
| Preface | iii |
| Introduction | 1 |
| Nature of the Written Tests | 1 |
| Type of Test Questions | 1 |
| Taking the Test | 2 |
| Recommended Study Materials | 3 |
| How to Obtain Sales Publications | 5 |
| Study Outline—Fundamentals of Instructing | 7 |
| Study Outline—Aeronautical Knowledge | 9 |
| Sample Test | 17 |
| Answers and Explanations | 23 |
| Additional Questions for Study | 25 |
| Appendix | 27 |

# GROUND INSTRUCTOR WRITTEN TEST GUIDE
# FUNDAMENTALS OF INSTRUCTING
# BASIC–ADVANCED

## INTRODUCTION

This study guide was prepared by the Flight Standards Service of the Federal Aviation Administration. It is not offered as a quick and easy way to gain the knowledge necessary for passing the written test. Knowledge and understanding are seldom gained quickly or easily. This is particularly true in the diversified field of aviation ground instruction. There can be no substitute for diligent study to attain basic knowledge, unremitting effort to develop competence, and continuous review to remain current in the many areas where technological change is the rule rather than the exception.

This guide will provide guidance for the serious student by outlining the scope of knowledge required. Thus, the student is better able to intelligently direct his study plan.

## NATURE OF THE WRITTEN TESTS

Much of the information and knowledge required of the instructor in aviation ground subjects is essentially the same today as it was many years ago, yet there has been a gradual and definite change in some areas. Technological advancements and refinements in today's aircraft, plus the increased usage of their capabilities by the general flying public, have outmoded the practice of testing for memory alone. Of course, basic knowledge is still necessary; but it must be related to the operationally realistic situation. An aircraft's primary commercial use is to provide safe, speedy, and efficient transportation; all civilian training, flight or ground, is directed toward this end. For this reason, knowledge must be related to skill, and skill is inextricably interwoven with knowledge. Therefore, written tests today require the ability to use basic knowledge in practical situations as well as in answering questions based on theoretical problems.

For this reason, this guide will deal with questions that test for knowledge, as well as questions that test for the ability to apply and use this knowledge in a realistic environment. Certain questions deal with specific subjects such as navigation, radio navigation, meteorology, Federal Aviation Regulations, aircraft and powerplants. These items test for sufficient basic knowledge and grasp of theory to assure that accurate dissemination of this subject matter can be accomplished in the classroom. Other questions will require the ability to combine and synthesize knowledge in two or more of the specific subject areas.

The certification process requires that the ground instructor applicant pass a separate written test covering the Fundamentals of Instructing. However, if the applicant already holds a valid FAA *Flight* or *Ground* Instructor Certificate which was acquired after passing a written test on Ground Instructor Fundamentals, or Fundamentals of Flight Instruction, he is not required to take the separate test on Fundamentals of Instructing when applying for an additional instructor certificate or rating.

It is not necessary to take the Fundamentals of Instructing test on the same day as the Basic or Advanced Ground Instructor Written Test. It is immaterial which test is taken first.

## TYPE OF TEST QUESTIONS

All test items are the objective, multiple-choice type, and can be answered by the selection of a single response. This type of test conserves the applicant's time when taking the test, permits greater coverage of subject matter, lessens the time required for scoring, and eliminates subjective judgment in determining grades.

Each item is independent of other test items. That is, a correct response to one test item does not depend upon, or influence, the correct response to another test item.

After completing the test the applicant's answer sheet is forwarded to the FAA Aeronautical Center for scoring by ADP computers. Shortly thereafter, the applicant will receive an Airman Written Test Report which not only includes his score but lists, in code, the subject areas in which he experienced difficulty. Those subject areas can be determined by reference to the Subject Matter Outline which accompanies the report. This method provides an essential feedback to the applicant and can be effectively used to strengthen his knowledge in weak areas.

## TAKING THE TEST

The equipment needed for the test includes a protractor or plotter and a computer. It is also desirable to have a pair of dividers. The time allowed for completing various tests is as follows:

A. Basic ---------- 4 hours
B. Advanced ---------- 5 hours
C. Fundamentals of Instructing ----- 3 hours

While it may be possible to complete the test in less time, it would be unwise to plan on this. If it becomes necessary to hurry, it may increase the probability of mistakes.

Always remember the following facts when taking the test:

1. The questions are not trick questions. Each statement means exactly what it says. Do not look for hidden meanings. The statement does not concern exceptions to the rule; it refers to the general rule.

2. Always read the statement or question first—before looking at the answers. Be sure to read the entire question carefully; avoid "skimming" and hasty assumptions. This may lead to an erroneous approach to the problem or failure to consider vital words.

3. Only one of the alternate answers given is completely correct. Other answers may be correct as far as they go, but are not complete or are answers based on erroneous assumptions, misconceptions, or incorrect procedures and interpretations. Understand the question or statement. *Then work out the answer* before choosing from the list of alternate answers the response which is considered to be the best.

4. Do not spend too much time on a question which appears difficult or one where there is doubt as to the correct answer. By so doing, the opportunity to mark all those questions which can be promptly solved or answered is lost. The applicant may always go back to the questions skipped after considering all those which can be readily answered. This procedure will assure maximum use of the time available, and it may mean the difference between a passing and a failing score.

5. In solving problems which require computations or use of the plotter and computer, select the answer which is closest to the calculated result. Due to slight differences in individual computers and small errors made in measuring distances, true courses, etc., it is possible that an exact agreement with available answers will not occur every time. Sufficient spread is provided between right and wrong answers, however, so that the selection of the answer closest to the calculated result will be the right choice, *provided* that correct technique and reasonable care in making computations have been used.

NOTE: When the test is constructed, various types of navigational computers are used to solve problems. The correct answer is an average of these computers, therefore, any of the several types of computers authorized for use on FAA written tests should prove satisfactory.

## RECOMMENDED STUDY MATERIALS

The prospective Ground Instructor will find the following list of publications useful in his preparation for the written test. In addition, there are many other excellent commercially prepared textbooks, audiovisual training aids, and other instructional materials which may be helpful.

### AERONAUTICAL CHARTS

The National Ocean Survey publishes and distributes aeronautical charts of the United States. Charts for foreign areas are published by the U.S. Air Force Aeronautical Chart and Information Center (ACIC) and are sold by the National Ocean Survey.

A "Catalog of Aeronautical Charts and Related Publications" listing their prices and instructions for ordering may be obtained free, on request, from:

National Ocean Survey
Distribution Division, (C–44)
Riverdale, Maryland 20840

Orders for specific charts or publications should be accompanied by check or money order made payable to "NOS, Department of Commerce."

*Airman's Information Manual.* This publication presents, in four Parts, information necessary for the planning and conduct of flights in the U.S. National Airspace System. Besides providing frequently updated airport and NAVAID data, the AIM includes instructional and procedural information and is designed for use in the cockpit.

Each Part is available on a separate annual subscription to better serve the needs of the individual pilot.

Part 1—Basic Flight Manual and ATC Procedures. ($7.60 domestic; $1.90 additional foreign mailing, GPO. Issued quarterly. Catalog No. TD 4.12:pt. 1/.).

Part 2—Airport Directory. ($7.00 domestic; $1.75 additional foreign mailing, GPO. Issued semi-annually. Catalog No. TD 4.12:pt. 2/.).

Part 3 and 3A—Operational Data and Notices to Airmen. ($22.00 domestic; $5.50 additional foreign mailing, GPO. Part 3 is issued every 56 days and Part 3A is issued every 14 days. Catalog No. TD 4.12:pt. 3/.).

Part 4—Graphic Notices—Supplemental Data. ($14.40 domestic; $3.60 additional foreign mailing, GPO. Issued quarterly. Catalog No. TD 4.12:pt. 4/.).

### HANDBOOKS AND TECHNICAL MANUALS

*Pilot's Handbook of Aeronautical Knowledge.* AC 61–23A ($5.30 GPO.) Catalog No. TD 4.408:P 64/5. This handbook contains essential authoritative information used in training and guiding pilots. Subject areas in which an applicant may be tested are covered in the handbook. It tells how to use the Airman's Information Manual and the data in FAA approved airplane flight manuals, as well as basic instruments for airplane attitude control.

*Personal Aircraft Inspection Handbook.* AC 20–9 ($1.50 GPO.) Catalog No. FAA 5.8/2:Ai 7/2. This is a general guide for inspection of aircraft; Part I deals with the fundamentals of inspection and Part II covers a typical inspection in detail. As reliable inspection comes only with experience, it is emphasized that the use of this handbook by the novice does not qualify him to make final determinations regarding the airworthiness of the aircraft.

*Flight Instructor's Handbook.* AC 61–16A ($2.00 GPO.) Catalog No. TD 4.408:In 7/3. This revised handbook is one of the primary sources of information and guidance for pilots preparing for the flight instructor written test. It is basically a book which explains accepted theories and practices applicable to teaching and the learning process. Therefore, it will also prove most useful to those preparing for the Fundamentals of Instructing section of the Ground Instructor Written Test.



672-269 O - 75 - 2

*Flight Training Handbook.* AC 61-21 ($2.10 GPO.) Catalog No. FAA 1.8:F 64/4. This text deals with certain basic flight information such as load factor principles, weight and balance, and related aerodynamic aspects of flights, as well as principles of safe flight. This book also provides information and direction in the introduction and performance of training maneuvers. Thus it serves primarily as a text for student pilots, for pilots improving their qualifications or preparing for additional ratings, and for flight instructors; however, it can also be useful to the ground instructor.

*Practical Air Navigation.* 10th Edition ($4.00). This publication provides a comprehensive coverage of all subjects and areas dealing with navigation whether it be pilotage, dead reckoning, or radio and celestial navigation. Students who understand the material available in this highly recommended text will have no serious trouble with the navigation problems on their test. This text may be obtained from many book dealers or from the publisher, Jeppesen & Co., 8025 East 40th Ave., Denver, Colorado 80209.

*Aviation Weather.* AC 00-6 ($4.00 GPO). Catalog No. FAA 5.8/2:W 37. Contains information on weather phenomena for pilots and other flight operations personnel whose interest in meteorology is primarily in its application to flying.

*Federal Aviation Regulations (FARs).* The suggested Parts for study are:

Part 1, Definitions and Abbreviations, ($3.00 domestic; $0.75 additional foreign mailing. GPO.)

Part 23, Airworthiness Standards—Normal, Utility, and Acrobatic Category Airplanes ($3.55 domestic; $0.95 additional foreign mailing, (GPO.)

Part 61, Certification: Pilots and Flight Instructors, ($5.05 domestic; $1.30 additional foreign mailing, GPO.)

Part 91, General Operating and Flight Rules, ($11.30 domestic; $2.85 additional foreign mailing, GPO.)

Part 141, Pilot Schools, ($3.00 domestic; $0.75 additional foreign mailing, GPO.)

Part 143, Ground Instructors, ($0.35, GPO.)

NOTE

For the convenience of the user, the FAA is in the process of reissuing the FARs as individual Parts. For information regarding the status of this conversion, obtain a copy of:

AC 00-2 (latest revision) Advisory Circular Checklist and Status of Regulations.

This checklist may be obtained free by requesting it from:

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

*National Transportation Safety Board. NTSB Part 430.* This publication deals with notification and reporting procedures required relating to accidents and lost or overdue aircraft in the United States, its territories, and possessions. Upon request, it is free from the National Transportation Safety Board, Publications Branch, Washington, D.C. 20591.

*Commercial Pilot Written Test Guide.* AC 61-28A ($2.00 GPO.) Catalog No. TD 4.408:P 64/4. This guide gives detailed information on the scope and depth of knowledge required of the commercial pilot applicant.

*VFR and IFR Exam-O-Grams.* Brief, timely, and graphic articles developed and published on a continuing basis. They are nondirective in nature and are issued as an information service, particularly to individuals interested in airman written tests. They relate to concepts, practices, and procedures critical to aviation safety and assist in giving safety-oriented information to airman applicants and practicing airmen. Exam-O-Grams are available free of charge but are limited to single copy per request. Requests for Exam-O-Grams should be addressed to:

U.S. Department of Transportation
Federal Aviation Administration
Flight Standards Technical Division
Operations Branch, AAC-240
P.O. Box 25082
Oklahoma City, Oklahoma 73125

## HOW TO OBTAIN SALES PUBLICATIONS

Requests for FAA publications sold through the Superintendent of Documents should be submitted on an order form, if possible and submitted to:

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

A sample order form is included in the back of this Guide. In order to aid in the processing of your order, the following suggestions are offered:

1. Place orders for subscription items and single sales items on separate requests.
2. Provide the exact title of the publication, the agency number, and the catalogue number, if given.
3. A check or money order payable to Superintendent of Documents—not cash—in the correct amount should accompany your order.
4. Enclose a self-addressed mailing label if you don't have an order blank.
5. Use GPO Bookstores.

In addition to the mail-order service provided by the Office of the Superintendent of Documents, several retail bookstores have been established throughout the country which constitute a part of the operations of the Superintendent of Documents. The public is encouraged to avail themselves of the services offered by these facilities, as many of the more popular publications are stocked in these bookstores. These retail outlets are located at the following addresses:

Atlanta GPO Bookstore
Room 100 Federal Bldg.
275 Peachtree St., NE
Atlanta, Ga. 30303
Phone: 404–526–6947

Birmingham GPO Bookstore
Room 102A 2121 Bldg.
Birmingham, Ala. 35203
Phone: 205–325–6056

Boston GPO Bookstore
Room G25 John F. Kennedy Federal Bldg.
Sudbury St.
Boston, Mass. 02203
Phone: 617–223–6071

Canton GPO Bookstore
Federal Office Bldg.
201 Cleveland Ave.
Canton, Ohio 44702
Phone: 216–455–4354

Chicago GPO Bookstore
Room 1463—14th Floor
Everett McKinley Dirksen Bldg.
219 South Dearborn St.
Chicago, Ill. 60604
Phone: 312–353–5133

Cleveland GPO Bookstore
Room 171 Federal Bldg.
1240 East 9th St.
Cleveland, Ohio 44199
Phone: 216–522–4934

Dallas GPO Bookstore
Room 1C46 Federal Bldg.—U.S. Courthouse
1100 Commerce St.
Dallas, Texas 75202
Phone: 214–749–1541

Denver GPO Bookstore
Room 1421
Federal Bldg.—U.S. Courthouse
1961 Stout St.
Denver, Co. 80202
Phone: 303–837–3965

Detroit GPO Bookstore
Room 229 Federal Office Bldg.
231 W. Lafayette Blvd.
Detroit, Mich. 48226
Phone: 313–226–7816

Kansas City GPO Bookstore
Room 144 Federal Office Bldg.
601 East 12th St.
Kansas City, Mo. 64106
Phone: 816–374–2160

Los Angeles GPO Bookstore
Room 1015 Federal Office Bldg.
300 North Los Angeles St.
Los Angeles, Ca. 90012
Phone: 213–688–5841

Milwaukee GPO Bookstore
Federal Bldg.
Room 190
517 E. Wisconsin Ave.
Milwaukee, Wisconsin 53202
Phone: 414–224–1300

New York GPO Bookstore
Room 1356
26 Federal Plaza
New York, N.Y. 10007
Phone: 212–264–3826

Philadelphia GPO Bookstore
Federal Office Bldg.
Room 1214
600 Arch St.
Philadelphia, Pa. 19106
Phone: 215–597–0677

San Francisco GPO Bookstore
Room 1023 Federal Office Bldg.
450 Golden Gate Ave.
San Francisco, Ca. 94102
Phone: 415–556–6657

Seattle GPO Bookstore
Federal Bldg.
Room 1056
909 First Ave.
Seattle, Wash. 98174
Phone: 206–442–4274

In addition, persons living within the metropolitan Washington, D.C., area may contact bookstores located at the following locations:

Government Printing Office Bookstore
710 North Capitol St.
Washington, D.C. 20402
Phone: 202–541–2091

Department of Commerce Bookstore
14th & Constitution Ave., NW
Washington, D.C. 20230
Phone: 202–967–3527

USIA Bookstore
1776 Pennsylvania Ave., NW
Washington, D.C. 20547
Phone: 202–632–9668

Department of State Bookstore
21st & C Sts. NW
Washington, D.C. 20520
Phone: 202–632–1437

Pentagon Bookstore
Main Concourse, south end
Washington, D.C. 20310
Phone: 202–541–2998

Forrestal Bookstore
Rm. 1–J–001
James H. Forrestal Bldg.
1000 Independence Ave., SW
Washington, D.C. 20407
Phone: 202–426–7937

## STUDY OUTLINE

### Section 1. Fundamentals of Instructing

#### I. THE LEARNING PROCESS

A. Definition of Learning.

B. Characteristics of Learning.
1. Learning is purposeful
2. Learning comes through experience
3. Learning is multifaceted
4. Learning is an active process

C. Laws of Learning.
1. Law of readiness
2. Law of exercise
3. Law of effect
4. Law of primacy
5. Law of intensity
6. Law of recency

D. How People Learn.
1. Perceptions
2. Factors which affect perception
3. Insights
4. Motivation

E. Levels of Learning.

F. Learning Skills.
1. Physical skills involve more than muscles
2. Desire to learn
3. Patterns to follow
4. Perform the skill
5. Knowledge of results
6. Progress follows a pattern
7. Duration and organization of lesson
8. Evaluation versus critique
9. Application of skill

G. Forgetting and Retention.
1. Theories of forgetting
2. Retention of learning

H. Transfer of Learning.

I. Habit Formation.

J. Obstacles to Learning During Flight Instruction.

K. The Instructor's Role in Flight Training.

#### II. HUMAN BEHAVIOR

A. Control of Human Behavior.

B. Human Needs.
1. Physical needs
2. Social needs
3. Egoistic needs
4. Self-fulfillment needs

C. Defense Mechanisms.
1. Rationalization
2. Flight
3. Aggression
4. Resignation

D. The Instructor's Role in Human Relations.
1. Keep students motivated
2. Keep students informed
3. Approach students as individuals
4. Give credit when due
5. Criticize constructively.
6. Be consistent
7. Admit errors

#### III. EFFECTIVE COMMUNICATION

A. Basic Elements of Communication Process.
1. Source
2. Symbols
3. Receiver

B. Barriers to Effective Communications.
1. Lack of common core of experience
2. Confusion between the symbol and the thing symbolized
3. Overuse of abstractions

#### IV. THE TEACHING PROCESS

A. Preparation.

B. Presentation.

C. Application.

D. Review and Evaluation.

## V. TEACHING METHODS

A. Organizing Material.
   1. Introduction
   2. Development
   3. Conclusion

B. Lecture Method.
   1. Types of lectures
   2. Teaching lecture
   3. Preparing the teaching lecture
   4. Suitable language
   5. Types of delivery
   6. Use of notes
   7. Formal versus informal lectures
   8. Advantages and disadvantages of the lecture

C. Guided Discussion Method.
   1. Use of questions in a guided discussion
   2. Planning a guided discussion
   3. Student preparation for a guided discussion
   4. Guiding a discussion–instructor technique

D. Demonstration Performance Method.
   1. Explanation phase
   2. Demonstration phase
   3. Student performance and instructor supervision phases
   4. Evaluation phase

E. The "Telling and Doing" Technique in Flight Instruction.
   1. Instructor tells — instructor does
   2. Student tells — student does
   3. Student does — instructor evaluates

F. Programmed Instruction.

## VI. THE INSTRUCTOR AS A CRITIC

A. Purpose of a Critique.

B. Characteristics of an Effective Critique.
   1. Objectivity
   2. Flexibility
   3. Acceptability
   4. Comprehensiveness
   5. Construction
   6. Organization
   7. Thoughtfulness
   8. Specific

C. Methods of Critique.
   1. Instructor student critique
   2. Student-led critiques
   3. Small-group critiques
   4. Individual student critique
   5. Written critique
   6. Self-critique

D. Ground Rules for Critiquing.

## VII. EVALUATION

A. Oral Quizzing.
   1. Characteristics of effective questions
   2. Types of questions to avoid
   3. Answering students' questions

B. Written Tests.
   1. Characteristics of a good test
   2. Written test items
   3. Effective item writing
   4. Principles to follow

C. Performance Tests.
   1. Uses of performance testing
   2. Demonstrations of pilot ability

## VIII. INSTRUCTIONAL AIDS

A. Theory Behind Use of Instructional Aids.

B. Reasons for Using Instructional Aids.

C. Guidelines For Use of Instructional Aids.

D. Types of Instructional Aids.
   1. Chalkboard
   2. Models
   3. Charts
   4. Projected material

E. Future Developments.

## IX. FLIGHT INSTRUCTOR RESPONSIBILITIES

A. Professionalism.
   1. Sincerity
   2. Acceptance of the student
   3. Personal appearance and habits
   4. Demeanor
   5. Safety practices and accident prevention
   6. Proper language
   7. Self-improvement

B. Helping Student Pilots Learn.
   1. Providing adequate instruction
   2. Demanding an adequate standard of performance
   3. Emphasizing the "positive"

C. The Flight Instructor as a Practical Psychologist.
   1. Anxiety
   2. Normal reactions to stress
   3. Abnormal reaction to stress
   4. Instructor's actions regarding seriously abnormal students

D. Student Pilot Supervision and Surveillance.

E. Flight Instructor Endorsements.

F. Flight Test Recommendations.

G. Airplane Checkouts.

H. Refresher Training.

## X. THE INTEGRATED METHOD OF FLIGHT INSTRUCTION

A. Definition.

B. Objectives.
   1. Development of habit patterns
   2. Accuracy of flight control
   3. Operating efficiency
   4. Emergency capability

C. Procedures.

D. Precautions.

E. Flight Instructor Qualifications.

## XI. PLANNING INSTRUCTIONAL ACTIVITY

A. Course of Instruction.
   1. Determination of standards and objectives
   2. Identification of blocks of learning

B. Syllabus.
   1. Sample ground training syllabus
   2. Sample flight training syllabus

C. Lesson Plan.
   1. Characteristics of a well-planned lesson
   2. How to use a lesson plan properly
   3. Lesson plan items

### Section 2. Aeronautical Knowledge

## I. PREFLIGHT—ACTIVITIES RELATING TO A PROPOSED CROSS-COUNTRY FLIGHT

A. Lay out the route on the aeronautical chart provided.
   1. Follow the instructions given in the test and draw the course lines for the proposed route.
   2. Determine the true courses with a protractor. Measure distances, *using the mileage scale at the bottom of the chart.* For accuracy use the center of the airport symbols.
   3. Study the area along the proposed route and note the locations of the following:
      a. *Prominent* checkpoints.
      b. Radio aids to navigation (VOR, nondirectional radiobeacons, VHF/DF, and radar availability). Be certain to check this data against current information in the *Airman's Information Manual.*
      c. High terrain (particular attention should be made to note the elevations—heights above sea level—of the higher ridges and peaks along the routes that traverse rough or mountainous country).
      d. Obstructions (note the elevations of high obstructions en route and in the vicinity of destination landing fields).
      e. Control areas, control zones, and airport traffic areas.
      f. Prohibited, restricted, caution, and warning areas.

B. Check the weather. Consult with the local FAA Flight Service Station or Weather Service for preflight weather briefings. Be able to read and interpret the following data:
   1. Surface weather map. (Identify fronts and read station model data using the key furnished in the test.)
   2. Area forecasts.
   3. Terminal forecasts.
   4. Wind aloft forecasts.
   5. SIGMETS (significant meteorological developments) and AIRMETS (weather phenomena of less severity than that covered by SIGMETS).
   6. Hourly sequence reports.

C. Review the data in the flight planning publication—*the Airman's Information Manual*. Be familiar with and able to use the information pertaining to:

1. Communication frequencies: control towers, ground control, departure control, Flight Service Stations.
2. Navigation aid frequencies: VOR stations, nondirectional radio beacons, VHF/DF, radar.
3. NOTAMS (Notices to Airmen).
4. Special Notices list of Military Training Routes, good operating practices, and other helpful information.
5. Airport data: location, runway information, availability of fuel and service, availability of UNICOM and weather reporting facilities, lighting, etc.
6. Review pertinent information on:
   a. En route cruising altitudes.
   b. Airport traffic control procedures.
   c. Light signal.
   d. Radio-telephone phraseology and techniques.
   e. VOR receiver checkpoints.
   f. En route communications.
   g. U.S. Aircraft Emergency procedures, search and rescue procedures, emergency SCATANA rules (Security Control of Air Traffic and Air Navigation Aids).
   h. U.S. Weather Service office phone numbers.
   j. Aircraft accident reporting.

D. Check aircraft equipment and records, and personal qualifications to see that regulations have been met.

1. Check to see that aircraft—
   a. Has the required documents aboard.
   b. Has had the necessary inspections within the required time.
   c. Is properly equipped for flight (including operations at night and operations in and out of airports on which control towers are located).
2. Check pilot qualifications to ascertain—
   a. The proper pilot and medical certificates are current.

E. Select cruising altitude, taking into consideration—

1. Regulations with regard to the VFR cruising altitudes.
2. En route terrain and obstruction elevations.
3. VFR cloud separation requirements.
4. Winds aloft.

F. Review the *Airplane Flight Manual* and *Owner's Handbook*.

1. Understand the difference between normal and utility category.
2. Consult the weight and balance data and determine that the aircraft is properly loaded. Know how to compute empty weight, useful load, gross weight, and moments.
3. Check on the grade and quantity of fuel and oil required.
4. Review flight load factor limitations and airspeed limitations.
5. Check airplane performance charts as required for—
   a. Takeoff data (Airplane Flight Manual or Owner's Handbook charts or Denalt Performance Computer).
   b. Climb data. ($V_X$ and $V_Y$ speeds).
   c. Landing distance data.
   d. Cruise performance data (cruise power settings, approximate true airspeeds, fuel consumption rate).
   e. Airspeed calibration table.
   f. Stall speed vs. angle of bank.

G. Compute navigation data for the flight based on selected cruising altitudes, cruise performance data from the *Airplane Flight Manual* or *Owner's Handbook*, and the wind aloft.

1. Convert the forecast winds aloft which are given in knots to miles per hour (also convert, when required, temperatures given in Celsius to Fahrenheit or vice versa). Interpolate, if necessary, for winds and temperatures at intermediate altitudes.
2. Compute true headings and convert to magnetic headings by applying the appropriate magnetic variation corrections. Convert magnetic headings to compass headings by applying correction for deviation.
3. Compute estimated groundspeeds and estimated times en route.

4. Compute estimated fuel required for flight based on estimated times en route and the aircraft cruise performance charts.
5. Compute normal range and maximum range based on Cruise Performance Charts. Compute range with reserve allowance.
6. Make a thorough visual inspection. Drain a generous amount of fuel from fuel supply (fuel strainer and wing tank sump drains) and inspect for evidence of water contamination. If ice, snow, or frost is on the aircraft, remove completely.

H. Follow the recommended procedures for filing a VFR flight plan.

NOTE: Except for knowledge and interpretation of instruments in relation to *attitude control* of the airplane, the Basic and Advanced Ground Instructor Written Tests will deal only with flight under VFR conditions.

## II. PREFLIGHT—BASIC AERONAUTICAL KNOWLEDGE INDIRECTLY RELATED TO THE PROPOSED CROSS-COUNTRY FLIGHT

These subjects may not directly relate to the flight, but are pertinent to the various airman certificates and ratings. These subject areas include:

A. Weather. As a ground instructor, demonstration of a broad understanding of weather is essential. Be familiar with—
1. Basic concepts of the earth's atmosphere and the composition of air.
2. Types of clouds and associated weather phenomena.
3. General circulation patterns (winds).
4. Air masses.
5. Low- and high-pressure centers.
6. Frontal weather (weather conditions generally associated with cold fronts, warm fronts, occluded fronts, etc.).
7. Thunderstorms.
8. Ice and turbulence.
9. Fog and other visibility obscurations.
10. Meteorological terminology (definitions).

B. Navigation. Understand the following:
1. The earth and its coordinates of latitude and longitude.
2. Chart projections used for air navigation (with emphasis on the properties of the Lambert Conformal Conic Projection).
3. Map reading.
4. Dead reckoning—
   a. Wind triangle (vector) problems:
      (1) Determine true course and groundspeed.
      (2) Determine true heading and groundspeed.
      (3) Determine wind direction and velocity.
      (4) Determine true heading and true airspeed.
      (5) Off-course corrections.
   b. True course to compass heading.
   c. Compass heading to true course. (Application of wind, variation, and deviation corrections.)
   d. Speed/time/distance problems.
   e. Knots – MPH conversions.
   f. Nautical – statute conversions for both speed and distance.
   g. Rates of climb and descent computations.
   h. Airspeed and altitude corrections.
   i. Celsius – Fahrenheit conversions.
   j. Estimated time of arrival (ETA), estimated time en route (ETE).
   k. Cruise control.
   l. Use of flight log (preflight and in-flight).
5. Radio navigation as it pertains to VFR flight.
6. Navigation terminology (definitions).
7. The vital relationship between weather phenomena and problems of navigation.

C. Aerodynamics and Principles of Flight. Demonstrate a knowledge of—
1. Laws of motion.
2. Functions of the flight controls.
3. Principles of airfoils.
4. Wing planform:
   a. Area, span, and chord.
   b. Aspect ratio, taper, and sweepback.
   c. Effect of planform on stall patterns.
6. Flight controls and axes of the aircraft.
7. Lift and drag during turns.
8. Lift versus angle of attack.
9. Lift and thrust vs. air density.
10. Types of flaps, spoilers, divebrakes.
11. Effect of flaps on lift, drag, and trim.
12. Effect of ice, snow, and frost on airfoils.
13. Power vs. climb, descent, and level flight.



572-289 O - 75 - 3

14. Gyroscopic precession.
15. Types and effect of induced, parasite, and profile drag.
16. Ground effect.
17. Loads and load factors.
18. Static, dynamic, longitudinal, lateral, and directional stability.
19. Stalls and spins.
20. Relative wind and angle of attack.
21. Effect of wind during turns.
22. Torque effect -- P factor.

D. Airframe and Powerplant. Have a knowledge of—

1. Aircraft structures.
2. Airframe components and control surfaces.
3. Fuel systems.
4. Oil systems.
5. Electrical systems.
6. Reciprocating engine principles and components.
7. Carburetion and fuel injection.
8. Ignition.
9. Propellers.
10. Engine instruments.
11. Engine controls.
12. Relationship between RPM and manifold pressure.
13. Brake mean effective pressure (BMEP) and its significance.

E. Radio Equipment. Understand the basic charactertistics, operations, frequency ranges, advantages, and limitations of—

1. VHF Communications Equipment.
   a. Understand the "line of sight" range of transmissions.
   b. Understand that an operative transmitter and receiver are all that are required to use VHF Direction Finding Service and radar assistance from ground stations. (In some instances, assistance may be available even when all radios are out if proper procedures are followed.)
2. VOR Equipment.
   a. Understand principles of VOR operation. Be able to recognize a usable signal.
   b. Know the components of a VOR receiver and the importance of proper tuning.
   c. Understand that a radial is a line of magnetic bearing extending from a VOR.
   d. Understand how to utilize receiver checkpoints to establish receiver accuracy.
   e. Be able to work a VOR orientation. Understand how to determine approximate position relative to the station by interpreting the setting of the omnibearing selector, the position of the LEFT-RIGHT needle, and the indication of the TO-FROM indicator. Know the importance of correct sensing.
   f. Know and understand the procedures for VOR off-course navigation and for solving time and distance problems.
3. Nondirectional Radio Beacons and ADF.
   a. Understand nondirectional beacons—their use, classification, and range.
   b. Understand how to interpret bearing information when using your ADF for tracking inbound and outbound, and for track interception:
      (1) Relative Bearings.
      (2) Magnetic Bearings.
      (3) True Bearings.

F. Flight Instruments. Understand the principles of operation and characteristics of flight instruments.

1. Know the similarity between visual and instrument flying with regard to control of aircraft attitude.
2. Be able to interpret the pitch-and-bank attitude of the aircraft by reference to the flight instruments.
3. Understand the bowl-type magnetic compass.
   a. Know the method of making turns by referring to the magnetic compass to determine the lead point at which to begin rolling out.
   b. Understand the following errors of the bowl magnetic compass:
      (1) Deviation.
      (2) Oscillation error.
      (3) Magnetic dip error. Dip error is responsible for—
         (a) *Northerly turning error* which is most pronounced on northerly and southerly headings and,
         (b) *Acceleration error* which is most pronounced on easterly and westerly headings.

4. Thoroughly understand the altimeter (sensitive altimeter adjustable for changes in barometric pressure).
   a. Know the effect of nonstandard temperature and pressure on the indications of the altimeter.
   b. Understand how to apply altimeter settings to the altimeter setting window of the altimeter.
   c. Be able to interpret the indications of the altimeter.
   d. Know how to determine pressure altitude.
5. The Airspeed Indicator. Know the airspeed ranges and limitations that are reflected by the standard marking system on the face of the airspeed indicator (white, green, and yellow arcs, and the red line).
   a. Flap operating range.
   b. Normal operating range.
   c. Caution range.
   d. Power-off stalling speed with the wing flaps and the landing gear in the landing position ($V_{SO}$).
   e. Power-off stalling speed "clean"—wing flaps up and landing gear retracted ($V_{S1}$), if equipped with a retractable landing gear.
   f. Maximum flap extended speed ($V_{FE}$).
   g. Maximum structural cruising speed ($V_{NO}$).
   h. Never-exceed speed ($V_{NE}$).

## III. PRESTARTING INSPECTIONS

A. Exterior Visual Inspection. Understand the importance of—
   1. The use of a checklist in establishing good habit patterns.
   2. Allowing sufficient time for a thorough walk-around inspection as recommended by the aircraft manufacturer.
   3. The emphasis placed on checking for, and adequate drainage of, possible contaminated fuel.
   4. Checking the pitot tube and static pressure orifice.
   5. Ice, snow, and frost removal from the aircraft.

## IV. STARTING, TAXIING, AND ENGINE RUNUP

A. Understand the need for—
   1. Following a checklist based on manufacturer's recommendations.
   2. Familiarity with emergency procedures with regard to engine or induction system fire.
   3. Ground control or tower contracts where applicable for taxi clearance.
   4. Careful observance of the oil pressure/temperature and magneto checks; where applicable, check on fuel pressure, cylinder head temperature, RPM, manifold pressure, flaps, trim, and full control travel in the proper direction.
   5. Caution in control of propeller blast in taxiing and runup where proximity of other aircraft, buildings, and personnel are involved.

## V. TAKEOFF

A. Use checklist.

B. Contact tower for takeoff clearance but check traffic carefully. Safety of the operation is still the pilot's responsibility even though a control tower gives a clearance.

C. Activate any VFR flight plan by reporting time of takeoff to appropriate facility.

D. Be certain tower instructions are clearly understood.

E. Follow tower instructions without deviation, except when cleared to do so or in an emergency.

F. Check density altitude/performance.

G. Use takeoff performance charts.

## VI. IN-FLIGHT

A. Climb to the selected altitude and complete the level-off procedures. Take necessary precautions to ensure accuracy when making readings from the magnetic compass. Reset the gyrodriven heading indicator to the magnetic compass frequently.

B. Comply with FAR 91, *General Operating and Flight Rules*, at all times. Maintain a constant vigilance for other traffic.

C. Compute true airspeeds and true altitudes. Be alert to the effects of density altitude.

D. Determine time between checkpoints and compute groundspeed. Compute ETA over various checkpoints and destinations. Keep log of time over various points.

E. Use good fuel management procedures. Keep close check on fuel consumption rate. Maintain proper fuel/air mixture setting appropriate to cruising altitude through proper use of mixture control.

F. If the winds aloft forecast proves inaccurate, and drifting off your planned course occurs, compute from present position, new headings and groundspeeds to destination.

G. Make periodic VFR position reports to Flight Service Stations. Give PIREPS (Pilot Reports) on unusual weather or erratic operation of radio navigation aids. Request weather information if necessary.

H. Be able to follow nondirectional radio beacon and VOR radials.

I. Know how to tune in and identify a radio beacon or VOR station. Understand how to utilize an air navigation radio aid, *i.e.*, VOR radial and ADF bearing.

J. Have a working knowledge of the procedures for requesting radar vectors, D/F steers, and associated en route emergency navigation assistance.

K. Monitor appropriate stations for scheduled weather broadcasts. Maintain a continuous listening watch for possible in-flight weather safety advisories (SIGMET or AIRMET).

L. When operating in the vicinity of a large aircraft, be on the alert for wingtip vortices. Take recommended action if wake turbulence is inadvertently encountered.

M. Avoid bad weather. Do not get trapped above an overcast. When necessary, use the 180° turn; but reversal is reliable only when an early decision has been made.

N. Avoid turbulent air if possible. If severe turbulence is encountered, slow the aircraft to at least the recommended maneuvering speed.

O. Monitor engine instruments. Be able to recognize symptoms of carburetor icing such as loss of power. Remember that, on aircraft equipped with constant-speed propellers, the initial loss of power will be reflected by decreased manifold pressure, not loss of RPM. The RPM will remain constant due to action of propeller governor.

P. When making in-flight power adjustments, sequence throttle and propeller controls in the correct order. Remember BMEP tolerances.

Q. Be prepared for in-flight emergencies—equipment failure, loss of orientation, or unexpected weather. Have alternate plans of action.

R. Before crossing a Military Training Route, be sure to check the current operational status with a Flight Service Station near the route.

S. If takeoff or landing is made at an airport located within an airport traffic area, follow applicable regulations.

T. Know the official sunset time over the area from which the flight takes place. Turn navigational lights on at the required time. Be familiar with airport lighting, runway lighting, and taxiway lighting.

U. Prior to starting a letdown, check to see that fuel selector is on the appropriate tank, and mixture control is in proper position. Take necessary precautions to avoid possible carburetor icing during prolonged letdowns at reduced power settings.

V. When approaching the destination airport, contact the appropriate facility for landing instructions. Be able to interpret instructions. For example, if instructed to land on "RUNWAY 22 RIGHT TRAFFIC", it should be understood that a landing on a runway with magnetic direction of 220°, using a right-hand traffic pattern should be made.

W. Use standard procedures when entering traffic. Watch for light signals from the tower, while in the air, or while on the ground if the radio receiver becomes inoperative. Maintain a constant vigilance for other traffic. Be alert for segmented marker system as indications of nonstandard traffic.

X. Run a complete prelanding check, *using checklist.*

Y. Understand the purpose and use the Visual Approach Slope Indicator (VASI).

Z. After landing, do not switch radio frequency until directed to do so by the controller, *after* turning off the active runway. Exercise caution while taxiing to the tie-down area.

## VII. POST-FLIGHT ACTIVITIES

A. Turn off all switches and secure the controls.

B. Close flight plan with the appropriate facility.

C. Refuel to capacity, to reduce condensation in the tanks and possible fuel contamination.

D. If applicable, arrange for hangar space or tie-downs.

E. Record flight time. (Not mandatory except to verify recent experience necessary for grade of certificate or rating sought.)

F. Record airframe and engine time in appropriate logbooks.

## SAMPLE TEST

The following test items are presented to familiarize the applicant with the type of questions he may expect to find on the Fundamentals of Instructing written test and Basic or Advanced Ground Instructor written tests. Performance on the sample test items should not be used as a measurement of ability or determination that the applicant is fully prepared to take either test, since all subjects on which he will be tested are not included herein.

The applicant should concentrate on the appropriate study outline provided in this guide. A knowledge of all topics listed in these outlines should be used as the criterion for determining that he is properly prepared to take the appropriate test. Proper preparation requires considerable time, effort, and the guidance of a competent instructor.

### *Section I*

### Fundamentals of Instructing

1. Test reliability refers to the
   1—characteristic of a test which indicates consistent results for a test over a period of time.
   2—measure of temporary variations influenced by chance errors.
   3—accuracy with which a test identifies the superior students.
   4—exactness with which a test measures what it is supposed to measure.

2. If an instructor wishes to do an effective job of teaching, the most important requirement is that he master
   1—only teaching methods.
   2—only his subject matter.
   3—both teaching methods and subject matter.
   4—public speaking technique.

3. One of the most significant sources of information for an instructor, with regard to the need to develop new and better ways of improving his teaching effectiveness, lies in
   1—noting whether a comparison between his methods and those used by successful teachers is favorable or unfavorable.
   2—the observations and suggestions made by supervisors and other instructors.
   3—the observation and evaluation of the difficulties which his students are having.
   4—listening to student's suggestions.

4. Good instruction techniques involve many important elements. Select the answer which includes only those items important to good instruction.
   A. Evaluate the student and recognize his difficulties as an individual.
   B. Instruct each class in exactly the same manner so as to assure a constant level of student proficiency.
   C. Set specific goals.
   D. Avoid setting standards of performance lest failure to meet them prevents progress.
   E. Acquaint the student with his progress only if he seems concerned about the matter.
   F. Keep student informed of his progress.
   G. Allow the student to participate in the class session and demonstrate his ability to anticipate mistakes and if possible, correct them before they occur.
   H. Use a teaching sequence that "makes sense" from the learner's point of view.
   I. Improve motivation through use of negative incentives.
   J. Use oral questions in the classroom to evaluate progress and level of learning.
   K. Use a lesson plan even if it is inadequate.
   L. Emphasize the lecture method of instruction.
   M. Limit classroom practice as much as possible since it consumes too much time.

The correct statements are:

1—A, C, F, H, J, K.
2—B, D, E, G, I, L, M.
3—A, D, E, H, L.
4—C, F, G, H, K.

5. True comprehension and understanding of a subject is the very essence of any learning. The best way to determine if a student really understands a subject is to

1—accept a high grade average as evidence of such understanding.

2—give tests which require high levels of retention in order to make a good grade.

3—ascertain that the student can actually apply his knowledge to all the problems covered in the classroom program.

4—test the student's ability to apply his knowledge toward solving new and difficult situations.

### *Section 2*

### Aeronautical Knowledge

This test is based on a flight within the state of Arizona.

Although this is a hypothetical cross-country, the weather data is authentic. The airplane you are assumed to be flying is a late model, 4-place, single-engine airplane. It is equipped with retractable, tricycle landing gear and a constant speed propeller. This airplane is designated as DAEDALIAN DART 2468-W. It is to be flown in accordance with FAA-approved Airplane Flight Manuals and placards that appear in the airplane.

### PROPOSED CROSS-COUNTRY FLIGHT DATA

You are a professional pilot employed by a mining company. You are scheduled for a flight originating at Greenlee County Airport, and terminating at Williams, with intermediate stops at Holbrook, and Flagstaff.

You will carry three executives who are conducting a safety survey. You have established your tentative route on the 12th Edition of the Phoenix Sectional Aeronautical Chart as follows:

LEG I

Greenlee County Airport, Arizona (see Clifton-Morenci in Airport Directory excerpts) direct to Holbrook Municipal Airport.

LEG II

Holbrook Municipal Airport direct to Winslow VORTAC; thence direct to Flagstaff Pulliam Airport.

LEG III

Flagstaff Pulliam Airport direct to Williams Municipal Airport.

* * * * * *

*COORDINATES*

Greenlee County Airport 32°57′N – 109°12′W.
Holbrook Municipal Airport 34°56′N – 110°08′W.
Flagstaff Pulliam Airport 35°08′N – 111°40′W.
Williams Municipal Airport 35°18′N – 112°12′W.

* * * * * *

Your preflight activities include:

(1) Necessary review of the *Airplane Flight Manual, Operations Placards,* and *Owner's Handbook,* with emphasis on operating speeds, power and mixture settings, weight and balance considerations, and emergency procedures.

(2) A study of pertinent information in the *Airman's Information Manual.*

(3) A review of the map with emphasis on the relationship between your route and airway structures, terrain and obstruction elevations, and airport facilities available en route in event of emergency.

(4) A review of radio checkpoints and navigational facilities.

(5) Thorough check of available weather information.

(6) Filing a flight plan.

(7) Preflight check of the airplane.

* * * * * *

STATION IDENTIFIERS

FLG—Flagstaff, Arizona
GNT—Grants, New Mexico
INW—Winslow, Arizona
PHX—Phoenix, Arizona
PRC—Prescott, Arizona
SAF—Santa Fe, New Mexico
TUS—Tucson, Arizona

1. According to the 1400Z Hourly Sequence Report, Figure 6.
   1—PHX reports a ceiling of 12,000 feet.
   2—PRC reports a pressure of 906.4 millibars.
   3—TUS reports an altimeter setting of 39.83 inches.
   4—GNT reports calm surface winds.

2. The 1500Z Hourly Sequence Report at Phoenix, Figure 6, indicates that
   1—the ceiling is 10,000 feet.
   2—the ceiling is 1,200 feet.
   3—the ceiling is 12,000 feet
   4—there is no reported ceiling at Phoenix.

3. You plan to depart at 0830 MST. After a study of all the Hourly Sequence Reports in Figure 6, you conclude that
   1—you have no weather problem with regard to the flight.
   2—you can anticipate frontal activity between 0700 MST and 0800 MST.
   3—ceilings will decrease along the route.
   4—you are unable to ascertain what the weather is likely to do in the next few hours.

4. After a study of *all* the weather information *available*, you determine that
   1—it is not possible to estimate what the weather is likely to do in the next few hours.
   2—turbulence and surface winds are likely to be your principal en route weather problems.
   3—scattered thunderstorms will probably occur along your route before 1200 MST.
   4—it would be best to fly as low as obstruction clearance will permit because of more favorable winds.

5. Suppose that pressure altitude and indicated altitude are approximately the same at 4,000 feet *above the ground* over Prescott, Arizona. Indicated airspeed is 170 MPH. If you use the PRC FD (Winds Aloft Forecast) Figure 5, you determine that
   1—TAS is approximately 200 MPH.
   2—TAS is approximately 183 MPH.
   3—TAS is approximately 190 MPH.
   4—there is not enough information available to find true airspeed.

NOTE: Assume Calibrated Airspeed (CAS) to be identical to Indicated Airspeed (IAS).

6. The statements listed below concerning the surface weather map excerpt, Figure 9, may or may not be correct.
   A. Warmer air is south and east of the front while cooler air lies north and west of the front.
   B. The front depicted on the weather map is an occluded front.
   C. The front depicted on the weather map is a stationary front.
   D. The isobar of lowest pressure that can be identified is the 1004.0 millibar line.
   E. The distance between the isobars is such that the surface winds over the area pictured should be moderately strong (30 to 35 knots).
   F. The surface wind at Winslow is from the north.
   G. The surface temperature is 60° F. and dewpoint is 23° F. at Winslow.

In selecting all the correct statements from the preceding, you would include items
   1—A, B, E, and G.
   2—A, C, D, and G.
   3—C, D, and G.
   4—B, E, and F.

7.

| | |
|---|---|
| Your weight | 165 lbs. |
| Front seat passenger weight | 150 lbs. |
| Rear seat passengers weight | 365 lbs. |
| Fuel | Full |
| Oil | Full |
| Baggage | 125 lbs. |
| Aircraft empty weight moment | 65.9 lb.-in. |

Using the above information, together with data from the Aircraft Description in Figure 13, you determine through use of the Loading Graph and Center of Gravity Envelope Graph Figure 15, that

1—the gross weight and balance requirements are both within limits.

2—the weight is in excess of maximum certificated gross limit and should be reduced before an attempt is made to determine the center of gravity condition.

3—both weight and balance conditions are outside of established limits.

4—it is not possible to determine if the weight and balance conditions are within limits on the basis of information supplied.

**8.** You plan to remain VFR at all times and to avoid turbulence as much as possible; you plan to fly more than 3,000 feet above the ground en route. Your en route altitude

1—would be indeterminable until you compute the magnetic heading.

2—should be odd thousand plus 500 feet from Greenlee County Airport to Holbrook, Arizona.

3—should be odd thousand plus 500 feet.

4—should be even thousand plus 500 feet.

LEG I

**9.** From the following conditions, compute the approximate compass heading and true airspeed.

| | |
|---|---|
| Indicated airspeed | 150 knots |
| Pressure altitude | 10,000 ft. |
| Outside air temperature | +10° C. |
| True course | 341° |
| Wind direction | 230° |
| Wind velocity | 25 knots |
| Magnetic variation | 14° E. |
| Compass deviation | +3° |

1—323° and 180 knots.

2—334° and 188 knots.

3—320° and 150 knots.

4—341° and 165 knots.

**10.** After your takeoff from Greenlee County Airport at 0830 MST, you notice as you climb on course that you are passing through 8,800 feet. Which of the altimeter illustrations in Figure 44, of the appendix indicates this altitude?

1—A.

2—B.

3—C.

4—D.

**11.** Assume that you have 33 gallons of usable fuel remaining after you reach 10,500 feet. Approximately how long can you fly with a power setting of 2,200 RPM and 19 inches of manifold pressure if you retain a 30-minute fuel reserve?

1—2 hours 52 minutes.

2—5 hours 6 minutes.

3—3 hours 21 minutes.

4—None of the above.

NOTE: Refer to the 10,000-foot Cruise Performance Chart in the appendix, Figure 18.

LEG II

**12.** If you select 10,500 feet as your cruising altitude on the flight from Holbrook to Flagstaff, and use an estimated indicated airspeed of 170 MPH, an outside air temperature of +15° C., and the winds aloft as 230° at 25 knots, you compute the estimated average groundspeed for this leg to be approximately

1—187 MPH.

2—175 MPH.

3—150 MPH.

4—None of the above.

NOTE: Assume pressure altitude and indicated altitude to be the same.

**13.** As you approach the Winslow VORTAC, you note that your course will cause you to cross approximately 3 miles behind and slightly below a four-engine jet. If you are familiar with hazards involving turbulence in the wake of large aircraft, you would select which of the following as correct statements?

A. The main source of the disturbance or turbulence is the "jet wash" or "prop wash".

B. The main source of the disturbance or turbulence is the vortex created by the wingtips.

C. Clean, heavy, slow flying aircraft produce the most violent turbulence or vortices.

D. The violent, compact, tornado-like air masses associated with this phenomena can cause loss of aircraft control or even structural failure.

E. Under the circumstances described, you are too far from the jet to be affected by this invisible hazard.

F. If you encounter this hazard in cruising flight, you should decrease speed immediately, avoid "fighting the controls," and if possible, change altitude.

G. If taking off or landing behind large aircraft, fly up-wind of their track, KEEP PLENTY OF DISTANCE, and request delay from the tower on takeoffs and landings if in doubt about wake turbulence or spacing.

H. Helicopters can create conditions of vortex turbulence similar to that produced by fixed-wing aircraft, and you should stay above their flight path.

1—B, C, D, F, G, and H.

2—A, D, E, F, and G.

3—A, C. D, E, and G.

4—B, E, F, and H.

**14.** If, for some reason, you were to lose your visual references while taking evasive action with regard to the jet, and a check of your instruments showed the readings pictured in F, Figure 19, in the appendix, which of the following statements are true? You are in a—

A. Slipping, descending turn to the right and should first reduce power and bank to return to level flight.

B. Coordinated, descending turn to the right and should first add power and increase back pressure to return to level flight.

C. Skidding, climbing turn to the left.

D. Nose-high attitude.

E. Nose-low attitude.

F. 40° bank, approximately.

G. 3° per/sec. rate turn.

The correct statements are:

1—A, D, F, and G.

2—B, E. F, and G.

3—A, E, F, and G.

4—C and D only.

**15.** Assume that you now find yourself in a coordinated level turn with a 40° bank. Your present gross weight, when in straight-and-level flight, is 2,800 lbs. Referring to Figures 40 and 41, which of the following statements are correct?

A. In the situation depicted in illustration X, your approximate effective gross weight is 3,640 lbs.

B. Your rate of turn is the same for situation X, Y, and Z, but the radius of turn increases as the speed increases.

C. The radius of turn remains constant for situations A, B, and C, but the rate of turn will increase as the speed increases.

D. The radius of turn is less, but the rate of turn is greater in situation A than in either B or C.

E. The load factor increases as the speed increases.

The correct statements are:

1—B and C.

2—A, C, and D.

3—A, B, and D.

4—A and D.

**16.** Soon after leveling off on-course you encounter moderate turbulence. To remain at or below a speed that would decrease the possibility of structural damage, you should not exceed the speed indicated by the

1—red radial line.

2—upper limit of the white arc.

3—upper limit of the green arc.

4—upper limit of the yellow arc.

**17.** You are ready to land on Runway 21 at Flagstaff Pulliam Airport, after a total flying time of 1 hour 15 minutes since leaving Greenlee County Airport. Fuel consumption has been at the rate of 10 gallons per hour. Surface wind is 20 knots from 210°, and surface temperature is 75° F. You will use 40° of flaps for the landing. Referring to the landing table in Figure 17, your landing distance for clearing a 50-foot obstacle is approximately

1—834 feet, if the temperature were standard at your altitude.

2—973 feet, regardless of the temperature.

3—1,390 feet.

4—645 feet.

NOTE: Interpolate weight to the closest 500 lbs, altitude to the closest 500 feet, and wind to the closest 6 MPH. Assume takeoff gross weight was 2,900 lbs.

LEG III

**18.** After departing Flagstaff, you wish to "dog-leg" your direct route so as to stay away from the Restricted Area (R–2302), 7 miles west of Flagstaff, and yet stay close to the highway and railroad leading into Williams You tune in and identify the Flagstaff VOR with the omnibearing selector set on 270 while maintaining a magnetic heading of 300°. If you did not know your position and used *only* your omni, which reads as illustrated in Figure 45, you would know that you are

1—on the 090 radial and flying directly toward the station.

2—crossing the 270 radial and flying away from the station.

3—unable to determine your position at the moment, but you are on the 090 radial.

4—unable to determine *anything* about where you are or where you are going.

**19.** Assume that while taxiing on Williams Municipal Airport your nosewheel collapses. If you were unsure about accident reporting procedures, you could find the necessary information in

1—Federal Aviation Regulations, Part 61.

2—Federal Aviation Regulations, Part 67.

3—Federal Aviation Regulations, Part 1.

4—National Transportation Safety Board, Part 430.

## ANSWERS AND EXPLANATIONS

### Fundamentals of Instructing

1. (1) Response #2 is incorrect because it refers only to one of the factors which affect reliability, not the complete evaluation of reliability. Response #3 has nothing to do with reliability of a test. Response #4 is the definition for validity.

2. (3) Responses #1 and #2 are not complete. Response #4, while useful, is not as essential to success in teaching as item #3.

3. (3) All of the other responses are means of effecting improvement, not clues to determining the need for improvement.

4. (1) The statements made in this question cover a broad range of items; however, the correct response may be found in *Flight Instructor's Handbook*, AC 61–16A. Response #2 is incorrect because every item included in it is incorrect. Response #3 is incorrect because items D, E, and L are incorrect. Response #4 is incorrect because it includes item G.

5. (4) All other responses will test for rote memory or ability to deal with familiar problems which, in themselves, will not effectively prove that the student *understands* what he knows.

### Aeronautical Knowledge

1. (4) The 1400Z Sequence Report for GNT shows the numbers " 0 0 0 0" in the space for surface wind and denotes a calm wind condition.

2. (4) The reported layer of *thin* scattered clouds at 12,000 feet does not constitute a ceiling. (*Aviation Weather*, AC 00–6, and Part 1 of the Federal Aviation Regulations.)

3. (4) The study of only hourly sequence reports will not furnish sufficient information to make a route forecast. (*Aviation Weather*, AC 00–6.)

4. (2) The terminal forecasts call for surface winds in this area to be 20 to 30 knots. The in-flight advisory calls for light to moderate turbulence below 8,000 feet until AIRMET is canceled. The 1300Z Pilot Report Summary supports the Terminal Forecasts and In-Flight Advisory.

5. (1) Using a pressure altitude of 9,042 (4,000 feet plus ground elevation at PRC) and a forecast temperature of +12° C., your computer should indicate approximately 200 MPH TAS opposite a CAS of 170 MPH.

6. (2) The air mass to the south and east of the front is composed of warmer air as represented by the station symbols at the 10 o'clock position. The air mass to the northwest of the front is composed of cooler air. (*Aviation Weather*, AC 00–6.) The front is stationary as indicated by the location of the warm and cold front symbols on the frontal line.

   Isobars are lines connecting points of equal pressure. The isobar curving southward from Casper, Wyoming, and northward into Nebraska; the isobar surrounding Grand Junction, Colorado; the isobar around the low pressure area over Las Vegas, Nevada, represent a pressure of 1004.0 millibars.

   The figure "60" at the 10 o'clock position and the figure "23" at the 8 o'clock position on the Winslow station model represents a temperature of 60° F. and a dewpoint of 23° F. respectively.

7. (2) The empty weight, including unusable fuel, is 1,839 lbs. Figure 13. The empty weight moment is approximately 65,873 pound-inches (empty weight × empty C.G. in inches or 1,839×35.82).



572-269 O - 75 - 4

## LOADING PROBLEM

| | *Weight (lbs.)* | *Moment (lb.-in.) Thousands* |
|---|---|---|
| Airplane (empty) | 1,839.0 | 65.9 |
| Pilot and front seat passenger | 315.0 | 11.5 |
| Rear seat passengers | 365.0 | 25.4 |
| Fuel (55 gal. @ 6 lbs. per gal., Fig. 14) | 330.0 | 15.8 |
| Oil (3 gal. @ 7.5 lbs. per gal., Fig. 14) | 22.5 | −.4 |
| Baggage | 125.0 | *11.5 |
| TOTAL | 2,996.5 | 129.7 |

* Taken from Loading Graph, Figure 15.

Your gross weight is 96.5 lbs. in excess of the maximum allowable gross weight; therefore, you must reduce the load to 2,900 lbs., or less, and compute the center of gravity.

**8.** (4) When an aircraft is operated in level cruising flight at an altitude of more than 3,000 feet above the surface, the following altitudes shall be observed:

a. Below 18,000 feet. At an altitude appropriate to the magnetic course being flown as follows—

(1) Zero degrees to 179° inclusive, at odd thousands plus 500 (3,500; 5,500; etc.).

(2) 180° to 359° inclusive, at even thousands plus 500 (4,500; 6,500; etc.). (Reference FAR 91.109.)

**9.** (1) Given: Indicated Airspeed 150 knots
Given: Pressure Altitude 10,000 feet
Given: Outside Air Temperature +10° C.
Computed: True Airspeed 180 knots
Plotted: True Course 341°
Wind 230°/25 knots
Computed: Wind Correction Angle −7°
Computed: True Heading 334°
Magnetic Variation 14° E.
Computed: Magnetic Heading 320°
Compass Deviation +3°
Computed: Compass Heading 323°

**10.** (2) The altitudes indicated by the four altimeters are as follows:

A. 880 feet.
B. 8,800 feet.
C. 18,800 feet.
D. 7,880 feet.

**11.** (1) Figure 18 shows a fuel consumption of 9.8 gal./hr. at 10,000 feet with a power setting of 2,200 RPM and 19 inches of manifold pressure. Subtracting the 30-minute fuel reserve from the total of 33 gals. leaves 28.1 gals. of fuel (33 gals. minus 4.9 gals). Burning 28.1 gals. of fuel at the rate of 9.8 gals. per hour would permit 2 hours 52 minutes of flying. Study the charts until you understand their use.

**12.** (1) You must first correct indicated airspeed to true airspeed. An indicated airspeed of 170 MPH at 10,500 feet and +15°C. results in a true airspeed of 207 MPH. To compute the average groundspeed you could either use an average true course and apply the wind to each segment of the leg or average the resulting groundspeeds. Averaging true courses is not always absolutely accurate; however, in this case the difference in groundspeeds over the two segments is negligible; therefore, the time difference would be slight. The winds aloft forecast at 10,000 feet is from 230° true, at approximately 29 MPH. Whether you apply this wind to an average true course of 279° or to the exact true course for each segment and average the resulting groundspeeds, the answer is approximately the same—187 MPH.

**13.** (1) This problem is covered in detail in AC 90-23D, *Wake Turbulence*. You should study this publication.

**14.** (3) The quality of a turn (slipping, skidding, coordinated) is indicated by the position of the ball in the turn-and-bank indicator. If the ball is to the inside of the turn, the airplane is slipping. The aircraft is in a nose-low attitude since the attitude indicator (artificial horizon) shows the nose below the horizon and the other instruments show a descent. Even if the attitude indicator were malfunctioning, it is scarcely possible to be in other than a nose-low attitude in your airplane with the airspeed, vertical speed, and altimeter indicating as illustrated. The attitude indicator shows a 40° bank to the right. The turn needle also indicates a turn to the right at a rate of 3°/sec. Reduce power, decrease bank, and then apply back pressure as necessary to recover when the nose is low and the airspeed is increasing. This is much safer than adding back pressure first which might well increase the load factor beyond safe limits.

**15.** (4) The load factor for a 40° bank is determined by using the graph in Figure 40. This graph gives a load factor of approximately 1.3 for a 40° bank. Multiplying 2,800 by 1.3 results in an effective gross weight of 3,640 lbs. In order to maintain a given rate of turn, the angle of bank must be varied with the TAS. If, for example, you wish to hold a standard rate turn of 3°/second at a true airspeed of 100 MPH, your angle of bank will be 13.5°. The bank required to produce this same rate of turn at 200 MPH TAS is nearly double the bank required at 100 MPH. It now becomes 25.6°; therefore, the rate of turn must decrease if the TAS increases while the bank remains constant. It then follows that any given bank at slow speed provides a higher rate of turn and results in a smaller radius of turn than the same degree of bank at higher speeds.

**16.** (3) Maximum structural speed ($V_{NO}$) is the maximum speed for normal operation. It is located at the juncture point of the lower limit of the yellow arc (caution) and the upper limit of the green arc (normal operating range) on the face of the airspeed indicator. Study FAR 23.1505.

**17.** (1) Flying for 1 hour and 15 minutes and burning fuel at the rate of 10 gals. per hour, would mean a gross weight reduction of approximately 75 lbs. Interpolating weight to the closest 500 lbs. would mean using a weight of 2,900 lbs. for the following computation:

(a) A 20-knot headwind equals 23 MPH.

(b) 24 MPH means a 40% reduction in landing distance.

(c) Field elevation of Flagstaff is 7,012 feet; thus the closest 1,000-foot value is 7,000 feet.

(d) Interpolating on the chart, with a gross weight of 2,900 lbs. at 7,000 feet and standard temperature, the landing distance to clear a 50-foot obstacle is 1,390 feet.

(e) A 40% reduction of 1,390 feet is 565 feet.

(f) Subtracting 556 feet from 1,390 feet equals 834 feet.

(g) This figure is valid only if the temperature is standard at 7,000 feet.

**18.** (2) With the information supplied you cannot fix your location by use of omni alone, but under the circumstances given here you can only determine that you are on the 270 radial. At any given moment, omni alone tells you only which radial you are on and not where you are going. Only by relating the course selector value and the **TO-FROM** indication to the magnetic compass reading can you determine whether you are actually going **TO** the station or **FROM** the station on the selected radial or simply crossing that radial. Even after you have determined which radial you are on, you can determine your position or "fix" along this radial only by use of geographical landmarks, or an accurate groundspeed estimate, or by a cross-bearing from another station. For a more detailed explanation of omni (VOR) and its use, study *Pilot's Handbook of Aeronautical Knowledge, Practical Air Navigation,* and VFR Exam-O-Grams 15 and 16.

**19.** (4) Figure 54, gives an explanation of how to report an accident and refers to the NTSB Regulation which pertains to this requirement.

### Additional Questions for Study

Answers and explanations are included with the following questions. These questions are intended to direct study to selected areas, but by no means cover all subject areas.

1. What safety precautions should be observed when in the vicinity of aircraft oxygen systems and pressurized oxygen containers?

2. How does "ground effect" affect aircraft performance?

3. How are wingtip vortices generated and why is this turbulence hazardous?

4. What is the function of the static system in an airplane?

5. Explain the difference between preignition and detonation?

6. What is hypoxia and how does the inhalation of tobacco smoke or other toxic fumes affect tolerance to hypoxia?

7. What are the forces acting on an airfoil in flight?

8. How do the forces acting on an airplane in flight change when establishing a climb, descent, or turn?

9. What are the similarities and differences between a propeller and a wing of an airplane?

10. Explain "load factor". How do various flight maneuvers affect load factor?

11. Explain dynamic stability? Static stability?

12. What is the significance of the color coding found on an airspeed indicator?

13. In-flight carburetor icing indications differ between various types of propellers. What are the reasons for these differences?

14. What effect does an increase in altitude have on indicated airspeed?

15. How does the term "cabin pressure altitude" apply to the use of supplemental oxygen?

16. Why is proper loading of an airplane important?

17. What causes an airplane to turn to the left during certain flight maneuvers?

18. What effect does the addition of water vapor to the atmosphere have on airplane performance?

19. How does a magnetic compass function, and what are its errors?

20. Why is poor flying weather more likely to be associated with a low pressure area than a high pressure area?

## APPENDIX

STATION IDENTIFIERS

ABQ - Albuquerque, New Mexico
FMN - Farmington, New Mexico
FLG - Flagstaff, Arizona
GNT - Grants, New Mexico
INW - Winslow, Arizona
PHX - Phoenix, Arizona
PRC - Prescott, Arizona
SAF - Santa Fe, New Mexico
TUS - Tucson, Arizona
ZUN - Zuni, New Mexico

FIGURE 1

LETTER DESIGNATORS FOR REPORTS AND FORECASTS

FT - Terminal Forecasts
FA - Area Forecasts
FD - Winds Aloft Forecasts
WS - SIGMET - Weather significant to safety of all aircraft
WA - AIRMET - Weather phenomena of operational interest to all aircraft, but potentially hazardous to aircraft of limited capability.
UA - Pilot Report
SA - Hourly Sequence Report
WW - Severe Weather Forecasts
AC - Severe Weather Outlooks
SD - Individual Single Station Radar Report

FIGURE 2.

## EXCERPTS FROM SLC AREA FORECAST

SLC FA 111240
13Z FRI - 07Z SAT
OTLK 07Z SAT - 19Z SAT

UTAH NEV IDA MONT ARIZ CALIF ORE WASH CSTL WTRS

HGTS ASL UNLESS NOTED

SYNS. LO PRES OVR SRN NEV WL MOV TO SWRN UTAH BY 01Z.
WK DFUS STNRY FNT WL CONT EXTRM WRN ARIZ.

SIGCLD AND WX.

. . . . . .

ARIZ. CLR UNTIL SCTD CU DVLP OVR MTNS DURG AFTN. 120-140 SCT WITH A FEW HIGH LVL SHWRS MTNS UNTIL 03Z. SFC WNDS LCLY 2325G35 BY 18Z. OTLK. VFR.

. . . . . .

ICG. LGT ICGIC. FRZG LVL 135-145.

FIGURE 3

## SELECTED TERMINAL FORECASTS

FT 111040

INW 111111 O. 19Z 80⊕1200 2525G35. 02Z 100⊕. 05Z VFR..
PRC 111111 O. 17Z 80⊕C1200 2320G30. 02Z C150⊕. 05Z VFR..
FLG 111111 O. 17Z 80⊕C1200 2020G30. 02Z C1200 2315G25. 05Z VFR..
FMN 111111 O. 19Z C80⊕ 2320 OCNLY C70⊕ BRF RW- VCNTY. 03Z C100⊕. 05Z VFR..
ABQ 111111 O. 19Z 80⊕1200 2020 OCNLY C80⊕ 2525G30. 02Z 100⊕. 05Z VFR..

FIGURE 4

WINDS ALOFT FORECASTS (FD)

10Z - 22Z (0300MST - 1500MST)

| FT | 3000 | 6000 | 9000 | 12000 | 18000 |
|---|---|---|---|---|---|
| ABQ | | 2020 | 2325+10 | 2730+03 | 2740-10 |
| FMN | 1915 | 1920+18 | 2030+10 | 2040+02 | 2140-10 |
| PRC | | 2715+20 | 2830+12 | 2940+05 | 3040-10 |
| BLD | | 2816+22 | 3032+14 | 3131+07 | 3242-12 |
| BCE | | 3018+24 | 3234+16 | 3444+09 | 3444-14 |

FIGURE 5.

SELECTED AVIATION WEATHER REPORTS
0700 MST

SA 111400Z
PRC 140-02Ø+Ø64/6Ø/32/181Ø/985
FLG 12Ø-015+ Ø55/55/18/1812G18/993
INW 1ØØ06Ø Ø45/55/26/181Ø/998
ZUN 12Ø02Ø+ Ø7Ø/55/3Ø/2ØØ5/995
GNT 12Ø-035 Ø65/55/31/ØØØØ/ØØ1
PHX 9Ø012Ø-045 Ø75/7Ø/3Ø/2704/HK ALQDS
TUS E150030005Ø Ø6Ø/75/35/181Ø/983

SELECTED AVIATION WEATHER REPORTS
0800 MST

SA 111500Z
PRC 13Ø045 Ø67/68/31/2728/991
FLG 12Ø02Ø+ Ø65/6Ø/3Ø/2Ø15/993
INW 1ØØ06Ø+ Ø47/65/31/1815/989
ZUN 1ØØ-025 Ø65/6Ø/33/231Ø/999
GNT 12003ØØ-035 Ø6Ø/65/32/181ØG15/ØØØ
PHX 1ØØ012Ø-035 Ø82/75/33/2705/HK ALQDS
TUS E150030070 Ø75/75/32/2315/985

FIGURE 6

## PILOT REPORTS

UA 111300Z

N MEX
GNT 40 W GNT MDT TURBC 105 BN35. FLG AREA LGT TURBC SFC TO 104 PA23. ZUN-INW MDT TURBC 95 C310
ZUN V-62 SAF MDT TURBC 120 C182
ZUN-GNT MDT TURBC INCRG 95 C172
ARIZ
50 E PRC LGT-MDT TURBC 105 PA24
ZUN-INW MDT TURBC 95 C310
INW-PRC MDT OCNLY SVR TURBC 105 PA22

FIGURE 7

## IN-FLIGHT ADVISORIES

SLC WAC 111345
111345-UFN

AIRMET ALPHA 1. FLT PRCTN. NRN ARIZ AND W OF CONTDVD IN NRN N MEX LGT TO MDT TURBC BLO 80 WITH STRONG DWNDRFTS OVR LEE SLPS. CONT AIRMET UNTIL CNCL NOTICE IS RCVD

SLC WA 112320
112320-120200

AIRMET ALPHA 2. CNCL AIRMET ALPHA 1. FLT PRCTN. NRN ARIZ NRN N MEX MDT TURBC BLO 140 DCRG TO LGT BY 02Z

FIGURE 8

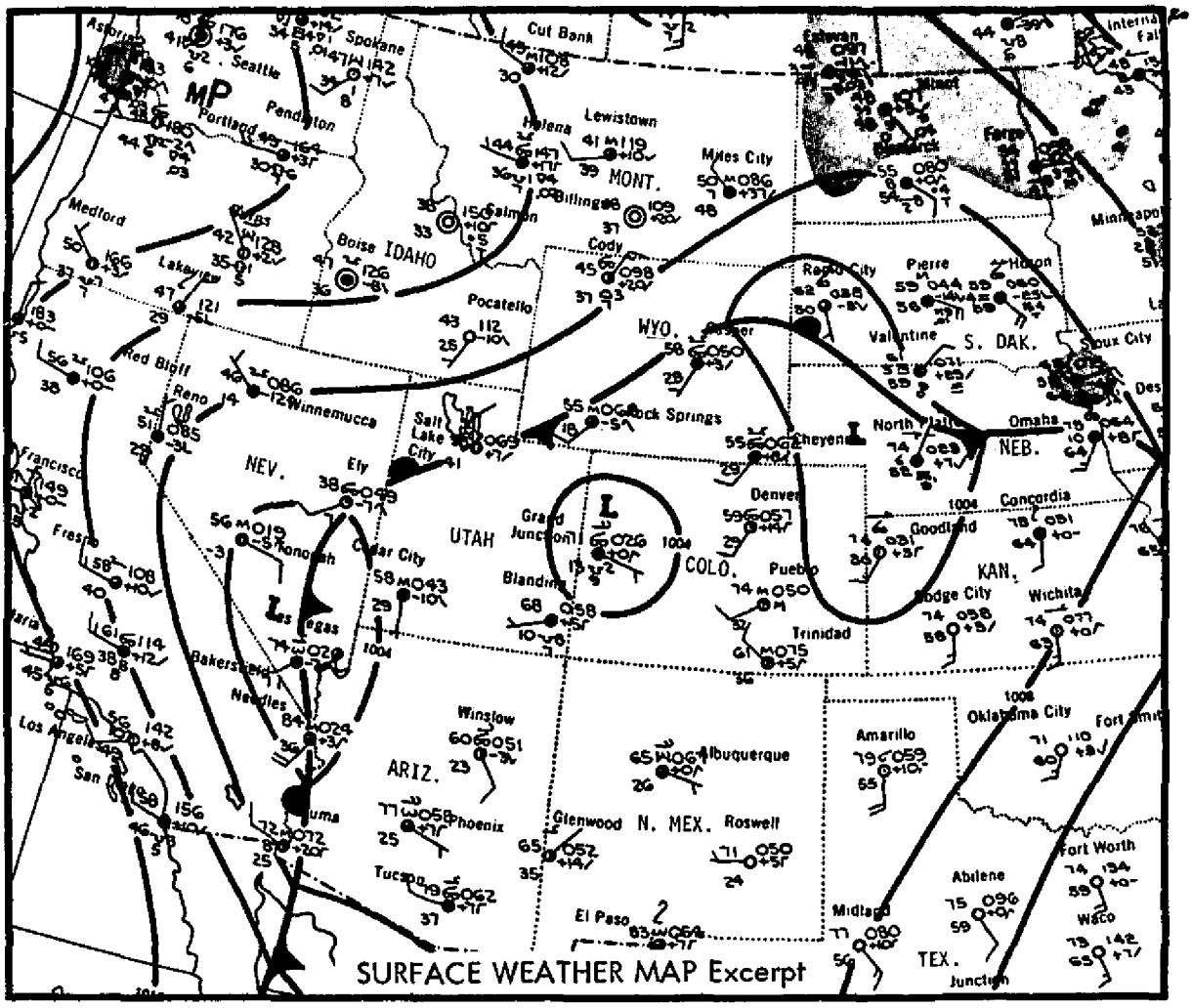
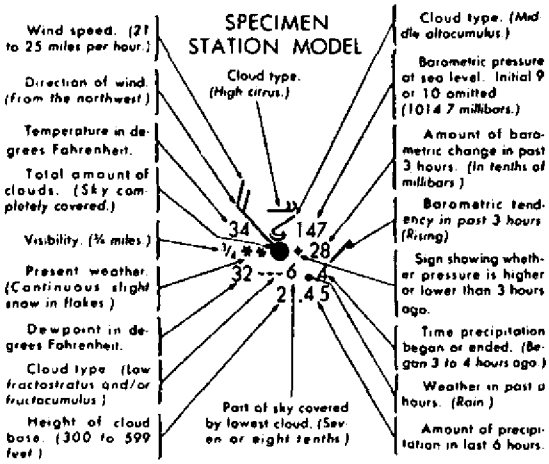

SURFACE WEATHER MAP Excerpt
Cut Bank
Spokane
Seattle
Portland
Pendleton
Helena
Lewistown
Miles City
MONT.
Billings
Medford
Boise
IDAHO
Salmon
Cody
Pocatello
WYO.
Rapid City
Pierre
Huron
Valentine
S. DAK.
Sioux City
Red Bluff
Reno
Winnemucca
Salt Lake City
Rock Springs
Cheyenne
North Platte
Omaha
NEB.
NEV.
Ely
Grand Junction
UTAH
COLO.
Denver
Concordia
Goodland
Pueblo
KAN.
Dodge City
Wichita
Trinidad
Las Vegas
Cedar City
Blanding
Bakersfield
Needles
Winslow
Albuquerque
Amarillo
Oklahoma City
ARIZ.
Phoenix
Glenwood
N. MEX.
Roswell
Tucson
El Paso
Midland
Abilene
Fort Worth
Waco
TEX.
Junction

FIGURE 9


SPECIMEN
STATION MODEL
Wind speed. (21 to 25 miles per hour.)
Direction of wind. (From the northwest.)
Temperature in degrees Fahrenheit.
Total amount of clouds. (Sky completely covered.)
Visibility. (¼ miles.)
Present weather. (Continuous slight snow in flakes.)
Dewpoint in degrees Fahrenheit.
Cloud type. (Low fractostratus and/or fractocumulus.)
Height of cloud base. (300 to 599 feet.)
Cloud type. (High cirrus.)
Part of sky covered by lowest cloud. (Seven or eight tenths.)
Cloud type. (Middle altocumulus.)
Barometric pressure at sea level. Initial 9 or 10 omitted. (1014.7 millibars.)
Amount of barometric change in past 3 hours. (In tenths of millibars.)
Barometric tendency in past 3 hours. (Rising.)
Sign showing whether pressure is higher or lower than 3 hours ago.
Time precipitation began or ended. (Began 3 to 4 hours ago.)
Weather in past 6 hours. (Rain.)
Amount of precipitation in last 6 hours.
34
147
¼
28
32
6
2
1.45

## KEY TO AVIATION WEATHER REPORTS.....

| LOCATION IDENTIFIER AND TYPE OF REPORT* | SKY AND CEILING | VISIBILITY WEATHER AND OBSTRUCTION TO VISION | SEA-LEVEL PRESSURE | TEMPERATURE AND DEW POINT | WIND | ALTIMETER SETTING | RUNWAY VISUAL RANGE | CODED PIREPS |
|---|---|---|---|---|---|---|---|---|
| MKC | 15ØM25⊕ | 1R-K | 132 | /58/56 | /18Ø7 | /993/ | RØ4LVR2ØV4Ø | /Ø55 |

**SKY**
Sky cover symbols are in ascending order. Figures preceding symbols are heights in hundreds of feet above station.

Sky cover symbols are

- ○ Clear. Less than 0.1 sky cover
- ① Scattered. 0.1 to less than 0.6 sky cover
- ◑ Broken. 0.6 to 0.9 sky cover
- ⊕ Overcast. More than 0.9 cover
- – Thin (When prefixed to the above symbols)
- ⊸ Partly obscured. 0.1 to less than 1.0 sky hidden by precipitation or obstruction to vision (based at surface)
- Ⓧ Obscured. 1.0 sky hidden by precipitation or obstruction to vision (based at surface)

**CEILING**
Letter preceding height of layer identifies ceiling layer and indicates how ceiling height was obtained. Thus

| | | | |
|---|---|---|---|
| A | Aircraft | R | Radar |
| B | Balloon (ceiling, pilot or rawb) | W | Indefinite |
| E | Estimated | V | Immediately following numerical value indicates a variable ceiling height |
| M | Measured | | |

**VISIBILITY**
Reported in Statute Miles and Fractions (V-Variable)

**WEATHER AND OBSTRUCTION TO VISION SYMBOLS**

| | | | | | |
|---|---|---|---|---|---|
| A | Hail | IC | Ice Crystals | RW | Rain Showers |
| BD | Blowing Dust | IF | Ice Fog | S | Snow |
| BN | Blowing Sand | IP | Ice Pellets | SG | Snow Grains |
| BS | Blowing Snow | IPW | Ice Pellet Showers | SP | Snow Pellets |
| D | Dust | | | SW | Snow Showers |
| F | Fog | K | Smoke | T | Thunderstorm |
| GF | Ground Fog | L | Drizzle | T+ | Severe Thunderstorm |
| H | Haze | R | Rain | ZL | Freezing Drizzle |
| | | | | ZR | Freezing Rain |

Precipitation intensities are indicated thus - Very Light, -Light; (no sign) Moderate, + Heavy

**WIND**
Direction in tens of degrees from true north, speed in knots. 0000 indicates calm. G indicates gusty. Peak speed follows G or Q when gusts or squalls are reported. The contraction WSHFT followed by local time group in remarks indicates windshift and its time of occurrence. (Knots X 1.15 = statute mi/hr.)

EXAMPLES 3677 360 Degrees. 27 Knots.
3677G49 360 Degrees. 27 Knots. Peak speed in gusts 40 knots.

**ALTIMETER SETTING**
The first figure of the actual altimeter setting is always omitted from the report.

**RUNWAY VISUAL RANGE (RVR)**
RVR is reported from some stations. Extreme values for 10 minutes prior to observation are given in hundreds of feet. Runway identification precedes RVR report.

**CODED PIREPS**
Pilot reports of clouds not visible from ground are coded with MSL height data preceding and/or following sky cover symbol to indicate cloud bases and/or tops respectively.

**DECODED REPORT**
Kansas City. Record observation. 1500 feet scattered, measured ceiling 2500 feet overcast, visibility 1 mile, light rain, smoke, sea level pressure 1013.2 millibars, temperature 58°F, dewpoint 56°F, wind 180°, 7 knots, altimeter setting 29.93 inches, runway 04 left, visual range 2000 ft. variable to 4000. Pilot reports top of overcast 5500 feet (MSL).

***TYPE OF REPORT**
The omission of type-of-report data identifies a scheduled record observation for the hour specified in the sequence heading. The time of an out-of-sequence special observation is given as 'S' followed by a time group (24-hour clock GMT) e.g., P13 S 0715 -RM1⊕. A special indicates a significant change in one or more elements. Local reports are identified by 'LCL' and a time group. Locals are transmitted on local teletypewriter circuits only.

---

**TERMINAL FORECASTS** contain information for specific airports on ceiling, cloud heights, cloud amounts, visibility, weather condition and surface wind. They are written in a form similar to the AVIATION WEATHER REPORT.

CEILING: Identified by the letter "C"
CLOUD HEIGHTS: In hundreds of feet above the station (ground)
CLOUD LAYERS: Stated in ascending order of height
VISIBILITY: In statute miles, but omitted if over 8 miles
SURFACE WIND: In tens of degrees and knots; omitted when less than 10

EXAMPLE OF TERMINAL FORECASTS

| | | | |
|---|---|---|---|
| C15⊕ | Ceiling 1500', broken clouds | O11/2GF | Clear, visibility one and one half miles, ground fog |
| CS11/4S+ | Sky obscured, vertical visibility 500 ft, visibility one fourth mile, heavy snow | 20DC70@4R 2230G | Scattered clouds at 7000', ceiling 7000' overcast, visibility 6 miles, smoke, surface wind 230 degrees 30 knots, gusty |

**AREA FORECASTS** are 18-hour forecasts plus 12-hour OUTLOOKS of cloud, weather and frontal conditions for an area the size of several states. Heights of cloud tops and icing are ABOVE SEA LEVEL (ASL); ceiling heights, ABOVE GROUND LEVEL (AGL); bases of cloud layers are ASL unless indicated.

**SIGMET or AIRMET** warns airmen in flight of potentially hazardous weather such as squall lines, thunderstorms, fog, icing, and turbulence. SIGMET concerns severe and extreme conditions of importance to all aircraft. AIRMET concerns less severe conditions which may be hazardous to some aircraft or to relatively inexperienced pilots. Both are broadcast by FAA on NAVAID voice channels.

**WINDS AND TEMPERATURES ALOFT (FD) FORECASTS** are computer prepared forecasts of wind direction (nearest 10° true N) and speed (knots) for selected flight levels. Temperatures are forecast for all levels shown except that no forecasts are issued for the 3000 ft. level or other levels within 2500 feet of a station's elevation.

EXAMPLES OF WINDS AND TEMPERATURES ALOFT (FD) FORECASTS

FD WBC 121745
BASED ON 1218Ø0Z DATA
VALID 1300Ø0Z FOR USE 1000-1800Z. TEMPS NEG ABV 24000

| FT | 3000 | 6000 | 9000 | 12000 | 18000 | 24000 | 30000 | 34000 | 39000 |
|---|---|---|---|---|---|---|---|---|---|
| BOS | 3127 | 3425-07 | 3428-11 | 3421-16 | 3316-27 | 3312-38 | 311649 | 292451 | 283451 |
| JFK | 3926 | 3337-08 | 3324-12 | 3322-16 | 3128-27 | 3923-38 | 286248 | 285158 | 283749 |

At 4000 feet ASL over JFK wind from 336° at 27 knots and temperature minus 8° C.

**PILOTS . . . report in-flight weather to nearest FSS**

FIGURE 10

## SEGMENTED CIRCLE

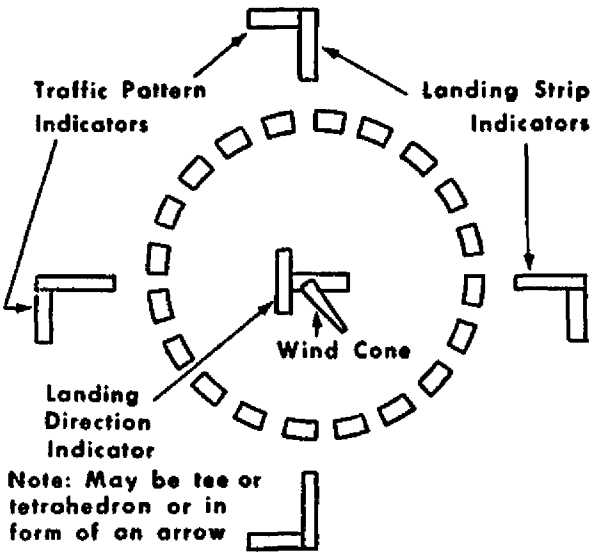



FIGURE 11

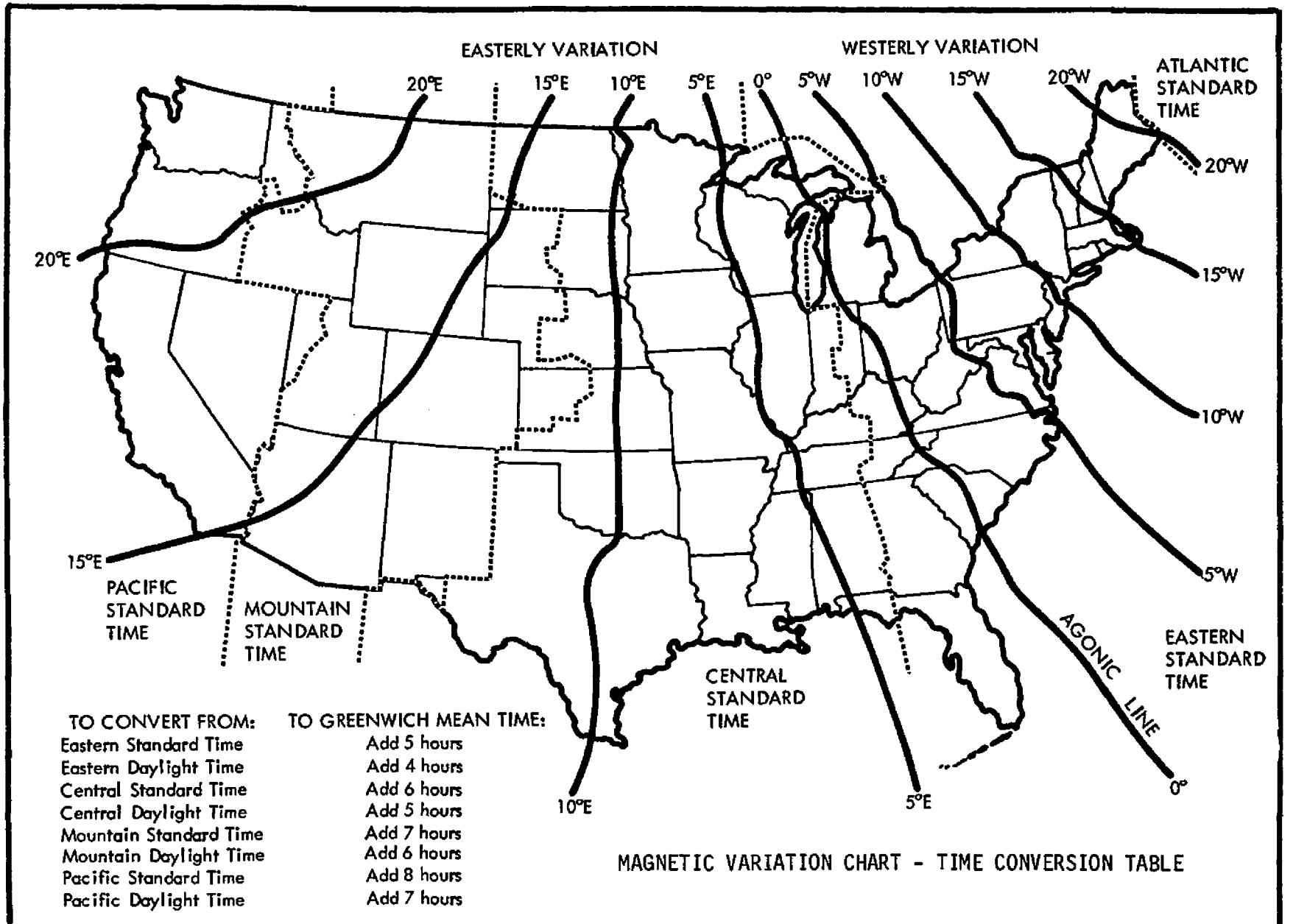

EASTERLY VARIATION
WESTERLY VARIATION
20°E
15°E
10°E
5°E
0°
5°W
10°W
15°W
20°W
ATLANTIC STANDARD TIME
20°W
15°W
10°W
5°W
20°E
15°E
PACIFIC STANDARD TIME
MOUNTAIN STANDARD TIME
CENTRAL STANDARD TIME
EASTERN STANDARD TIME
AGONIC LINE
10°E
5°E
0°
TO CONVERT FROM: TO GREENWICH MEAN TIME:
Eastern Standard Time Add 5 hours
Eastern Daylight Time Add 4 hours
Central Standard Time Add 6 hours
Central Daylight Time Add 5 hours
Mountain Standard Time Add 7 hours
Mountain Daylight Time Add 6 hours
Pacific Standard Time Add 8 hours
Pacific Daylight Time Add 7 hours
MAGNETIC VARIATION CHART - TIME CONVERSION TABLE

FIGURE 12

# AIRCRAFT DESCRIPTION
# PLACARDS IN THE AIRPLANE

THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE. NO ACROBATIC MANEUVERS (INCLUDING SPINS) APPROVED

*IDENTIFICATION:* N 2468W.

*MAXIMUM GEAR OPERATING SPEED:* 135 mph, CAS.

*MANEUVERING SPEED:* 130 mph, CAS.

*MAXIMUM ALLOWABLE WEIGHT IN BAGGAGE COMPARTMENT:* 125 lbs.

The following information is excerpted from the AIRPLANE FLIGHT MANUAL.

*ENGINE OPERATION LIMITATION:*
Power and Speed 260 bhp at 2625 rpm.

*FUEL SYSTEM:* The engine is approved for 100/130 fuel only. Fuel is supplied from 2 tanks of 32.5 gallons total capacity each.

Separate electric gauges indicate the quantity in each tank. The gauges read empty when the level is down to 5 gallons since the last 5 gallons in each tank are unusable. The airplane is equipped with an electrically-driven auxiliary fuel pump for standby use in the event the engine-driven pump fails.

*OIL:* The engine uses a wet-sump, full-pressure oil system. The oil capacity is 12 quarts.

For temperature above 40° F use SAE 50; below 40° F use SAE 30.

*PROPELLER:* The propeller is a single-acting, hydraulic constant-speed type with two forged aluminum blades, controlled by an engine-driven governor.

*HYDRAULIC SYSTEM:* The landing gear and flaps are extended and retracted by hydraulic actuators, powered by an engine-driven hydraulic pump and a pressure accumulator.

*ENGINE INSTRUMENT MARKINGS:*

| | |
|---|---|
| Oil Pressure Gauge | |
| Idling | 10 psi (red line) |
| Normal Operating Range | 30-60 psi (green arc) |
| Maximum Pressure | 100 psi (red line) |
| Manifold Pressure Gauge | |
| Normal Operating Range | 15-24 in. Hg (green arc) |
| Cylinder Head Temperature | |
| Normal Operating Range | 300-460° F (green arc) |
| Do Not Exceed | 460° F (red line) |
| Tachometer | |
| Normal Operating Range | 2200-2450 rpm (green arc) |
| Maximum (Engine-rated speed) | 2625 rpm (red line) |
| Fuel Quantity Indicators | |
| Less than one-quarter tank remaining | red arc to red line |
| Empty (includes 5 gallons each tank unusable) | E (red line) |

*EMPTY WEIGHT:* 1839 lbs.

*MAXIMUM GROSS WEIGHT:* 2900 lbs.

*FLIGHT LOAD FACTORS:*

| | |
|---|---|
| Flaps Up | +3.8, − 1.52 |
| Flaps Down | +3.5 |

*EMERGENCY PROCEDURES:*

Emergency Gear Extension Procedure.

When the landing gear will not extend hydraulically, it may be extended manually as follows:

(1) Place the gear handle in the full down position.

(2) Pull the auxiliary pump handle out its full extension.

(3) Operate the auxiliary pump handle up and down until the green gear-down light comes on.

*AVIONICS EQUIPMENT:*

Transceiver with 360 communications channels

Nav/Com 360 channel with remote VOR/ILS and glide slope indicator

ADF receiver with fixed Azimuth

Transponder with 4096 code capability

DME

Marker Beacon

☆ ☆ ☆ ☆ ☆

FIGURE 13

## WEIGHT AND BALANCE

All airplanes are designed for certain limit loads and balance conditions. These limits for your aircraft are shown on the graphs for Figure 15.

An individual weight and balance report and equipment list is furnished with each airplane; these documents list the empty weight and empty weight center of gravity of the individual airplane as equipped when it left the factory. *Changes in equipment which affect the empty weight and empty weight center of gravity must be entered in the aircraft maintenance records in accordance with Federal Aviation Regulations.*

To determine that your gross weight and center of gravity for a given flight are within limits, use the following procedure:

(1) From the weight and balance report or the latest entry pertaining to weight and balance in the aircraft maintenance record.

(2) Determine the weights and moments of your disposable load items, using the loading graph.

(3) Add these items, as shown in the sample problem.

(4) Plot the totals on the center of gravity envelope graph.

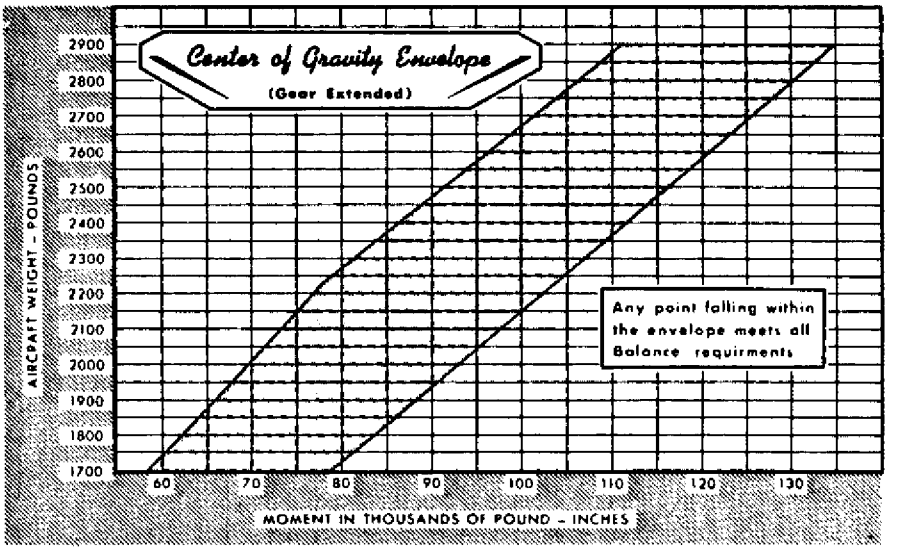
### EXAMPLE PROBLEM

Example for an airplane with a licensed empty weight of 1839 pounds and a moment of 65,873 pound-inches: (Empty weight of 1,839 lbs. multiplied by the number of inches the empty C. G. is from the datum—in this airplane 35.82 inches. The figure thus obtained is arbitrarily divided by 1,000, the moment in pound inches.)

| | *Weight Pounds* | *Moment (lb-in) 1000* |
|---|---|---|
| Empty Weight (licensed) | 1839.0 | 65.9 |
| Oil (12 qts.) | 22.5 | −0.4 |
| Pilot and Front Seat Passenger | 340.0 | 12.2 |
| Rear Seat Passengers | 340.0 | 23.8 |
| Full Fuel (55 gal.) | 330.0 | 15.8 |
| Baggage | 28.5 | 2.7 |
| TOTAL | 2900.0 | 120.0 |

Locate this point (2900 – 120.0) on the center of gravity envelope graph. Since the point falls within the envelope the above loading meets all the balance requirements.

FIGURE 14



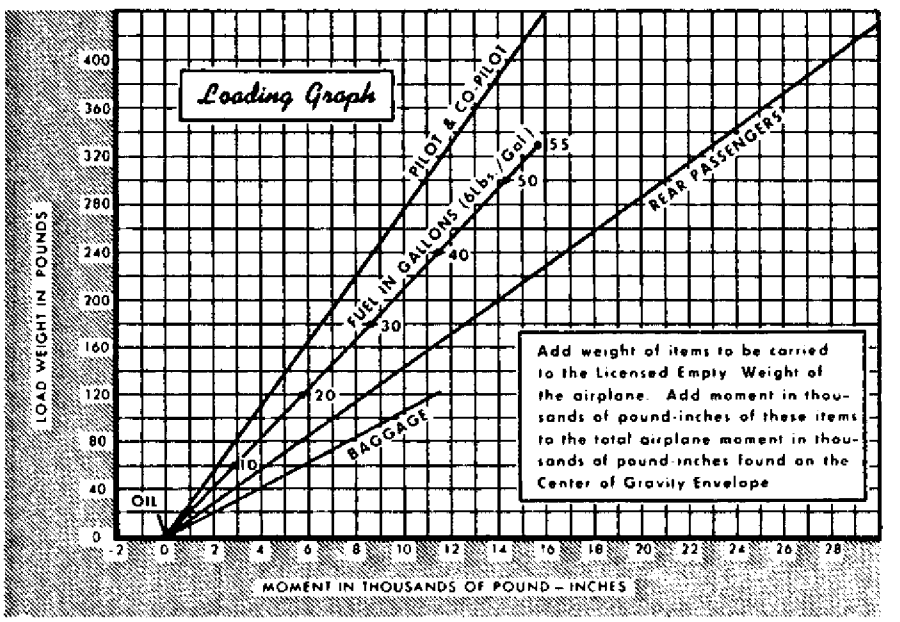




FIGURE 15

| COMPASS CORRECTION CARD | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FOR(MH) 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 |
| STEER(CH) 0 | 28 | 56 | 88 | 120 | 151 | 183 | 216 | 240 | 268 | 296 | 328 |

FIGURE 16

# LANDING DISTANCE TABLE

| GROSS WEIGHT LBS. | APPROACH IAS MPH | AT SEA LEVEL & 59°F | | AT 2500 FT & 50°F | | AT 5000 FT & 41°F | | AT 7500 FT & 32°F | |
|---|---|---|---|---|---|---|---|---|---|
| | | GROUND ROLL | TO CLEAR 50' OBSTACLE | GROUND ROLL | TO CLEAR 50' OBSTACLE | GROUND ROLL | TO CLEAR 50' OBSTACLE | GROUND ROLL | TO CLEAR 50' OBSTACLE |
| 2300 | 68 | 415 | 1015 | 445 | 1070 | 480 | 1130 | 520 | 1190 |
| 2600 | 72 | 470 | 1105 | 505 | 1165 | 545 | 1230 | 590 | 1300 |
| 2900 | 76 | 530 | 1190 | 560 | 1260 | 605 | 1330 | 655 | 1405 |

**NOTE: REDUCE LANDING DISTANCES 10% FOR EACH 6 MPH HEADWIND. FLAPS 40° AND POWER OFF.**

# CLIMB DATA

| GROSS WEIGHT LBS. | AT SEA LEVEL & 59°F | | | AT 5000 FT. & 41°F | | | AT 10000 FT. & 23°F | | | AT 15000 FT. & 5°F | | | AT 20000 FT. & -12°F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BEST CLIMB IAS MPH | RATE OF CLIMB FT/MIN | GAL. OF FUEL USED | BEST CLIMB IAS MPH | RATE OF CLIMB FT/MIN | FROM S.L. FUEL USED | BEST CLIMB IAS MPH | RATE OF CLIMB FT/MIN | FROM S.L. FUEL USED | BEST CLIMB IAS MPH | RATE OF CLIMB FT/MIN | FROM S.L. FUEL USED | BEST CLIMB IAS MPH | RATE OF CLIMB FT/MIN | FROM S.L. FUEL USED |
| 2300 | 97 | 1770 | 2.0 | 94 | 1415 | 3.0 | 91 | 1065 | 4.0 | 88 | 715 | 5.1 | 85 | 370 | 6.3 |
| 2600 | 100 | 1510 | 2.0 | 98 | 1150 | 3.1 | 95 | 875 | 4.4 | 92 | 560 | 5.8 | 89 | 250 | 7.5 |
| 2900 | 104 | 1300 | 2.0 | 101 | 1010 | 3.3 | 98 | 720 | 4.8 | 96 | 430 | 6.7 | 94 | 140 | 9.2 |

**NOTE:** THROTTLE, 2625 RPM, MIXTURE AT RECOMMENDED LEANING SCHEDULE-FLAPS AND GEAR UP. FUEL USED INCLUDES WARM-UP AND TAKE-OFF ALLOWANCE.

# TAKE-OFF DATA

TAKE-OFF DISTANCE WITH 20° FLAPS FROM HARD-SURFACED RUNWAY

| GROSS WEIGHT LBS. | IAS AT 50 FT. MPH | HEAD WIND MPH | AT SEA LEVEL & 59°F | | AT 2500 FT. & 50°F | | AT 5000 FT. & 41°F | | AT 7500 FT. & 32°F | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | GROUND RUN | TO CLEAR 50' OBSTACLE | GROUND RUN | TO CLEAR 50' OBSTACLE | GROUND RUN | TO CLEAR 50' OBSTACLE | GROUND RUN | TO CLEAR 50' OBSTACLE |
| 2300 | 58 | 0 | 435 | 695 | 515 | 805 | 615 | 950 | 740 | 1145 |
| | | 15 | 265 | 465 | 320 | 545 | 390 | 650 | 480 | 800 |
| | | 30 | 135 | 270 | 170 | 330 | 215 | 400 | 270 | 505 |
| 2600 | 62 | 0 | 570 | 885 | 680 | 1040 | 815 | 1250 | 985 | 1550 |
| | | 15 | 360 | 605 | 435 | 720 | 530 | 880 | 655 | 1105 |
| | | 30 | 195 | 365 | 240 | 445 | 305 | 560 | 385 | 725 |
| 2900 | 65 | 0 | 740 | 1135 | 880 | 1355 | 1055 | 1655 | 1285 | 2155 |
| | | 15 | 480 | 790 | 580 | 950 | 705 | 1200 | 875 | 1580 |
| | | 30 | 270 | 500 | 335 | 615 | 425 | 795 | 540 | 1080 |

**NOTE:** INCREASE DISTANCES 10% FOR EACH 25°F ABOVE STANDARD TEMPERATURE FOR PARTICULAR ALTITUDE.

FIGURE 17

## CRUISE PERFORMANCE — 10000

**NORMAL LEAN MIXTURE**

Standard Atmosphere
Zero Wind

Gross Weight - 2900 Pounds
55 Gallons - No Reserve

**10,000 FEET**

| RPM | MP | % BHP | Fuel Press. | MPH TAS | Gal/ Hour | Endurance Hours | Range Sta. Miles |
|---|---|---|---|---|---|---|---|
| 2450 | 20 | 65 | 7.5 | 184 | 12.2 | 4.5 | 830 |
| | 19 | 60 | 6.8 | 179 | 11.4 | 4.8 | 860 |
| | 18 | 56 | 6.2 | 174 | 10.6 | 5.2 | 900 |
| | 17 | 52 | 5.6 | 169 | 9.9 | 5.6 | 940 |
| 2300 | 20 | 59 | 6.5 | 177 | 11.0 | 5.0 | 885 |
| | 19 | 55 | 6.0 | 172 | 10.4 | 5.3 | 910 |
| | 18 | 51 | 5.5 | 167 | 9.7 | 5.7 | 950 |
| | 17 | 47 | 5.1 | 162 | 9.1 | 6.0 | 975 |
| 2200 | 20 | 55 | 5.9 | 172 | 10.3 | 5.3 | 915 |
| | 19 | 51 | 5.5 | 168 | 9.8 | 5.6 | 940 |
| | 18 | 48 | 5.1 | 163 | 9.1 | 6.0 | 985 |
| | 17 | 44 | 4.8 | 157 | 8.6 | 6.4 | 1005 |
| 2100 | 20 | 50 | 5.3 | 165 | 9.5 | 5.8 | 955 |
| | 19 | 47 | 5.0 | 161 | 9.0 | 6.1 | 980 |
| | 18 | 43 | 4.7 | 156 | 8.5 | 6.5 | 1010 |
| | 17 | 40 | 4.4 | 151 | 8.0 | 6.9 | 1035 |
| | 16 | 37 | 4.2 | 145 | 7.6 | 7.2 | 1050 |
| | 15 | 34 | 4.0 | 138 | 7.1 | 7.8 | 1070 |
| | 14 | 30 | 3.8 | 129 | 6.6 | 8.3 | 1075 |

FIGURE 18

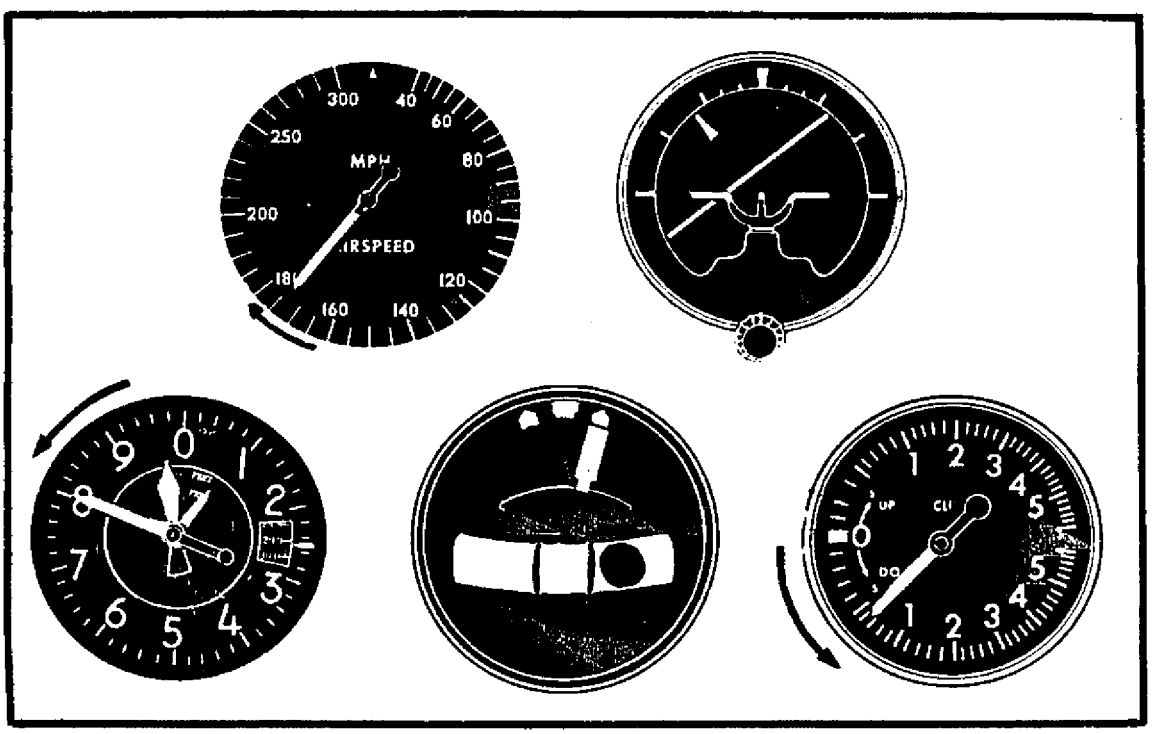



FIGURE 19

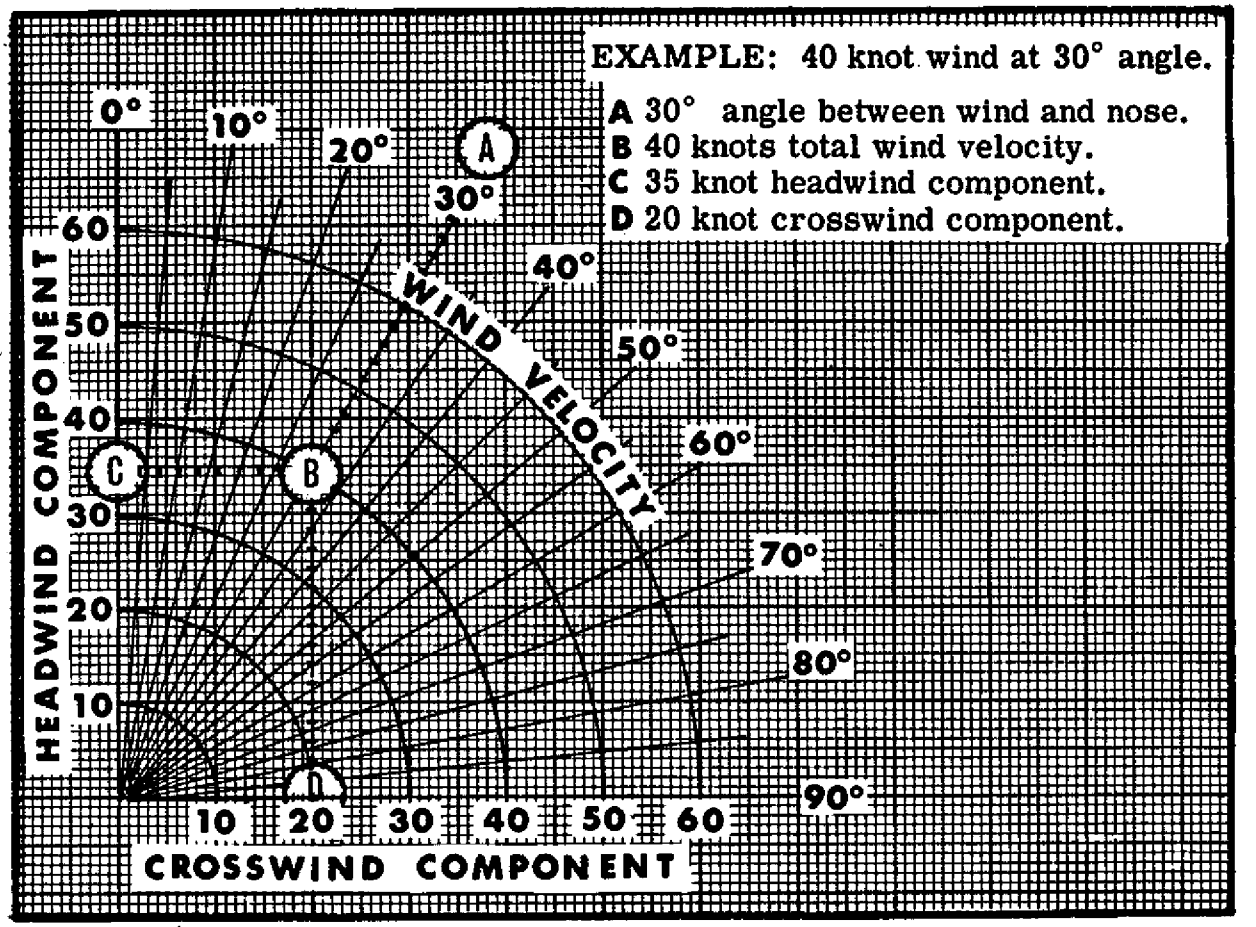
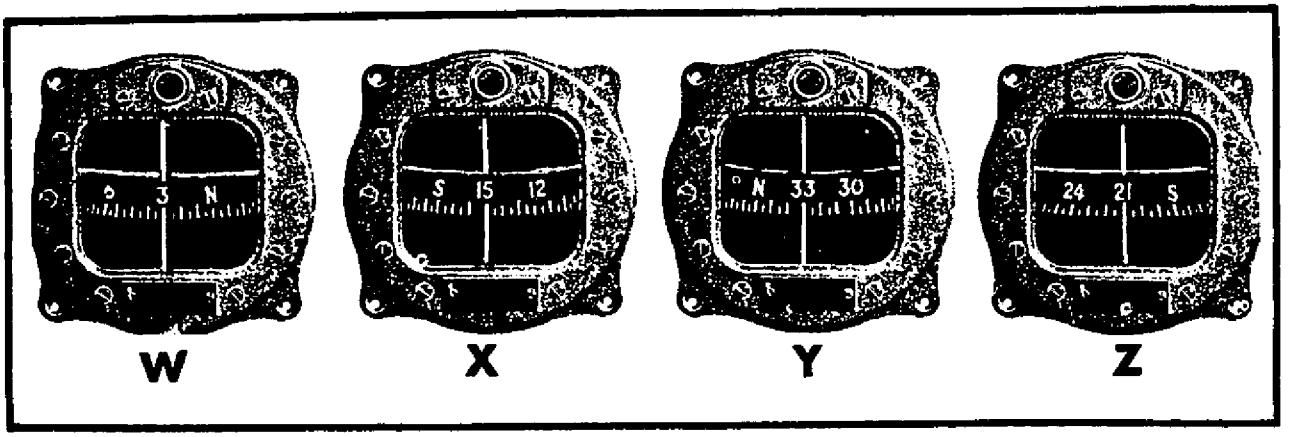



FIGURE 20




MAGNETIC COMPASS INDICATIONS

FIGURE 21

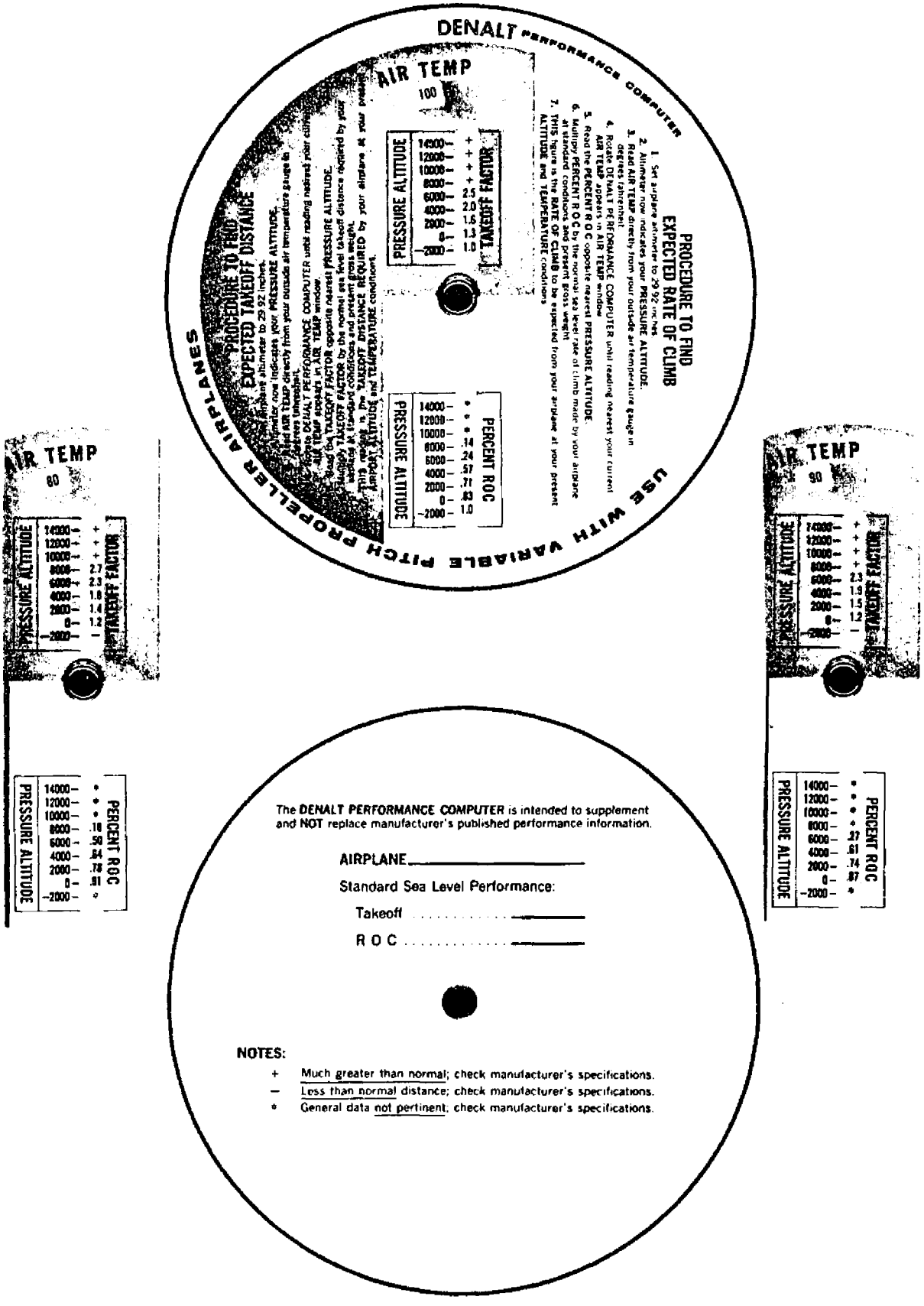

DENALT PERFORMANCE COMPUTER
USE WITH VARIABLE PITCH PROPELLER AIRPLANES
PROCEDURE TO FIND EXPECTED TAKEOFF DISTANCE
1. Set airplane altimeter to 29.92 inches.
2. Altimeter now indicates your PRESSURE ALTITUDE.
3. Read AIR TEMP directly from your outside air temperature gauge in degrees fahrenheit.
4. Rotate DENALT PERFORMANCE COMPUTER until reading nearest your current AIR TEMP appears in AIR TEMP window.
5. Read the TAKEOFF FACTOR opposite nearest PRESSURE ALTITUDE.
6. Multiply TAKEOFF FACTOR by the normal sea level distance required by your airplane at standard conditions and present gross weight.
7. This figure is the TAKEOFF DISTANCE REQUIRED by your airplane at your present AIRPORT ALTITUDE and TEMPERATURE conditions.
PROCEDURE TO FIND EXPECTED RATE OF CLIMB
1. Set airplane altimeter to 29.92 inches.
2. Altimeter now indicates your PRESSURE ALTITUDE.
3. Read AIR TEMP directly from your outside air temperature gauge in degrees fahrenheit.
4. Rotate DENALT PERFORMANCE COMPUTER until reading nearest your current AIR TEMP appears in AIR TEMP window.
5. Read the PERCENT R O C opposite nearest PRESSURE ALTITUDE.
6. Multiply PERCENT R O C by the normal sea level rate of climb made by your airplane at standard conditions and present gross weight.
7. THIS figure is the RATE OF CLIMB to be expected from your airplane at your present ALTITUDE and TEMPERATURE conditions.
AIR TEMP
100
PRESSURE ALTITUDE
TAKEOFF FACTOR
14000 + 12000 + 10000 + 8000 + 6000 + 4000 2.5 2000 2.0 0 1.6 -2000 1.3 1.0
PRESSURE ALTITUDE
PERCENT ROC
14000 * 12000 * 10000 * 8000 .14 6000 .24 4000 .57 2000 .71 0 .83 -2000 1.0
AIR TEMP
80
PRESSURE ALTITUDE
TAKEOFF FACTOR
14000 + 12000 + 10000 + 8000 2.7 6000 2.3 4000 1.8 2000 1.4 0 1.2 -2000 —
PRESSURE ALTITUDE
PERCENT ROC
14000 * 12000 * 10000 * 8000 .18 6000 .50 4000 .84 2000 .78 0 .81 -2000 *
AIR TEMP
90
PRESSURE ALTITUDE
TAKEOFF FACTOR
14000 + 12000 + 10000 + 8000 + 6000 2.3 4000 1.9 2000 1.5 0 1.2 -2000 —
PRESSURE ALTITUDE
PERCENT ROC
14000 * 12000 * 10000 * 8000 * 6000 .27 4000 .61 2000 .74 0 .87 -2000 *
The DENALT PERFORMANCE COMPUTER is intended to supplement and NOT replace manufacturer's published performance information.
AIRPLANE
Standard Sea Level Performance:
Takeoff
R O C
NOTES:
+ Much greater than normal; check manufacturer's specifications.
— Less than normal distance; check manufacturer's specifications.
* General data not pertinent; check manufacturer's specifications.

FIGURE 22

DEPARTMENT OF TRANSPORTATION — FEDERAL AVIATION ADMINISTRATION

# FLIGHT PLAN

Form Approved
OMB No. 04-R0072

| 1. TYPE | 2. AIRCRAFT IDENTIFICATION | 3. AIRCRAFT TYPE/ SPECIAL EQUIPMENT | 4. TRUE AIRSPEED | 5. DEPARTURE POINT | 6. DEPARTURE TIME | | 7. CRUISING ALTITUDE |
|---|---|---|---|---|---|---|---|
| | | | | | PROPOSED (Z) | ACTUAL (Z) | |
| VFR | | | KTS | | | | |
| IFR | | | | | | | |
| DVFR | | | | | | | |

8. ROUTE OF FLIGHT

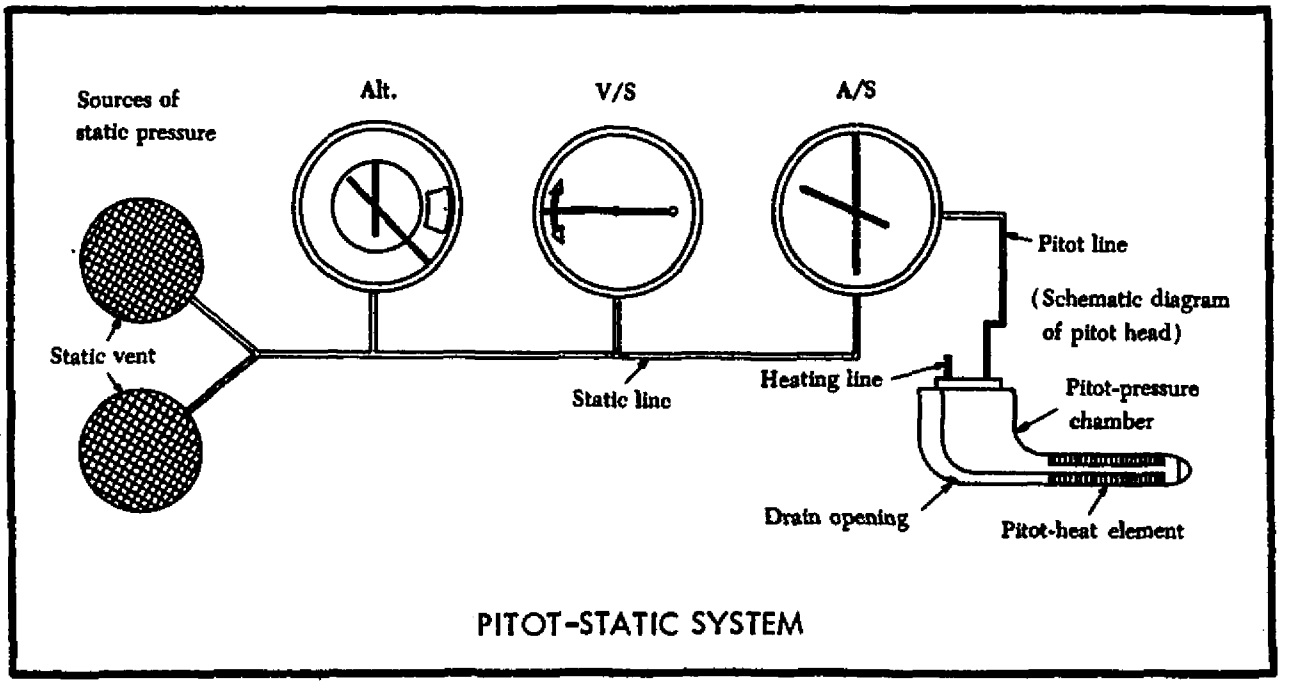
| 9. DESTINATION (Name of airport and city) | 10. EST. TIME ENROUTE | | 11. REMARKS |
|---|---|---|---|
| | HOURS | MINUTES | |

| 12. FUEL ON BOARD | | 13. ALTERNATE AIRPORT (S) | 14. PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE | 15. NUMBER ABOARD |
|---|---|---|---|---|
| HOURS | MINUTES | | | |

| 16. COLOR OF AIRCRAFT | CLOSE VFR FLIGHT PLAN WITH_____FSS ON ARRIVAL |
|---|---|

FAA Form 7233-1

FIGURE 23




PITOT-STATIC SYSTEM

FIGURE 24

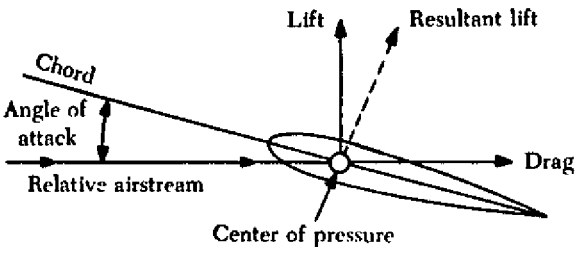



FIGURE 25

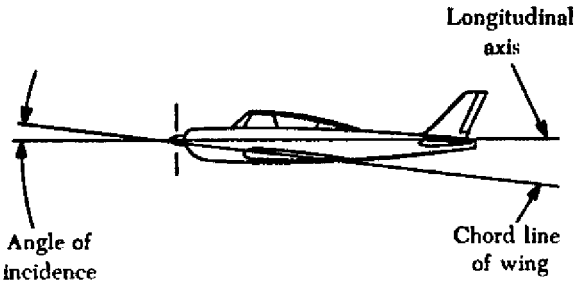



FIGURE 26

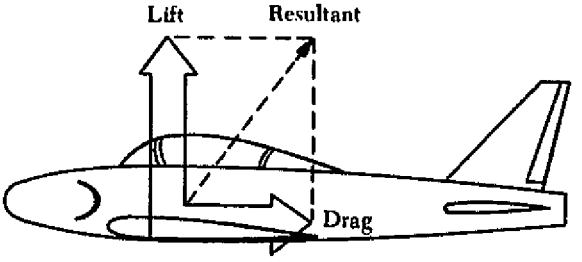



FIGURE 27.

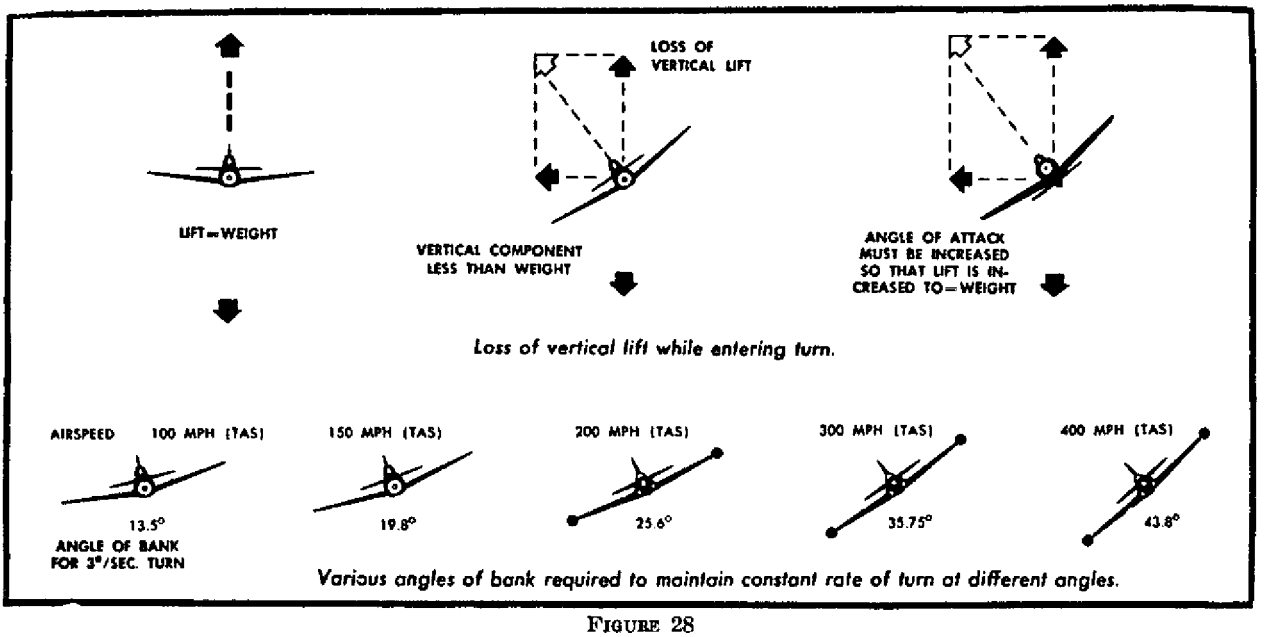



FIGURE 28

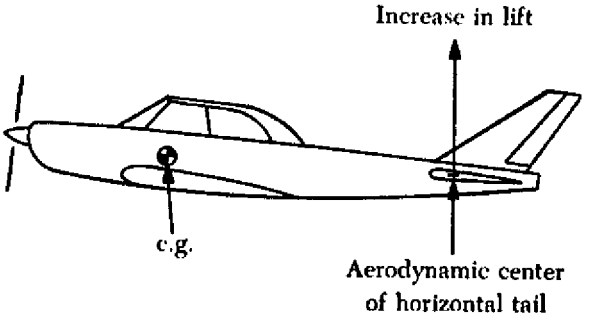
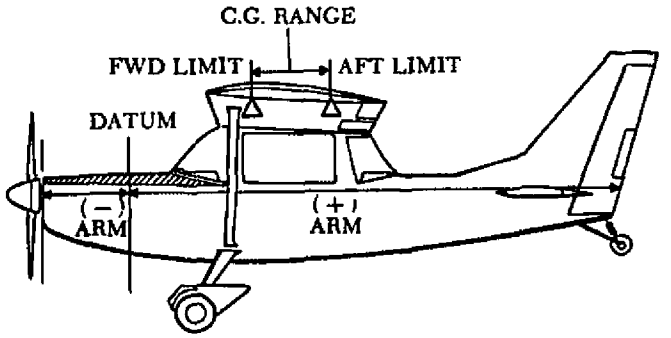


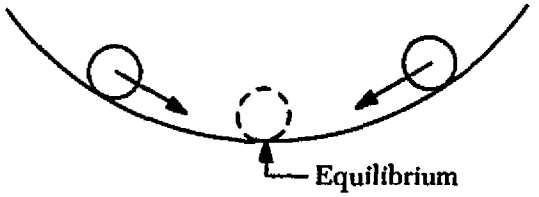

FIGURE 29.



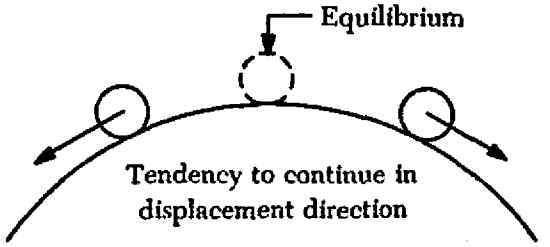

Weight and Balance

FIGURE 30

Static Stability




A. Positive Static Stability

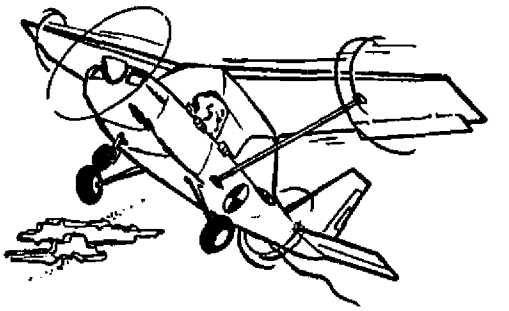



B. Negative static stabiliy or
static instability

Equilibrium encountered at
any point of displacement

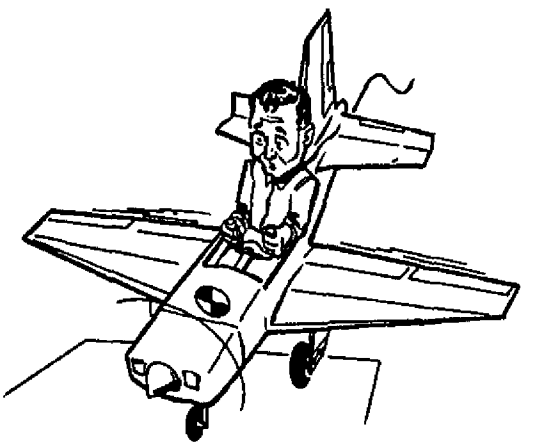
C. Neutral static stability

FIGURE 31



Aft c.g. critical in a stall.

FIGURE 32



Forward c.g. critical on landing.

FIGURE 33

SLIPSTREAM'S CORKSCREWING EFFECT

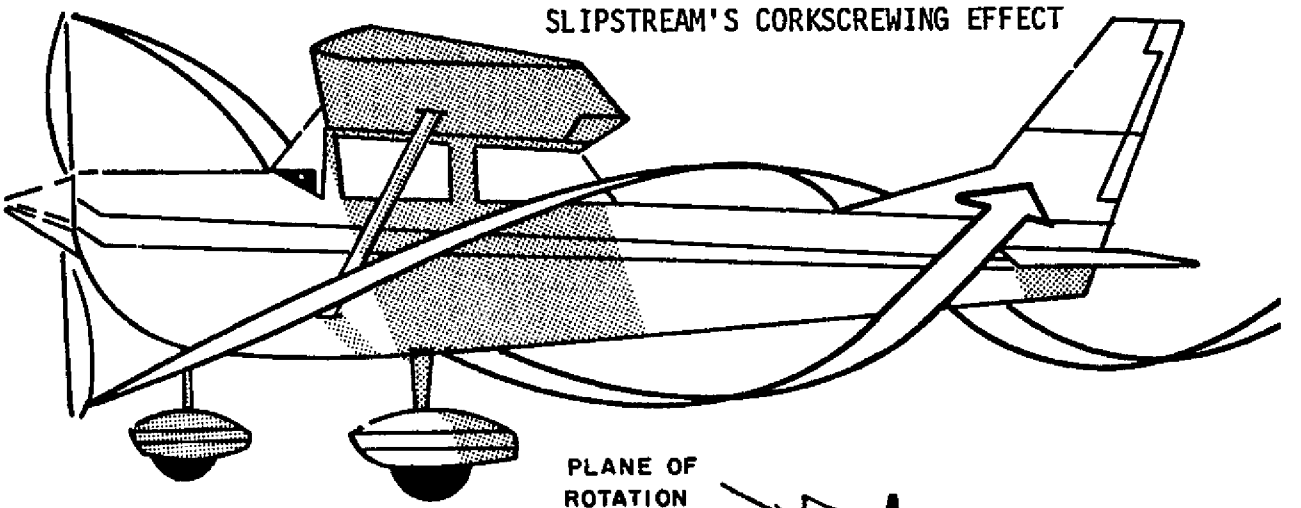
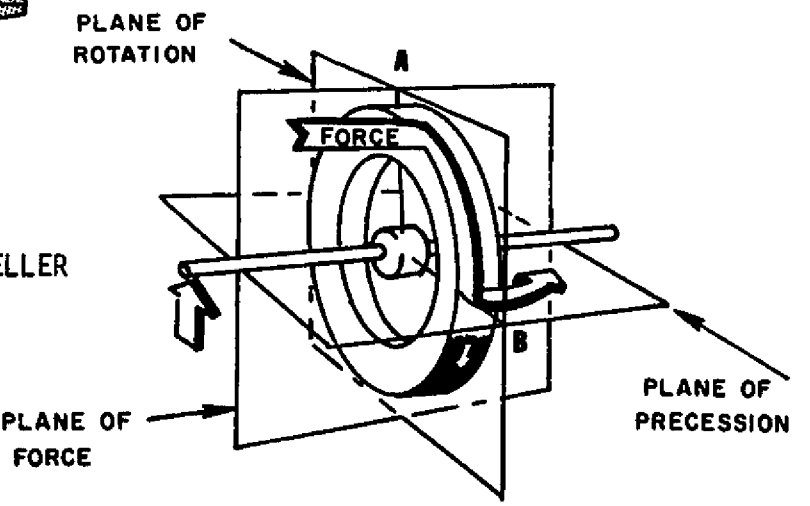


FIGURE 34

GYROSCOPIC ACTION OF THE PROPELLER



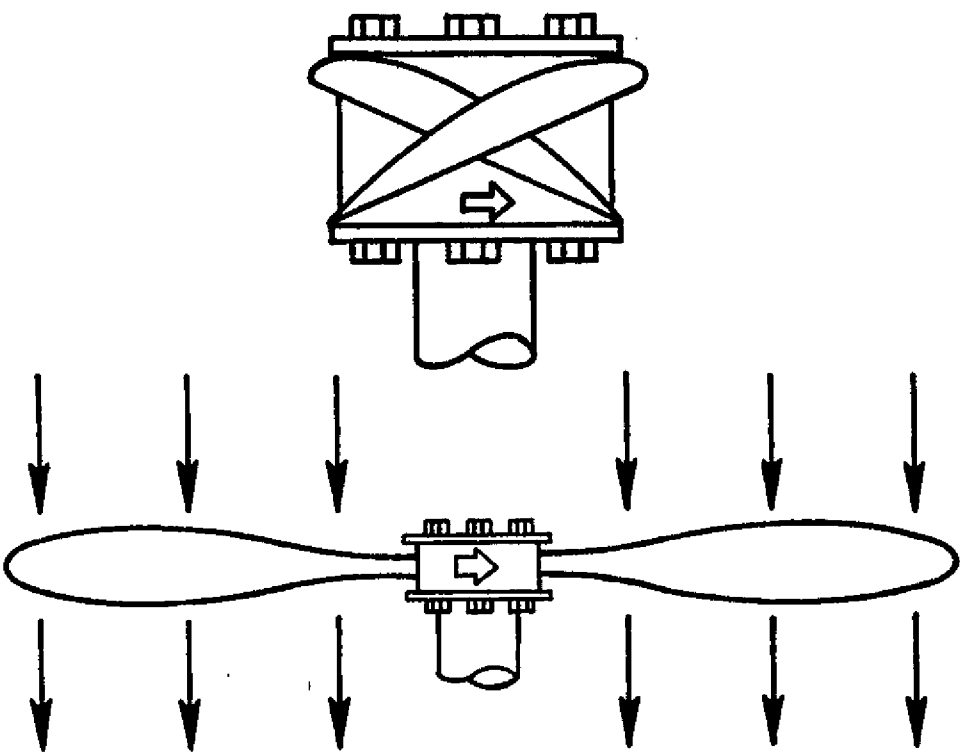
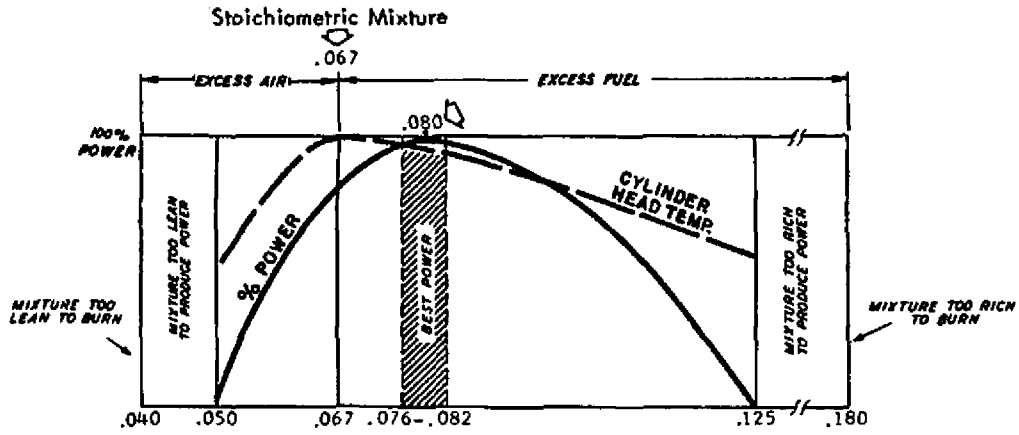
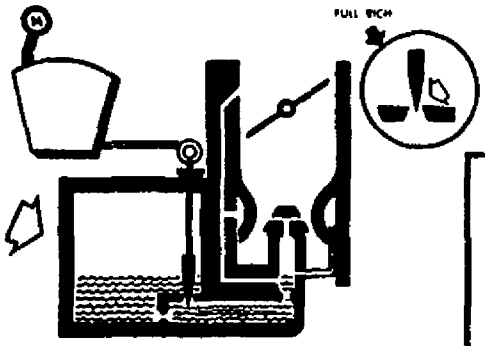



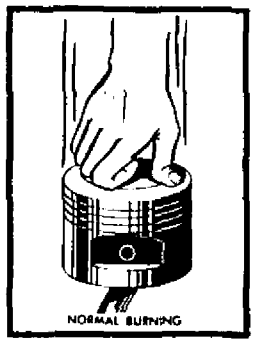
FIGURE 35

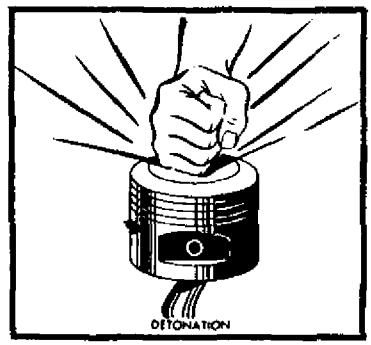



Fuel-Air Ratios vs Power & Temperature



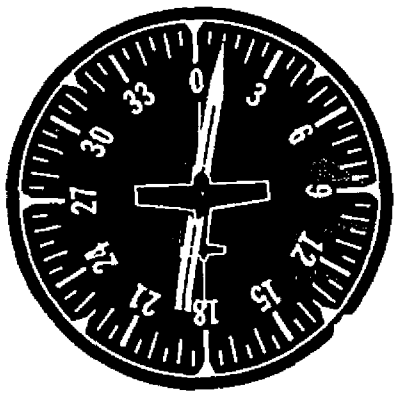

Needle Type Mixture Control System

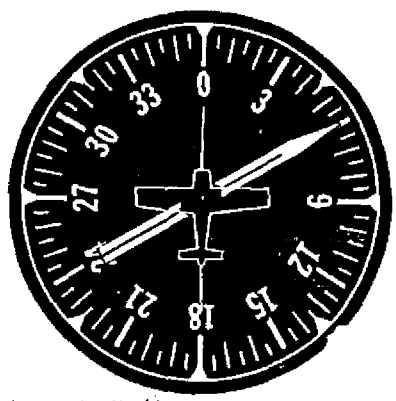



MIXTURE CONTROL - FUEL/AIR RATIO

FIGURE 36




ADF INDICATIONS (fixed-dial)

FIGURE 37

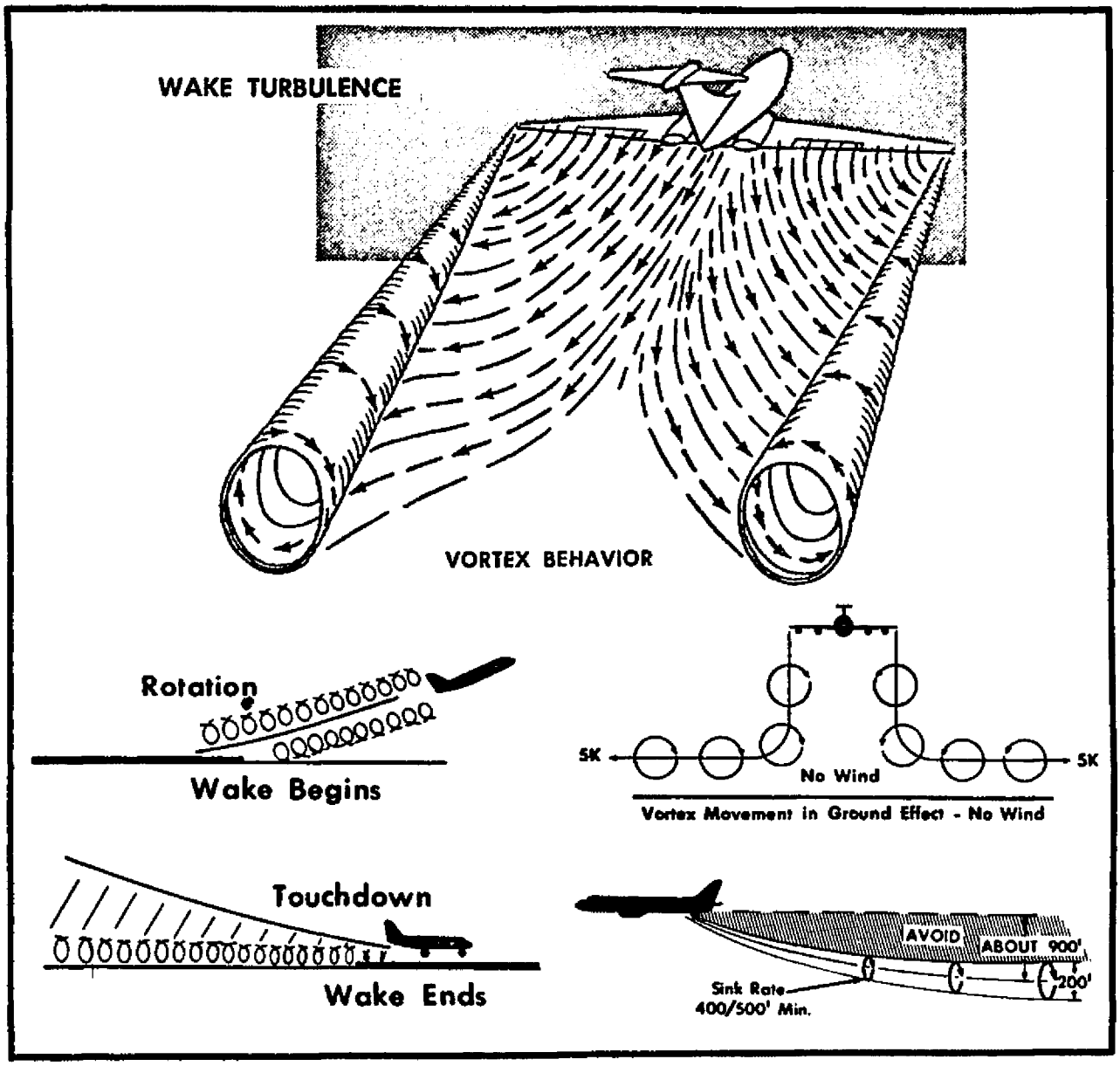



FIGURE 38

## AIRSPEED CORRECTION TABLE

| | IAS | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FLAPS UP | CAS | 55 | 58 | 65 | 72 | 82 | 91 | 101 | 110 | 120 | 129 | 139 |
| FLAPS DOWN | CAS | 48 | 54 | 63 | 72 | 82 | 93 | 105 | • | • | • | • |

FIGURE 39

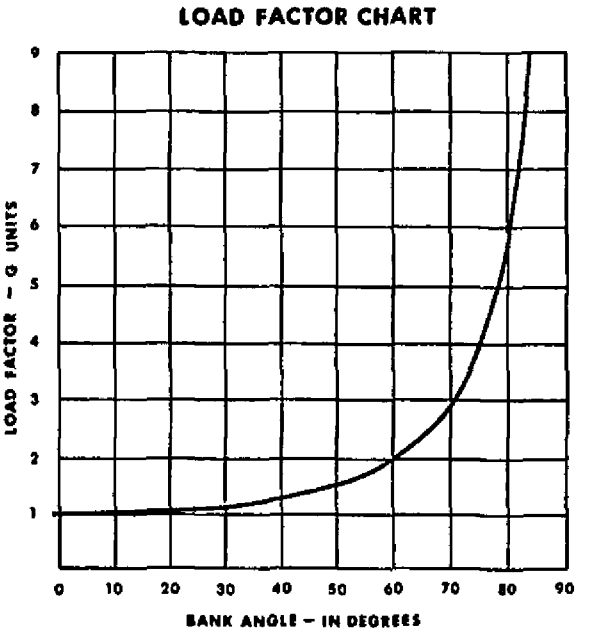



FIGURE 40

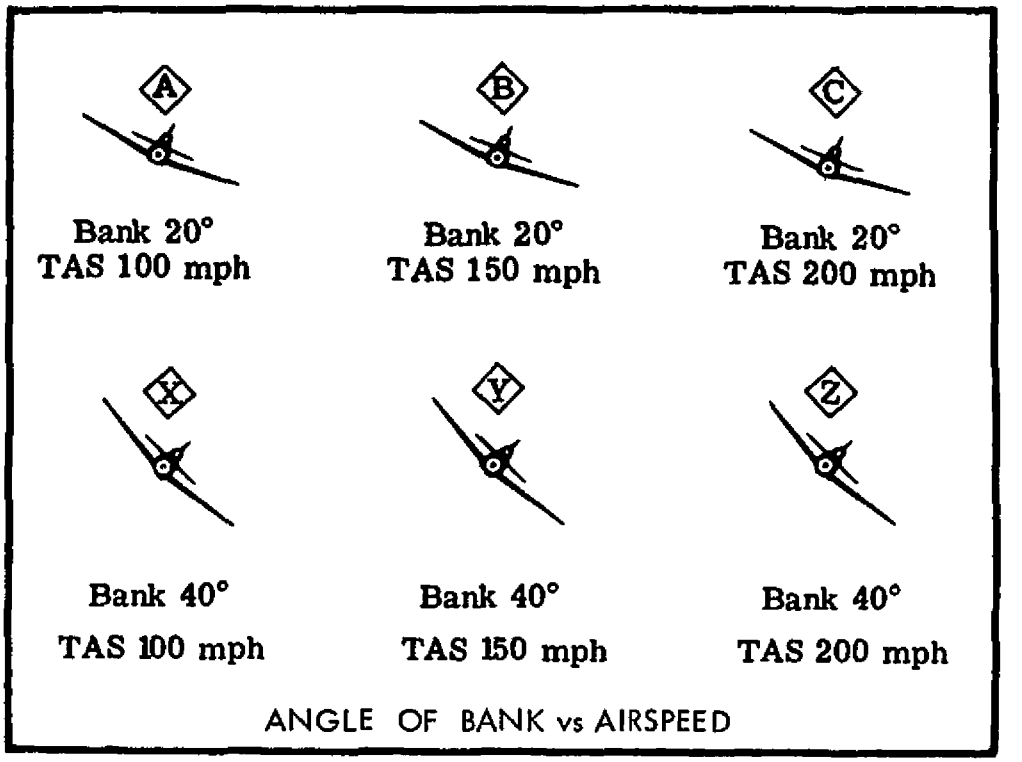



FIGURE 41

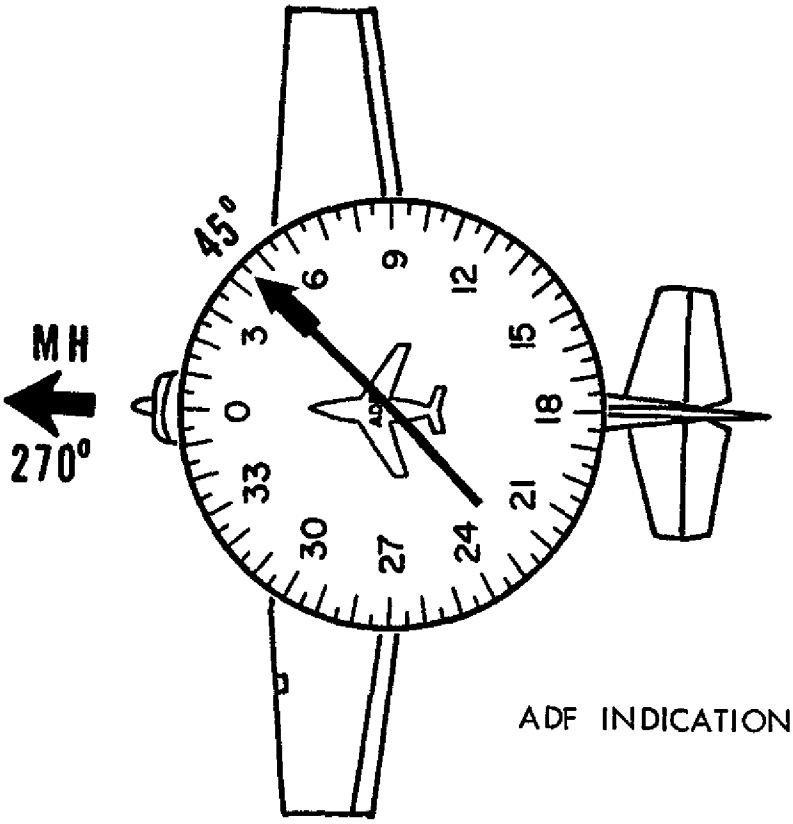



FIGURE 42

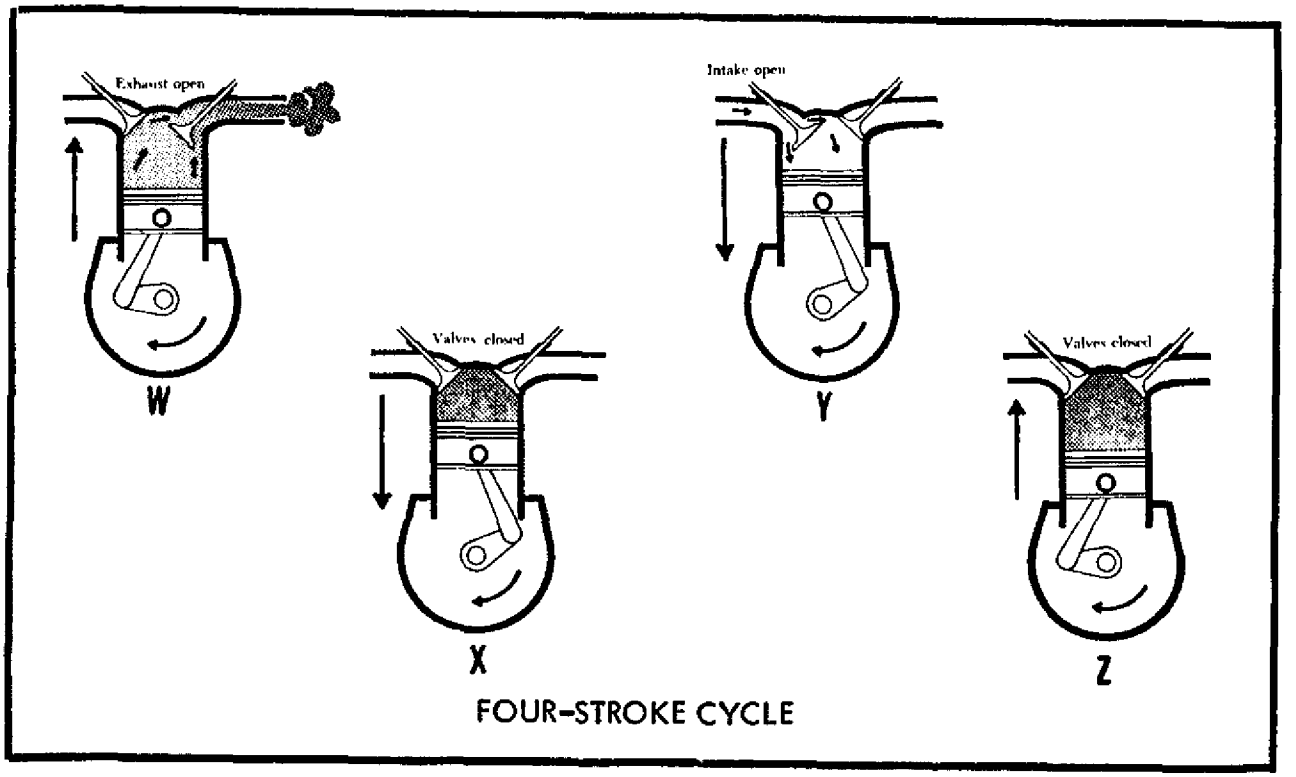



FIGURE 43

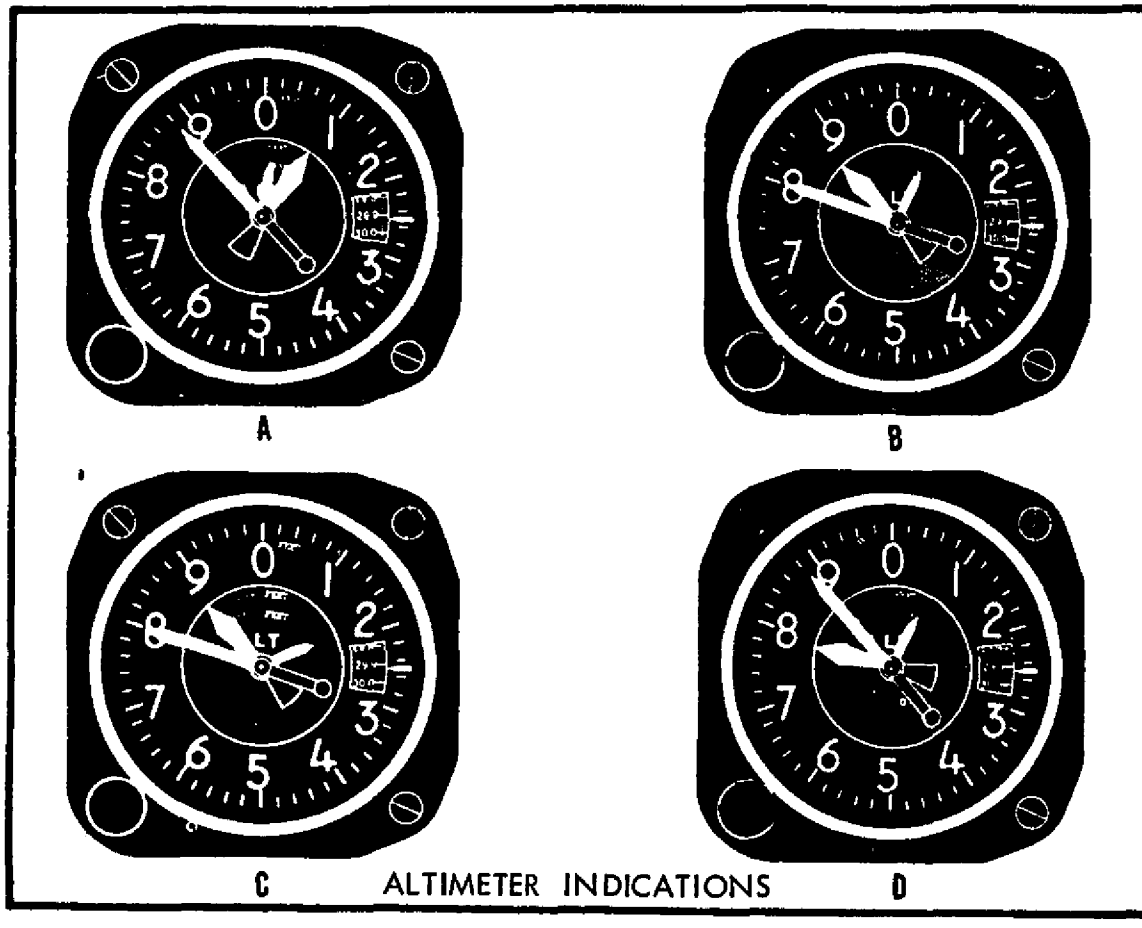
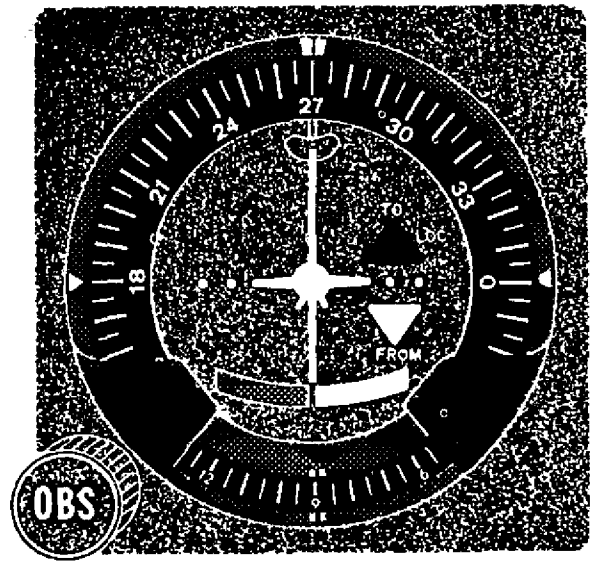



FIGURE 44




OMNIBEARING - COURSE DEVIATION INDICATOR

FIGURE 45

AIRMAN'S INFORMATION MANUAL (AIM)

Excerpt

# AIRPORT/FACILITY DIRECTORY

The Airport Directory in this publication is limited to airports with control towers and/or instrument landing systems. See Part 2 for a complete listing of all public use airports.
NOTE: All times are local time unless otherwise indicated.

## LOCATION

The airport location is given in nautical miles (to the nearest mile) and direction from center of referenced city.

## ELEVATION

Elevation is given in feet above mean sea level and is based on highest usable portion of the landing area. When elevation is sea level, elevation will be indicated as "00." When elevation is below sea level, a minus sign (−) will precede the figure.

## RUNWAYS

The runway surface length, and weight bearing capacity are listed for the longest instrument runway or sealane, or the longest active landing portion of the runway or strip, given to the nearest hundred feet, using 70 feet as the division point, i.e., 1469 feet would be shown as "14"; 1470 feet would be shown as "15". Runway lengths prefixed by the letter "H" indicates that runways are hard surfaced (concrete; asphalt; bitumen, or macadam with a seal coat). If the runway length is not prefixed, the surface is sod, clay, etc. The total number of runways available is shown in parenthesis. (However, only hard surfaced runways are counted at airfields with both hard surfaced and sod runways.)

## RUNWAY WEIGHT BEARING CAPACITY

Runway strength data shown in this publication is derived from available information and is a realistic estimate of capability at an average level of activity. It is not intended as a maximum allowable weight or as an operating limitation. Many airport pavements are capable of supporting limited operations with gross weights of 25–50% in excess of the published figures. Permissible operating weights, insofar as runway strengths are concerned, are a matter of agreement between the owner and user. When desiring to operate into any airport at weights in excess of those published in this publication, users should contact the airport management for permission.

Add 000 to figure following S, D, DT and MAX for gross weight capacity, e.g., (S-000).

S–Runway weight bearing capacity for aircraft with single-wheel type landing gear. (DC-3), etc.

D–Runway weight bearing capacity for aircraft with dual-wheel type landing gear. (DC-6), etc.

DT–Runway weight bearing capacity for aircraft with dual-tandem type landing gear. (707), etc.

Quadricycle and dual-tandem are considered virtually equal for runway weight bearing considerations, as are single-tandem and dual-wheel.

Omission of weight bearing capacity indicates information unknown. Footnote remarks are used to indicate a runway with a weight bearing greater than the longest runway.

## LIGHTING

**B: Rotating Beacon.** Green and white, split-beam and other types.

**L: Field Lighting.** An asterisk (*) may precede an element to indicate that it operates on prior request only (by phone call).

4—Low Intensity Runway
5—Medium Intensity Runway
6—High Intensity Runway
7—Instrument Approach (neon)
7A—Medium Intensity Approach Lights (MALS)
8—High Intensity Instrument Approach (ALS)
10—Visual Approach Slope Indicator (VASI)
11—Runway end identifier lights (threshold strobe) (REIL)
12—Short approach light systems (SALS)
13—Runway alignment lights (RAIL)
14—Runway centerline
15—Touchdown zone

Because the obstructions on virtually all lighted fields are lighted, obstruction lights have not been included in the codification.

## SERVICING

S2: Minor airframe repairs.
S3: Minor airframe and minor powerplant repairs.
S4: Major airframe and major powerplant repairs.
S5: Major airframe and major powerplant repairs.

## FUEL

*(Fuel data includes each grade available.)*

| Code | Grade |
|---|---|
| F12 | 80/87 |
| F15 | 91/96 |
| F18 | 100/130 |
| F22 | 115/145 |
| F30 | Kerosene, freeze point −40°F |
| F34 | Kerosene, freeze point −58°F |
| F40 | Wide-cut gasoline, freeze point −60°F |
| F45 | Wide-cut gasoline without icing inhibitor, freeze point −60°F |

## OXYGEN

| | |
|---|---|
| Ox1 | High Pressure |
| Ox2 | Low Pressure |
| Ox3 | High Pressure—Replacement Bottles |
| Ox4 | Low Pressure—Replacement Bottles |

FIGURE 46

## OTHER

**1**—NOTAM Service is provided. Applicable only to airports with established instrument approach procedures, or high volume VFR activity.

**AOE**—Airport of Entry—A customs Airport of Entry where permission from U.S. Customs is not required, however, at least one hour advance notice of arrival must be furnished.

**AVASI**—Abbreviated Visual Approach Slope Indicator—2 boxes.

**FSS**—The name of the associated FSS is shown in all instances. When the FSS is located on the named airport, "on fld" is shown following the FSS name. When the FSS can be called through the local telephone exchange, (Foreign Exchange) at the cost of a local call, it is indicated by "(LC)" (local call) with the phone number immediately following the name of the FSS, i.e., "FSS: WICHITA (LC481-5867)." When an Interphone line exists between the field and the FSS, it is indicated by "(DL)" (direct line) immediately following the name of the FSS, i.e., "FSS: OTTO (DL)."

**IFR**—Airport with approved FAA Standard Instrument Approach Procedure.

**LRA**—Landing Rights Airport—Application for permission to land must be submitted in advance to U.S. Customs. At least one hour advance notice of arrival must also be furnished.

**REIL**—Runway end identifier lights (threshold strobe).

**RVV**—Runway Visibility Values, applicable runway provided.

**RVR**—Runway Visual Range, applicable runway provided.

**TPA**—Traffic Pattern Altitude—This information is provided for only those airports without a 24-hour operating control tower or FSS.

**TRI-VAS**—Tri-Color Visual Approach Slope Aid.

**VASI**—Visual Approach Slope Indicator, applicable runway provided.

**TCH**—Threshold Crossing Height.

**RRP**—Runway Reference Point.

## AIRPORT REMARKS

**Aircraft Categories**—*Category I*—Light-weight, single-engine, personal-type propeller driven aircraft. (Does not include higher performance single-engine aircraft such as the T-28.)

*Category II*—Light-weight, twin engine, propeller driven aircraft weighing 12,500 pounds or less such as the Aero Commander, Twin Beechcraft, DeHavilland Dove, Twin Cessna. (Does not include such aircraft as a Lodestar, Learstar, DC-3).

*Category III*—All other aircraft such as the higher performance single-engine, heavy twin-engine, four engine and turbojet aircraft.

**"FEE"** indicates landing charges for private or non-revenue producing aircraft. In addition, fees may be charged for planes that remain over a couple of hours and buy no services, or at major airline terminals for all aircraft.

**"Rgt tfc 13–31"** indicates right turns should be made on landings and takeoffs on runways 13 and 31.

Remarks data are confined to operational items affecting the status and usability of the airport, traffic patterns and departure procedures.

**Obstructions.**—Because of space limitations only the more dangerous obstructions are indicated. Natural obstructions, such as trees, clearly discernible for contact operations, are frequently omitted. On the other hand, all pole lines within at least 15:1 glide angle are indicated.

## FLIGHT SERVICE STATIONS

Flight Service Station (FSSs) and Combined Station/Tower (CS/Ts) are listed alphabetically by state in the Airport/Facility Directory. At certain locations the preflight briefing and flight plan processing responsibilities of the CS/T have been reassigned to an adjacent FSS. At these locations the adjacent FSS will be listed as the 'Associated FSS,' otherwise, the CS/T will be listed. Limited Remote Communications Outlet (LRCO) and Remote Communications Outlet (RCO), where available at the facility, are shown following the three letter identifier. If located at other than a facility site they are listed alphabetically.

FSSs and CS/Ts provide information on airport conditions, radio aids and other facilities, and process flight plans. Airport Advisory Service is provided at the pilot's request on 123.6 by FSSs located at non-tower airports or when the tower is not in operation. (See Part 1, ADVISORIES AT NON TOWER AIRPORTS.)

Aviation weather briefing service is provided by FSSs and CS/Ts; however, CS/T personnel are not certified weather briefers and therefore provide only factual data from weather reports and forecasts. Flight and weather briefing services are also available by calling the telephone numbers listed in the chapter entitled 'FSS-CS/T Information and Weather Service Office Telephone Numbers,' located in Part 2."

**Limited Remote Communications Outlet (LRCO)**—Unmanned satellite air/ground communications facility, which may be associated with a VOR. These outlets effectively extend service range of the FSS and provide greater communication reliability.

**Remote Communications Outlet (RCO)**—An unmanned satellite air to ground communications stations remotely controlled and providing UHF and VHF communications capability to extend the service range of an FSS.

**Civil communications frequencies used in the FSS air/ground system are now operated simplex on 122.0, 122.2, 122.3, 122.4, 122.6, 122.7, 123.6; emergency 121.5; plus receive-only on 122.05, 122.1, 122.15 and 123.6.**

**a. 122.0 is assigned to selected FSSs as a weather channel for both general aviation and air carrier.**

**b. 122.2 is assigned to all FSSs as a common en route simplex service.**

**c. 123.6 is assigned as the airport advisory channel at non-tower FSS locations, however, it is still in commission at some FSSs collocated with towers to provide part-time Airport Advisory Service.**

**d. 122.1 is the primary receive-only frequency at VORs. 122.05, 122.15 and 123.6 are assigned at selected VORs meeting certain criteria.**

**e. Some FSSs are assigned 50KHz channels for simplex operation in the 122–123 MHz band (e.g. 122.35).**

**Pilots using the FSS A/G system should refer to this directory or appropriate charts to determine frequencies available at the FSS or remoted facility through which they wish to communicate.**

Part time FSS hours of operation are shown in remarks under facility name.

## COMMUNICATIONS

Clearance is required prior to taxiing on a runway, taking off, or landing at a tower controlled airport.

When operating at an airport where the control tower is operated by the U.S. Government, two-way radio communication is required unless otherwise authorized by the tower. (When the tower is operated by someone other than the U.S. Government, two-way radio com-

FIGURE 47

munication is required if the aircraft has the necessary equipment.

Frequencies transmit and receive unless specified as: T—Transmit only, R—Receive only, X—On request. **Primary frequencies are listed first in each frequency grouping, i.e., VHF, LF.** Emergency frequency 121.5 is available at all TOWER, APPROACH CONTROL and RADAR facilities, unless indicated as not available in remarks.

## COMMUNICATIONS REMARKS

Remarks data are confined to operational items affecting the status and usability of navigational aids, such as: ILS component restrictions, part time hours of operation, frequency sectorization, VOT frequencies.

## VOICE CALL

The voice call for contact with the air traffic control tower is listed at each airport assigned such a facility.

## SERVICES AVAILABLE

**TOWER**

Pre-Taxi Clearance Procedure
Clearance Delivery (CLRNC DEL).
Approach Control (App Con) Radar and Non-Radar.
Departure Control (Dep Con) Radar and Non-Radar.
VFR Advisory Service (VFR Adv) Service provided by Non Radar Approach Control.
Radar Advisory Service for VFR Acft (Stage I).
Radar Advisory and Sequencing Service for VFR Acft (Stage II).
Radar Sequencing and Separation Service for participating VFR Aircraft, (Stage III-Terminal Radar Service Area (TRSA)).
Radar Sequencing and Separation Service for all aircraft in a Terminal Control Area (TCA).
Ground Control (GND CON).
VHF Direction Finding (VHF/DF).

**RADIO NAVIGATION AIDS**

Included in this section is a tabulation listed by facility name of all Air Navigation Radio Aids in the National Airspace System and those upon which the FAA has approved an instrument approach. Private or military Navigation Radio Aids not in the National Airspace System are not tabulated.

**AUTOMATIC TERMINAL INFORMATION SERVICE (ATIS)**

ATIS is continuous broadcast of recorded non-control information in selected areas of high activity. See Part 1.

**FLIGHT SERVICE STATION (FSS)**

Airport Advisory Service (AAS).
En Route Weather Advisory Service (Flight Watch).
Island, Mountain and Lake Reporting Service.
Remote Weather Radar Display (WR).
VHF Direction Finding (DF).

**UNICOM**

A private aeronautical advisory communications facility operated for purposes other than air traffic control, transmits and receives on one of the following frequencies:

U-1—122.8 MHz for Landing Areas (except heliports) without an ATC Tower or FSS;
U-2—123.0 MHz for Landing Areas (except heliports with an ATC Tower or FSS;
U-3—123.05 MHz for heliports with or without ATC Tower or FSS;
U-4—122.85 MHz for landing areas not open to the public;
U-5—122.95 MHz for landing areas not open to the public.

**NOTE.—UNICOM used for communications must be licensed by the Federal Communications Commission.**

## RADIO CLASS DESIGNATIONS

**Identification of VOR/VORTAC/TACAN Stations by Class (Operational Limitations):**

**Normal Usable Altitudes and Radius Distances**

| Class | Altitudes | Distance (miles) |
|---|---|---|
| T | 12,000′ and below | 25 |
| L | Below 18,000′ | 40 |
| H | Below 18,000′ | 40 |
| H | 14,500′ — 17,999′ | 100* |
| H | 18,000′ — FL 450 | 130 |
| H | Above FL 450 | 100 |

***Applicable only within the contiguous 48 States.**

(H) = High (L) = Low (T) = Terminal

**NOTE: An H facility is capable of providing L and T service volume and an L facility additionally provides T service volume.**

The term VOR is, operationally, a general term covering the VHF omnidirectional bearing type of facility without regard to the fact that the power, the frequency-protected service volume, the equipment configuration, and operational requirements may vary between facilities at different locations.

AB ——— Automatic Weather Broadcast (also shown with ■ following frequency).
B ——— Scheduled Broadcast Station (broadcasts weather at 15 minutes after the hour.
DME ——— UHF standard (TACAN compatible) distance measuring equipment.
H ——— Non-directional radio beacon (homing), power 50 watts to less than 2,000 watts.
HH ——— Non-directional radio beacon (homing), power 2,000 watts or more.
H-SAB ——— Non-directional radio beacons providing automatic transcribed weather service.
ILS ——— Instrument Landing System (voice, where available, on localizer channel).
LDA ——— Localizer Directional Aid.
LMM ——— Compass locator station when installed at middle marker site.
LOM ——— Compass locator station when installed at outer marker site.
MH ——— Non-directional radio beacon (homing) power less than 50 watts.
S ——— Simultaneous range, homing signal and/or voice.
SABH ——— Non-directional radio beacon not authorized for IFR or ATC. Provides automatic weather broadcasts.
SDF ——— Simplified Direction Facility.
TACAN ——— UHF navigational facility—omnidirectional course and distance information.
VOR ——— VHF navigational facility—omnidirectional, course only.
VOR/DME — Collocated VOR navigational facility and UHF standard distance measuring equipment.
VORTAC — Collocated VOR and TACAN navigational facilities.
W ——— Without voice on radio facility frequency.
Z ——— VHF station location marker at a LF radio facility.

FIGURE 48

AIRMAN'S INFORMATION MANUAL (AIM)
Excerpt

# AIRPORT/FACILITY DIRECTORY

## SAMPLE

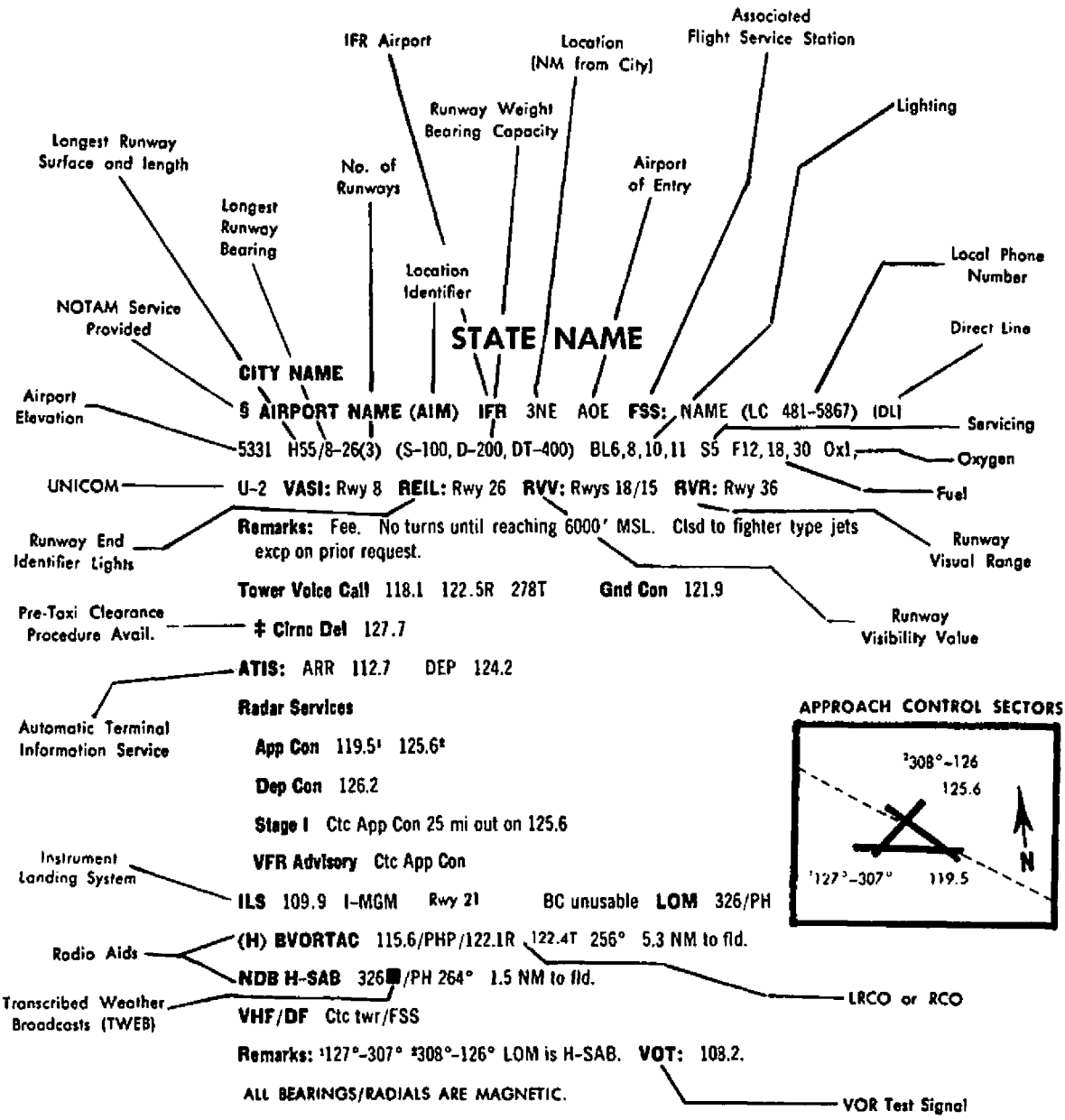



FIGURE 49

## ALABAMA—Continued

**MUSCLE SHOALS FSS** 121.5 122.1R 122.2 122.4T 123.6 **DF**

**§ MUSCLE SHOALS *IFR* (MSL)** 1E **FSS:** MUSCLE SHOALS on fld 550 H60/11-29(2) (S-38, D-53, DT-75) BL5,6 S5 F12,18,34 Ox2 U2
**Remarks:** Rwy 18-36 (S-53, D-78, DT-135). Attended daylight hrs, ngts phone 766-2203, ngt service charge. During a calm wind condition the preferred rwy is 29.
**Radar Services:**
**Huntsville App Con** 120.35 118.75
**Huntsville Dep Con** 120.35 118.75
**ILH** 109.7 I-MSL Rwy 29
**Muscle Shoals (L) BVORTAC** 116.5/MSL 289° 5.7NM rwy 29
**VHF/DF** Ctc FSS.
**Remarks:** GS not cmsnd.

**ROEBUCK NDB MHW** 201/ROE **FSS:** BIRMINGHAM

**SARATOGA NDB MHW** 296/ARF **FSS:** ANNISTON
**Remarks:** Non-federal facility.

**TALLADEGA (L) BVORTAC** 108.8/TDG/122.05R **FSS:** ANNISTON

**§ TROY MUNI (TOI) *IFR*** 5NW **FSS:** DOTHAN (DL)
399 H50/7-25(3) (S-50, D-80, DT-140) BL5 S5 F12,18 U-1
**Remarks:** Attended Mon-Fri 0600-1700 except holidays, other times ctc FBO. Extensive helicopter operations approach end rwy 32 0700-2100 lcl. Unmrkd dsplcd thr rwy 14R.
**Troy Tower** 124.3 134.95
**Radar Services:**
**Cairns App Con** 125.8 133.45
**ILS** 108.9 I-TOI Rwy 7 BC unusable **LOM:** 365/TO
**NDB MHW** 066° 4.6NM to rwy 7 (see Youngblood).
**Remarks:** Twr opers 0600-1800 Mon-Fri except holidays. ILS unmonitored when twr not in opern, GS unusable below 588' MSL. Rwy 7 LOM is Youngblood NDB.

**TUSCALOOSA FSS** 123.6

**§ TUSCALOOSA MUNI (TCL) *IFR*** 3NW **FSS:** TUSCALOOSA on Fld 169 H65/4-22(2) (S-90, D-120, DT-190) BL5,6 S5 F12,18,34 Ox2
**Remarks:** Rwy 11 clsd for tkof 1800-1000. 500' stopway each end rwy 11-29.
**Tuscaloosa Tower** 126.3 **Gnd Con** 121.8
**Radar Services:**
**Birmingham App Con** 124.5
**ILS** 109.1 I-TCL Rwy 4 **LOM:** 362/TC
**Tuscaloosa (L) BVORTAC** 117.8/TCL 238° 4.0NM to rwy 4.
**Remarks:** Twr operates 1000-1800, FSS provides AAS other hrs on 126.3.

**TUSKEGEE (L) BVORTAC** 117.3/TGE/122.1R **FSS:** MONTGOMERY

**WHITESBURG NDB MHW** 407/ITS **FSS:** MUSCLE SHOALS

**WILMER NDB BH** 248/MO **FSS:** MOBILE

**YOUNGBLOOD NDB MHW** 365/TO **FSS:** DOTHAN
**Remarks:** NDB unmonitored SS-0700 weekdays and weekends.

## ALASKA

A separate publication titled ALASKA SUPPLEMENT is issued every 28 days for Alaska.

## ARIZONA

**BUCKEYE (L) BVORTAC** 110.6/BXK/122.1R **FSS:** PHOENIX

**CASA GRANDE (H) BVORTAC** 114.8/CZG/122.1R **FSS:** PHOENIX

**COCHISE (H) BVORTAC** 115.8/CIE/122.1R **FSS:** DOUGLAS

**DOUGLAS FSS** 121.5 122.1R 122.2 122.6 123.6
**Remarks:** No wea bcst avbl 2200-0500 lcl time.

**DOUGLAS (L) BVORTAC** 108.8/DUG **FSS:** DOUGLAS

**FLAGSTAFF (L) BVOR** 108.2/FLG/126.65R **FSS:** PRESCOTT

## ARIZONA—Continued

**FORT HUACHUCA/SIERRA VISTA**
**§ LIBBY AAF/SIERRA VISTA MUNI (FHU) *IFR*** 3N **FSS:** DOUGLAS
4664 H53/11-29(2) BL5 F12,18
**Remarks:** Attended daylight. Rgt tfc rwys 20, 29.
**Libby Tower** 118.9 122.5R **Gnd Con** 121.7
**Fort Huachuca (T) VOR** 111.6/FHU on fld
**Fort Huachuca NDB H** 410/FHU on fld
**Remarks:** Twr opers 0600-2200 Mon-Fri, 0700-1700 Sat, Sun and holidays.

**GILA BEND (H) BVORTAC** 116.6/GBN/121.5 122.1R 122.6 **FSS:** PHOENIX

**GLOBE LRCO** 122.3 **FSS:** PHOENIX

**GOODYEAR**
**§ PHOENIX-LITCHFIELD MUNI (GYR)** 1SW **FSS:** PHOENIX (LC 261-4295)
968 H85/3-21(1) (S-60, D-80, DT-140) BL5 S5 F12,18,22,30 U2
**Remarks:** Rwy 21 threshold displaced 2000'. Rgt tfc rwy 21 for acft approaching from West at 2000' or below, otherwise left tfc pattern. TRI-VAS rwy 21.
**Litchfield Tower** 120.1 **Gnd Con** 121.7
**Radar Services:**
**Phoenix App Con** 120.7
**Remarks:** Twr opers 0600-2300. Two-way rdo required. Freq 121.5 not avbl.

**§ GRAND CANYON NATIONAL PARK (GCN) *IFR***
7S **FSS:** PRESCOTT
6605 H90/3-21(1) (S-40, D-50, DT-80) BL5 S3 F12,18,30 U1
**Remarks:** TRI-VASI: Rwys 3, 21.
**Grand Canyon Tower** 119.0 **Gnd Con** 121.9
**Grand Canyon (L) BVOR** 109.0/GCN/122.1R 090° 0.3NM to fld
**Remarks:** Twr opers 0800-1600. Twr clsd Oct-June.

**IMPERIAL LRCO** 122.6 **FSS:** IMPERIAL

**KINGMAN (L) BVOR** 108.8/IGM/122.1R **FSS:** PRESCOTT

**NOGALES RCO** 122.4 **FSS:** TUCSON

**PAPAGO NDB H-SAB** 326■/PQO **FSS:** PHOENIX

**PEACH SPRINGS (H) BVORTAC** 112.0/PGS/122.15R **FSS:** PRESCOTT

**PHOENIX FSS** 121.5 122.1R 122.2 122.6 122.05 **DF**
**Remarks:** No wea bcst avbl 2200-0600 lcl time.

**PHOENIX**
**DEER VALLEY MUNICIPAL (P09)** 17N **FSS:** PHOENIX
1475 H51/7-25(1) (S-30, D-45, DT-60) BL4 S5 F12,18 U-2
**Remarks:** 5150 x 60 extension E end clsd, but avbl on prior request. Glider operns in vicinity of arpt Sat & Sun 1100-Sunset.
**Deer Valley Tower** 118.4 **Gnd Con** 121.8
**Remarks:** Twr opers 0700-1900 lcl Mon-Fri, dawn-dusk Sat and Sun. Non-federal facility.

**PHOENIX**
**§ SKY HARBOR INTL (PHX) *IFR*** 3E LRA **FSS:** PHOENIX on Fld 1128 H103/8R-26L(2) (S-100, D-200, DT-350) BL5,6,7A,11,13 S5 F12,18,30,34 Ox1,2,3,4 U2 **REIL:** Rwy 8L, 26R **RVV:** Rwy 8R
**Remarks:** Rgt tfc rnwys 8R, 26R. Rnwy 26L threshold displaced 706'. Unless advised by ATC all turbine acft and acft 12,500 lbs and over remain at or above 3,000' MSL until established on final. Fly base leg at least 5 mi from arpt.
**Phoenix Tower** 118.7 (Rwy 8L-26R) 120.9 (Rwy 8R-26L) **Gnd Con** 121.9
**‡ Clrnc Del** 118.1
**ATIS:** 125.6
**Radar Services:**
**Phoenix App Con** 119.2 (010-109°), 124.1 (110-269°), 120.7 (270-009°), 115.6T
**Phoenix Dep Con** 119.2 (010-109°), 124.1 (110-269°), 120.7 (270-009°), 115.6T

FIGURE 50

AIM Excerpt

# AIRPORT/FACILITY DIRECTORY

## ARIZONA—Continued

**PHOENIX—(Continued)**

Stage I Ctc App Con beyond 10 miles
ILS 108.3 I-PHX Rwy 8R
Phoenix (H) BVORTAC 115.6/PHX 256° 5.3 NM to fld.
Remarks: No wea bcst avbl 2200–0600. VOT: 109.0.

**PRESCOTT FSS** 121.5 122.15R 122.2 122.4 123.6 **DF**
Remarks: No wea bcst avbl 2200–0500 lcl time.

**PRESCOTT (H) BVORTAC** 114.1/PRC **FSS: PRESCOTT**

**RYAN NDB H-SAB** 338■/RYN **FSS: TUCSON**

**ST. JOHNS (H) BVORTAC** 112.3/SJN/122.1R **FSS: GALLUP**

**SAN SIMON (H) BVORTAC** 115.4/SSO/122.1R **FSS: DOUGLAS**

**TUBA CITY (H) BVORTAC** 113.5/TBC/122.05R **FSS: PRESCOTT**

**TUCSON LRCO** 122.4 **FSS: TUCSON**

**TUCSON FSS** 121.5 122.1R 122.2 122.7 123.65 **DF**
Remarks: No wea bcst avbl 2200–0500.

§ **TUCSON INTL (TUS)** *IFR* 7S AOE **FSS: TUCSON** on Fld
2630 H120/11L-29R(3) (S-160, D-205, DT-305) BL5,10 S5 F12,18,22,30,40 Ox1,2,3,4 U2 **VASI:** Rwy 29R
Remarks: Rwy 11L threshold displaced 1100'. 1000' asph overrun each end rwy 11L-29R. Lndg fee. J-bar rwy 11L-29R. VASI rwy 29R upper TCH 78', lower TCH 42'; upper RRP 1690', lower RRP 1090'.
Tucson Tower: 118.3 **Gnd Con** 121.9
Radar Services:
App Con 118.5 (121–299°) 125.1 (300–120°) 134.1 117.1T
Dep Con 118.5 (121–299°) 125.1 (300–120°)
Stage II Ctc App Con 25 NM out on 125.9 (300–120°) 30 NM out on 124.0 (121–299°)
ILS 108.5 I-TUS Rwy 11L
VHF/DF Ctc FSS.
(H) BVORTAC 117.1/TUS 254° 6.1 NM to fld.
Remarks: VHF/DF unusable beyond 40 NM below 13,500' MSL 345–070° below 12,500' MSL 070–090°.

**VERDE LRCO** 122.7 **FSS: PRESCOTT**

**WINSLOW (H) BVORTAC** 112.6/INW/122.15R 122.6 **FSS: PRESCOTT**

**YUMA FSS** 121.5 122.1R 122.2 122.3
Remarks: No sked wea bcst 2200–0500 lcl time.

§ **YUMA MCAS/INTL (YUM)** *IFR* 4S AOE **FSS: YUMA** on Fld
213 H133/3L-21R(4) (S-103, D-200, DT-400) BL6 S5 F12,18,30 Ox1, 2
Remarks: Attended daylight. Rwy 3R-21L GWT (S-162, D-200, DT-400). 1000 overrun each end rwy 3L-21R. A-gear rwys 3L-21R and 3R-21L. 2300–0600 civil rwy will remain lgtd and addnl lgtg avbl thru FSS in emerg. TPA-jets 1700' MSL, props 1200' MSL, helicopters 700' MSL. Rgt tfc rwy 3L, 3R, 8, 26, 17.
Marine Yuma Tower 119.3 126.2 **Gnd Con** 121.9
‡ Clmc Del 121.9
App Con 120.0
ILS 108.3 I-YUM Rwy 21R
VHF/DF Ctc twr.
(H) BVORTAC 116.8/YUM 167° 6.0NM to fld.
Remarks: Twr opers 0600–2300 except avbl for emgcy, FSS provides AAS other hrs on 119.3. Rwy 21R ILS unmonitored 2300–0600.

## ARKANSAS

**ARKADELPHIA NDB MHW** 275/ADF **FSS: PINE BLUFF**
Remarks: Non-federal facility.

**BATESVILLE NDB MHW** 317/BVX **FSS: JONESBORO**
Remarks: Non-federal facility.

**BLYTHEVILLE (L) VOR** 111.8/BYH **FSS: DYERSBURG**
**NDB HW** 311/BYH

## ARKANSAS—Continued

**BRUINS NDB MHW** 215/BSA **FSS: MEMPHIS**

**CAMDEN NDB MHW** 335/CDH **FSS: EL DORADO**
Remarks: Non-federal facility.

**CHEROKEE VILLAGE NDB MHW** 344/CVK **FSS: JONESBORO**
Remarks: Non-federal facility.

**DeQUEEN NDB MHW** 281/DEQ **FSS: TEXARKANA**

**CROSSETT NDB MHW** 396/CRT **FSS: EL DORADO**
Remarks: Non-federal facility.

**DRAKE (T) BVOR** 108.8/DAK **FSS: FAYETTEVILLE**

**ELDORADO FSS** 121.5 122.1R 122.2 123.6 **DF**

**EL DORADO (L) BVORTAC** 108.2/ELD **FSS: EL DORADO**

**FAYETTEVILLE FSS** 121.5 122.2 122.3 **DF**

**FAYETTEVILLE**
§ **DRAKE FLD (FYV)** *IFR* 4S **FSS: FAYETTEVILLE** on Fld
1251 H60/16-34(1) (S-40, D-60, DT-102) BL5 S5 F12,18,30 U-1
Remarks: Attended dalgt hrs.
Drake Tower 118.5 **Gnd Con** 121.8
LOC 111.9 I-FYV Rwy 16
Fayetteville (H) BVORTAC 116.4/FYV/122.1R
Remarks: FSS provides AAS on 118.5 when twr clsd. Twr opers 0800–2000.

**FLIPPIN (L) BVOR** 115.1/FLP/121.5 122.1R 122.6 122.2 **FSS: HARRISON**

**FORREST CITY NDB MHW** 332/FCY **FSS: MEMPHIS**
Remarks: Monitored 0700–2200 lcl Mon-Sat.

**FORT SMITH CS/T** 121.5 122.1R 122.6 122.2

§ **FORT SMITH MUNI (FSM)** *IFR* 4SE **FSS: FAYETTEVILLE (LC 782-0343)**
468 H80/7-25(2) (S-75, D-170, DT-300) BL5,6,8,10 S5 F12,18,22,30 U2 **RVV:** Rnwy 25 **VASI:** Rwy 7
Remarks: Attended 0600–2200. Fuel avbl on req after 2200, and fee. A-gear rwy 7-25. Arresting Cable rwwy 25 1000' from threshold.. VASI rwy 7 TCH 46' RRP 1000'.
Fort Smith Tower 118.3 **Gnd Con** 121.9
App Con 125.4 110.4T
ILS 109.5 I-FSM Rwy 25 **LOM:** 223/FS
Fort Smith (L) BVORTAC 110.4/FSM 226° 5.2NM to fld.
Fort Smith NDB HW 223/FS 254° 6.9NM to fld.
Remarks: Rwy 25 LOM is Fort Smith NDB.

**HARRISON FSS** 121.5 122.1R 122.2 123.6

**HARRISON (L) BVOR** 112.5/HRO **FSS: HARRISON**

**HEBER SPRINGS NDB MHW** 296/HBZ **FSS: HARRISON**
Remarks: Non-federal facility.

**HICKS NDB MHW** 299/HKA **FSS: DYERSBURG**
Remarks: Non-federal facility.

**HOT SPRINGS**
§ **MEMORIAL FLD (HOT)** *IFR* 3SW **FSS: PINE BLUFF (LC NA 4-4481)**
535 H61/5-23(2) (S-35, D-49, DT-78) BL5,6,7A,13 S5 F12,18,30
Remarks: Attended 0700–2100. MALSR unmonitored when twr is clsd. P-line SW. Pole NE.
Hot Springs Tower[1] 120.3 122.5R **Gnd Con** 121.7
Hot Springs App Con[1] 118.85 122.5R 110.0T
VFR Advisory Ctc App Con on 118.85
ILS 111.5 I-HOT Rwy 5 **LOM:** 385/HO
Hot Springs (L) VOR 110.0/HOT on fld.
Hot Springs NDB MHW 385/HO 048° 5.1NM to fld.
Remarks: Twr opers 0700–2300, other hrs ctc Little Rock App Con 110.0T and 120.3R. Rwy 5 ILS unmonitored when twr not operg. Rwy 5 LOM is Hot Springs NDB.

**JONESBORO FSS** 121.5 122.1R 122.2 122.6 123.6
Remarks: Opers 0600-2200, other hrs ctc Memphis FSS.

**JONESBORO (T) BVOR** 108.6/JBR **FSS: JONESBORO**
Remarks: From 2200–0600 automatic course monitor only.

FIGURE 51

AIM Excerpts

# AIRPORT DIRECTORY

## ARIZONA

**AJO MUNI (P01)** 6N 32°27'00'' 112°52'00'' **FSS: PHOENIX**
1458 H63/12-30 (1) BL4 F12
**REMARKS:** ARPT UNATTENDED. HVY JET TFC VCNTY ARPT. FUEL AVBL EMERG, CALL SHERIFF 387-7621. LIGHTS ON CENTER 3950'.

ANGEL FLD **See FORT GRANT**

ANTELOPE RANCH **See ROLL**

**BAGDAD** 2NE 34°35'45'' 113°10'10'' **FSS: PRESCOTT**
4136 H36/5-23 (1) (S-4) BL4
**REMARKS:** ARPT UNATTENDED. UNUSUAL AIR CURRENTS VICINITY ARPT,ESPECIALLY EAST APCH. RWY LGTS ACTIVATED BY KEYING 122.8 3 TIMES OR BY PRIOR REQ OR CIRCLING TOWN.

**BISBEE MUNI (P84)** 6SE 31°21'50'' 109°52'57'' **FSS: DOUGLAS**
4700 39/2-20 (3) L4 S5 F12
**REMARKS:** RWY LGTS TURNED ON AUTOLY FOR 12 MIN BY VOICE RELAY ON 122.8.

**§ CLIFTON-MORENCI, GREENLEE COUNTY (CFT)** 9SE **FSS: DOUGLAS**
32°57'10'' 109°12'35''
3811 H49/7-25 (1) (S-21) *BL5
**REMARKS:** ARPT UNATTENDED. FOR RWY LGTS & ROTG BCN PHONE 864-3000 OR 864-4149.

COCHISE COUNTY **See WILLCOX**

**COLORADO CITY MUNI** 4SW 36°56'58'' 113°00'50'' **FSS: CEDAR CITY**
4840 34/13-31 (2)
**REMARKS:** ARPT UNATTENDED.

**COOLIDGE MUNI** 2SW 32°58'00'' 111°32'45'' **FSS: PHOENIX**
1492 H21/8-26 (1) (S-4) F12 (LC 723-3392)
**REMARKS:** ARPT ATTENDED IRREGULARLY. FUEL IN EMERG ONLY.

**COOLIDGE FLORENCE MUNI (P08)** 6SE 32°56'00'' **FSS: PHOENIX**
111°25'30''
1587 H55/5-23 (4) (S-80,D-115,DT-210) S3 F12, 18 (LC 723-3392)
**REMARKS:** RGT TFC RWY 5, 8, 11, 35. PARACHUTE JUMPING SAT & SUN. TPA 1000' AGL. ALL TRAFFIC PATTERNS VARY DURING AF TRAINING. INTENSIVE JET TRAINING RWY 5-23 DAYLGT HRS MON-FRI. CTC AF MOBILE ATCT ON 122.8 BEFORE ENTERING TRAFFIC PATTERN.

**DOLAN SPRINGS, LAKE MOHAVE RANCHOS** 1W 35°34'06'' **FSS: NEEDLES**
114°17'55''
3200 37/1-19 (1)
**REMARKS:** ARPT UNATTENDED. P-LINE IN RWY 1 APCH.

**DOUGLAS MUNI (DGL)** 2E 31°20'30'' 109°30'15'' **FSS: DOUGLAS**
4181 53/18-36 (3) BL5 S5 F12, 18 OX2,4 (LC 364-8458)
**REMARKS:** ANTENNA IN RWY 8 APCH. RGT TFC RWY 8, 36, 12. ADDNL 3000 X 90 ASPH STRIP ON S SIDE RWY 8-26 CLSD. ONLY MID 2000' RWY 18-36 LGTD. OX-1 & OX-4 AVBL FM TOWN.

**§ DOUGLAS BISBEE, BISBEE DOUGLAS INTERNATIONAL (DUG)** **FSS: DOUGLAS ON FLD**
9NW 31°28'02'' 109°36'03'' IFR AOE
4158 H75/12-30 (4) (S-12) BL5 S5 F12, 18, 22, 34
**REMARKS:** RWY 8-26 WT BRG CPTY S-85,D-95,DT-155. ARPT ATTENDED 0600-2000. MAX ALLOWABLE GROSS WGT RWYS 03-21 & 12-30 IS 12500 LBS. RWY LGTS & ROTG BCN ACTIVATED ON 121.7.

DOWNTOWN TUCSON **See TUCSON**

DVR **See YACNA**

EDS FIELD **See PICACHO**

**ELOY MUNI** 4NW 32°48'25'' 111°35'10'' **FSS: PHOENIX**
1513 H39/2-20 (1) (S-12.5) BL5 F12, 18

ESTRELLA SAILPORT **See MARICOPA**

FALCON FLD **See MESA**

FARM AERO **See PHOENIX**

**§ FLAGSTAFF, PULLIAM (FLG)** 5S 35°08'16'' 111°48'18'' **FSS: PRESCOTT**
IFR
7012 H70/3-21 (1) (S-65,D-85,DT-130) BL5 S5 F12, 18, 30 (LC 774-8475)
U-1
**REMARKS:** ARPT ATTENDED 0700-1900 ON CALL AFTER 1900.

FLY IN PICNIC GROUNDS **See QUARTZSITE**

FLYING E GUEST RANCH **See WICKENBURG**

FOREPAUGH **See WICKENBURG**

## ARIZONA—CONTINUED

**HOLBROOK MUNI (P14)** 3NE 34°56'20'' 110°08'20'' **FSS: PRESCOTT**
5245 H50/3-21 (1) (S-12) BL5 S3 F12, 18

**HUNT, GREEN VALLEY** 2S 34°35'00'' 109°37'23'' **FSS: PRESCOTT**
5600 56/N-S (1)
**REMARKS:** ARPT UNATTENDED.

**§ PHOENIX SKY HARBOR INTL (PHX)** 3E 33°26'07'' **FSS: PHOENIX ON FLD**
112°00'43'' IFR LRA
1128 H193/8R-26L (2) (S-190,D-280,DT-350) BL5, 13, 7A, 11
S5 F12, 18, 30, 34 OX1,2,3,4 U-2
**REIL:** RWY 8L, 26R RVV: RWY 8R
**REMARKS:** (†) RWY 26L THRESHOLD DISPLACED 706'. RGT TFC RWY 26R, 8R. FLY BASE LEG AT LEAST 5 MI FM ARPT. UNLESS ADZD BY ATC ALL TURBINE ACFT & ACFT 12,500 LBS & OVER REMAIN AT OR ABOVE 3000' MSL UNTIL ESTABD ON FINAL.

**POLACCA** 4SW 35°48'00'' 110°25'00'' **FSS: PRESCOTT**
5573 H38/4-22 (1)
**REMARKS:** ARPT UNATTENDED. RGT TFC RWY 4, 22, 15, 33.

**§ PRESCOTT MUNI (PRC)** 8N 34°39'05'' 112°25'15'' IFR **FSS: PRESCOTT ON FLD**
5042 H76/3-21 (2) (S-50,D-63,DT-100) BL5 S5 F12, 18
U-2
**VHF/DF:** CTC FSS
**REMARKS:** ARPT ATTENDED 0600-1900 ON CALL OTHER HRS. RWY 3 THRESHOLD DISPLACED 797'

PULLIAM **See FLAGSTAFF**

**TUCSON, DOWNTOWN TUCSON** ADJ SE 32°11'10'' **FSS: TUCSON**
110°56'55''
2490 43/16-34 (2) F12, 18 (LC 792-6359)
**REMARKS:** ARPT ATTENDED DAWN DUSK. P-LINE IN RWY 11 APCH. P-LINE IN RWY 29 APCH. P-LINE IN RWY 16 APCH.

**§ TUCSON, FREEWAY (P12)** 4NW 32°16'40'' 111°00'30'' **FSS: TUCSON**
2290 H45/12-30 (1) (S-6) BL4 S5 F12, 18 U-1 (LC 792-6359)
**REMARKS:** RWY 30 THRESHOLD DISPLACED 500'. P-LINE IN RWY 30 APCH. MAINTAIN 50' OVER ROMERO RD ON FINAL TO RWY 30.

**TUCSON, RYAN FIELD** 12SW 32°00'29'' 111°10'00'' **FSS: TUCSON**
2413 H40/6R-24L (1) (S-9) BL4 S5 F12, 18 U-1 (LC 792-6359)
**REMARKS:** ARPT ATTENDED 0800-1800. RGT TFC RWY 6R, 16. GLIDER OPERNS WITHIN 10 MILE RADIUS WEEKENDS. 2525 X 25 ASPH STRIP SUPERIMPOSED ON DIRT STRIP 6L-24R BEGINNING 625' FM SW END. RWY 6L-24R RESTRICTED TO GLIDERS ONLY.

**§ TUCSON INTL (TUS)** 7S 32°07'05'' 110°56'32'' IFR **FSS: TUCSON ON FLD**
AOE
2630 H120/11L-29R (3) (S-160,D-205,DT-305) BL5, 10 S5
F12, 18, 22, 30, 40 OX1,2,3,4 U-2
**VASI:** RWY 29R
**VHF/DF:** CTC FSS
**REMARKS:** (†) RWY 11L THRESHOLD DISPLACED 1100'. ARRESTING DEVICE RWY 21, 11L, 29R. VASI RWY 29R UPPER TCH 78', LOWER TCH 42'/ UPPER RRP 1690', LOWER RRP 1090' 1000' ASPH OVRN EACH END RWY 11L-29R.

**WINDOW ROCK (P34)** 1S 35°39'20'' 109°03'45'' **FSS: GALLUP**
6755 H70/2-20 (1) (S-30,D-45,DT-75) L5 F10
**REMARKS:** ARPT ATTENDED 0800-1700.

**§ WINSLOW MUNI (INW)** 1W 35°01'20'' 110°43'20'' IFR **FSS: PRESCOTT**
4938 H71/11-29 (2) (S-60,D-70,DT-110) BL5 S3 F12, 18 (DL)
U-1
**REMARKS:** ARPT ATTENDED 0700-1800 ON CALL AFTER HRS. RWY 29 THRESHOLD DISPLACED 400'.

**§ YUMA MCAS/YUMA INTERNATIONAL (YUM)** 4S 32°39'24'' **FSS: YUMA ON FLD**
114°36'18'' IFR AOE
213 H133/3L-21R (4) (S-163,D-260,DT-400) BL6 S5 F12,
18, 30 OX1,2
**VHF/DF:** CTC TWR
**REMARKS:** (†) RWY 3R-21L WT BRG CPTY S-162,D-200,DT-400. ARPT ATTENDED DAYLIGHT. ARRESTING DEVICE RWY 3L, 21R, 3R, 21L. RGT TFC RWY 3L, 3R, 8, 26, 17. 1000' OVERRUN EACH END RWY 03L-21R. FSS PROVIDES ARPT ADV SVC WHEN TWR CLSD. TPA-JETS 1700' MSL/PROPS 1200' MSL/COPTERS 700' MSL. 2300-0600 APROP CIVIL RWY LGTD, OTHER RWYS LGTD ON REQ THRU FSS IN EMERG.

FIGURE 52

Excerpt

# AIRMAN'S INFORMATION MANUAL—PART 3A

## NOTICES TO AIRMEN

**This part is issued every 14 days. It contains appropriate notices from the daily NOTAM Summary, and other items considered essential to flight safety.**

**This section contains Notices to Airmen that are expected to remain in effect for at least seven days. Temporary notices without published duration dates are normally carried twice unless resubmitted.**

**NOTE: Data preceded by a checkmark (✓) are considered permanent and will be published one time only in this section. Data should be noted on charts and records.**

**NOTE: Notices are arranged in alphabetical order by State (and within the State by City or locality).**

**NEW OR REVISED DATA: New or revised data are indicated by underlining the first line of the affected item. The new information is not necessarily limited to the underlined portion, which is used only to attract attention to the new insert.**

### ALABAMA

AUBURN, OPELIKA ARPT: Tmpry ATCT and FSS will oper on Nov 10. Freqs 123.1 lcl ctl, 121.8, 122.5R gnd ctl, 121.5 emgcy. Hours 1000-1800 lcl.

TALLADEGA MUNI ARPT: Rwy 3-21 clsd to acft 40,000 lbs GWT or over. (3-73)

TUSCALOOSA: FSS remains operational, telephone number—(205) 758-3628.

TUSKEGEE—MOTON FIELD ARPT: Const in progress. Arpt clsd til aprxly Dec 1973. (3-73)

### ALASKA

SPECIAL NOTICE: Pilots flying aircraft equipped with SCR-718 altimeters will assure that the altimeter is turned off within 200 NM of Clear, Alaska and Thule, Greenland.

**For complete information on Alaska consult the Alaska Supplement.**

### ARIZONA

BISBEE MUNI ARPT: Rwy lgts 2-20 inop. (8-73)

GRAND CANYON: Control zone hrs 0800-2000 lcl time.

GRAND CANYON NATIONAL PARK ARPT: ATCT deactivated until aprxly 1 June 74.

GRAND CANYON NATIONAL PARK: All pilots are requested to avoid flying below the canyon rim and to maintain a distance 1500' above and horizontally from all scenic overlooks, parks, trails and Grand Canyon Village.

PRESCOTT MUNI ARPT: Obstrn 30' AGL lctd ¼ NM SSW of TDZ rwy 3 unlgtd. First 1450' rwy 11 clsd.

### ARKANSAS

EL DORADO, GOODWIN FLD: Threshold rwy 22 displaced 413'. (6-73)

FORDYCE MUNI ARPT: Rwy 04 thr dspled 100'. (8-73)

HELENA/WEST HELENA - THOMPSON - ROBBINS ARPT: Rwy 17-35 clsd UFN. (9-73)

### CALIFORNIA

SPECIAL NOTICE: Do not mistake dirt strip on large island, Lake Berryessa, lctd lat 38-34 long 122-13 for airport. Strip is unauthorized and unsafe.

ANO NUEVO ISLAND: Avoid low flying in the vicinity and over island. Biological research of wild life in progress.

BISHOP RDO: VOR ident "BIH" OTS. (11-73)

BLYTHE ARPT: Intensive airline jet acft training in progress 24 hrs daily. Inbound acft report 20 miles out on 123.6 and guard 123.6 for arpt advisory service, UFN. Use other freqs for other purposes. Unicom is not for arpt advisory use.

CHINO ARPT: Constr on arpt til aprxly Jan 1974.

LOS ANGELES INTL ARPT: ILS/OM "I-LAX" serving rwy 25L shutdown til aprxly Dec 20. (8-73)

PRIEST RDO: VOR/DME—DME portion will be dcmsnd eff 6 Dec 73. (11-73)

REDDING, SKY RANCH ARPT: 4' drop off SE end rwy 12-30 not marked or lgtd. (10-73)

SALINAS MUNI ARPT: Const on fld. Rwy 13-31 clsd til aprxly Feb 74. Check NOTAMS for current info. (9-73)

SAN CLEMENTE FLIGHT RESTRICTION: FAR Section 91.95 prohibits acft operns below 4000' MSL within a one mile radius of the San Mateo Point Loran Station/Oceanside VORTAC 300 radial 12.5 NM.

SAN FRANCISCO INTL ARPT: Rwy 10L-28R clsd lndg Mon-Sat 0600-1830 lcl til aprxly Jan 74. Blast fence 8 ft high lctd 770 ft east of dspled thr of rwy 28R til aprxly Apr 74. East 600' rwy 10L-28R clsd til aprxly April, 1974. (11-73)

SAN JOSE MUNI ARPT: In the interest of noise abatement, all turbojet acft are requested not to takeoff or land between 2400-0600 lcl unless justifiable. Cessna Citation or acft of equally low noise level excepted. The use of reverse thrust should be minimized at pilot's discretion at all times.

SAN JOSE MUNI ARPT: DME lctd glide slope bldg operg on test on channel 46 for 2-segment apch rwy 30L.

SANTA ROSA, SONOMA CO. ARPT: Twr 40' AGL W side TDZ rwy 32 unlgtd UFN.

FIGURE 53

AIM Excerpt

# RULES PERTAINING TO AIRCRAFT ACCIDENTS, INCIDENTS, OVERDUE AIRCRAFT, AND SAFETY INVESTIGATIONS

(National Transportation Safety Board, Procedural Regulation, Part 430 (in part)).

### 1. IMMEDIATE NOTIFICATION

The operator of an aircraft shall immediately, and by the most expeditious means available, notify the nearest National Transportation Safety Board, Bureau of Aviation Safety Field Office when:

(a) An aircraft accident or any of the following listed incidents occur:

(1) Flight control system malfunction or failure;

(2) Inability of any required flight crewmember to perform his normal flight duties as a result of injury or illness;

(3 Turbine engine rotor failures excluding compressor blades and turbine buckets;

(4) In-flight fire;

(5) Aircraft collide in flight.

(b) An aircraft is overdue and is believed to have been involved in an accident

(c) The following information is required if available:

(1) Location;

(2) Date;

(3) Time;

(4) Aircraft make, model, and registration number and nationality.

(5) Names of operator and crew;

(6) Number of persons involved;

(7) Injuries of each person;

(8) Weather conditions.

### 2. MANNER OF NOTIFICATION

The most expeditious method of notification to the National Transportation Safety Board by the operator will be determined by the circumstances existing at that time. The National Transportation Safety Board has advised that any of the following would be considered examples of the type of notification that would be acceptable:

(a) Direct telephone notification.

(b) Telegraphic notification.

(c) Notification to the Federal Aviation Administration who would in turn notify the NTSB by direct communication; i.e., dispatch or telephone.

### 3. REPORTS

a. The operator shall file a report on NTSB Form 6120.1 or 6120.2, available from the National Transportation Safety Board Field Offices, or the National Transportation Safety Board, Washington, D.C.:

(1) Within ten (10) days after an occurrence for which notification is required in 1 (a) and (b) above;

(2) When, after seven (7) days, an overdue aircraft is still missing;

(3) Upon request of an authorized representative of the National Transportation Safety Board;

b. Each crew member, if physically able at the time the report is submitted, shall attach thereto a statement setting forth the facts, conditions and circumstances relating to the accident or occurrence as they appear to him to the best of his knowledge and belief. If the crew member is incapacitated, he shall submit the statement as soon as he is physically able.

### 4. WHERE TO FILE THE REPORTS

a. The operator of an aircraft shall file with the Field Office of the National Transportation Safety Board nearest the accident or incident any report required by this section.

b. The National Transportation Safety Board field offices are listed under U.S. Government in the telephone directories in the following cities: Anchorage, Alaska; Chicago, Ill.; Denver, Colo.; Fort Worth, Texas; Kansas City, Mo.; Los Angeles, Calif.; Miami, Fla.; New York, N.Y.; Oakland, Calif.; Seattle, Wash.; Washington, D.C.

FIGURE 54

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration

# 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 |

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. They have been discontinued since the subject areas which they cover are now adequately treated in one or more of the following FAA publications:

Pilot's Handbook of Aero. Knowledge, AC 61-23A
Aviation Weather - AC 00-6
Airman's Information Manual (annual subscription)
Other pertinent FAA Advisory Circulars

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

The Advisory Circular Checklist and certain free Advisory Circulars may be obtained from:

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



U. S. GOVERNMENT PRINTING OFFICE : 1975 O - 572-269

AC 143-1D

# Ground Instructor
# Written Test Guide

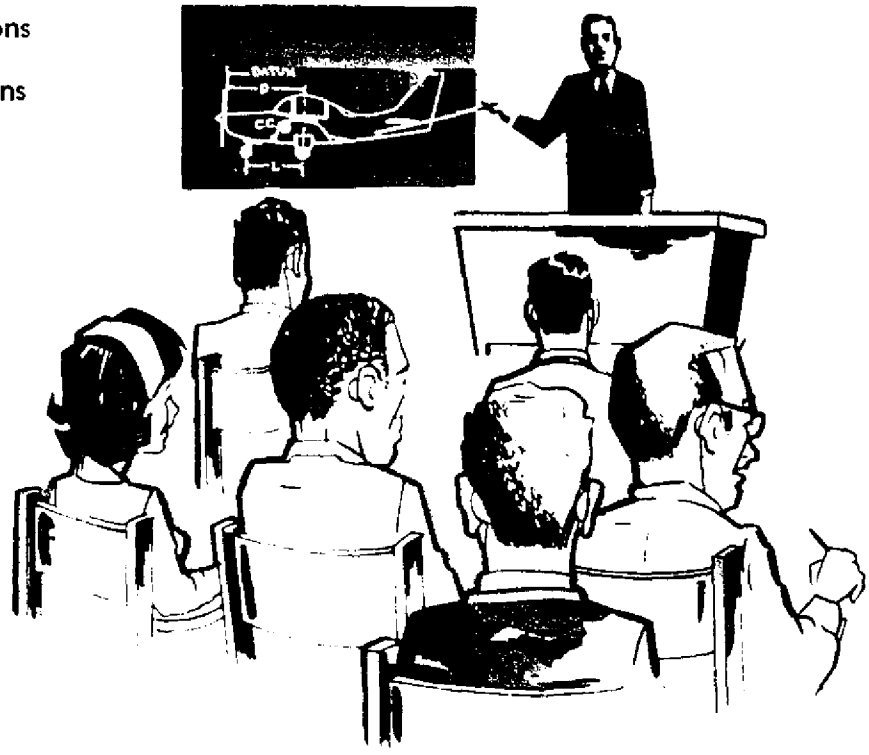
# Basic-Advanced

1. Motivation

2. Presentations and Explanations

3. Performance and Application

4. Evaluation



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

# GROUND INSTRUCTOR WRITTEN TEST GUIDE
# FUNDAMENTALS OF INSTRUCTING
# BASIC–ADVANCED

## INTRODUCTION

This study guide was prepared by the Flight Standards Service of the Federal Aviation Administration. It is not offered as a quick and easy way to gain the knowledge necessary for passing the written test. Knowledge and understanding are seldom gained quickly or easily. This is particularly true in the diversified field of aviation ground instruction. There can be no substitute for diligent study to attain basic knowledge, unremitting effort to develop competence, and continuous review to remain current in the many areas where technological change is the rule rather than the exception.

This guide will provide guidance for the serious student by outlining the scope of knowledge required. Thus, the student is better able to intelligently direct his study plan.

## NATURE OF THE WRITTEN TESTS

Much of the information and knowledge required of the instructor in aviation ground subjects is essentially the same today as it was many years ago, yet there has been a gradual and definite change in some areas. Technological advancements and refinements in today's aircraft, plus the increased usage of their capabilities by the general flying public, have outmoded the practice of testing for memory alone. Of course, basic knowledge is still necessary; but it must be related to the operationally realistic situation. An aircraft's primary commercial use is to provide safe, speedy, and efficient transportation; all civilian training, flight or ground, is directed toward this end. For this reason, knowledge must be related to skill, and skill is inextricably interwoven with knowledge. Therefore, written tests today require the ability to use basic knowledge in practical situations as well as in answering questions based on theoretical problems.

For this reason, this guide will deal with questions that test for knowledge, as well as questions that test for the ability to apply and use this knowledge in a realistic environment. Certain questions deal with specific subjects such as navigation, radio navigation, meteorology, Federal Aviation Regulations, aircraft and powerplants. These items test for sufficient basic knowledge and grasp of theory to assure that accurate dissemination of this subject matter can be accomplished in the classroom. Other questions will require the ability to combine and synthesize knowledge in two or more of the specific subject areas.

The certification process requires that the ground instructor applicant pass a separate written test covering the Fundamentals of Instructing. However, if the applicant already holds a valid FAA *Flight* or *Ground* Instructor Certificate which was acquired after passing a written test on Ground Instructor Fundamentals, or Fundamentals of Flight Instruction, he is not required to take the separate test on Fundamentals of Instructing when applying for an additional instructor certificate or rating.

It is not necessary to take the Fundamentals of Instructing test on the same day as the Basic or Advanced Ground Instructor Written Test. It is immaterial which test is taken first.

## TYPE OF TEST QUESTIONS

All test items are the objective, multiple-choice type, and can be answered by the selection of a single response. This type of test conserves the applicant's time when taking the test, permits greater coverage of subject matter, lessens the time required for scoring, and eliminates subjective judgment in determining grades.

Each item is independent of other test items. That is, a correct response to one test item does not depend upon, or influence, the correct response to another test item.

After completing the test the applicant's answer sheet is forwarded to the FAA Aeronautical Center for scoring by ADP computers. Shortly thereafter, the applicant will receive an Airman Written Test Report which not only includes his score but lists, in code, the subject areas in which he experienced difficulty. Those subject areas can be determined by reference to the Subject Matter Outline which accompanies the report. This method provides an essential feedback to the applicant and can be effectively used to strengthen his knowledge in weak areas.

## TAKING THE TEST

The equipment needed for the test includes a protractor or plotter and a computer. It is also desirable to have a pair of dividers. The time allowed for completing various tests is as follows:

| | |
|---|---|
| A. Basic | 4 hours |
| B. Advanced | 5 hours |
| C. Fundamentals of Instructing | 3 hours |

While it may be possible to complete the test in less time, it would be unwise to plan on this. If it becomes necessary to hurry, it may increase the probability of mistakes.

Always remember the following facts when taking the test:

1. The questions are not trick questions. Each statement means exactly what it says. Do not look for hidden meanings. The statement does not concern exceptions to the rule; it refers to the general rule.

2. Always read the statement or question first—before looking at the answers. Be sure to read the entire question carefully; avoid "skimming" and hasty assumptions. This may lead to an erroneous approach to the problem or failure to consider vital words.

3. Only one of the alternate answers given is completely correct. Other answers may be correct as far as they go, but are not complete or are answers based on erroneous assumptions, misconceptions, or incorrect procedures and interpretations. Understand the question or statement. *Then work out the answer* before choosing from the list of alternate answers the response which is considered to be the best.

4. Do not spend too much time on a question which appears difficult or one where there is doubt as to the correct answer. By so doing, the opportunity to mark all those questions which can be promptly solved or answered is lost. The applicant may always go back to the questions skipped after considering all those which can be readily answered. This procedure will assure maximum use of the time available, and it may mean the difference between a passing and a failing score.

5. In solving problems which require computations or use of the plotter and computer, select the answer which is closest to the calculated result. Due to slight differences in individual computers and small errors made in measuring distances, true courses, etc., it is possible that an exact agreement with available answers will not occur every time. Sufficient spread is provided between right and wrong answers, however, so that the selection of the answer closest to the calculated result will be the right choice, *provided* that correct technique and reasonable care in making computations have been used.

NOTE: When the test is constructed, various types of navigational computers are used to solve problems. The correct answer is an average of these computers, therefore, any of the several types of computers authorized for use on FAA written tests should prove satisfactory.

## RECOMMENDED STUDY MATERIALS

The prospective Ground Instructor will find the following list of publications useful in his preparation for the written test. In addition, there are many other excellent commercially prepared textbooks, audiovisual training aids, and other instructional materials which may be helpful.

## AERONAUTICAL CHARTS

The National Ocean Survey publishes and distributes aeronautical charts of the United States. Charts for foreign areas are published by the U.S. Air Force Aeronautical Chart and Information Center (ACIC) and are sold by the National Ocean Survey.

A "Catalog of Aeronautical Charts and Related Publications" listing their prices and instructions for ordering may be obtained free, on request, from:

National Ocean Survey
Distribution Division, (C-44)
Riverdale, Maryland 20840

Orders for specific charts or publications should be accompanied by check or money order made payable to "NOS, Department of Commerce."

*Airman's Information Manual.* This publication presents, in four Parts, information necessary for the planning and conduct of flights in the U.S. National Airspace System. Besides providing frequently updated airport and NAVAID data, the AIM includes instructional and procedural information and is designed for use in the cockpit.

Each Part is available on a separate annual subscription to better serve the needs of the individual pilot.

Part 1—Basic Flight Manual and ATC Procedures. ($7.60 domestic; $1.90 additional foreign mailing, GPO. Issued quarterly. Catalog No. TD 4.12:pt. 1/.).

Part 2—Airport Directory. ($7.00 domestic; $1.75 additional foreign mailing, GPO. Issued semi-annually. Catalog No. TD 4.12:pt. 2/.).

Part 3 and 3A—Operational Data and Notices to Airmen. ($22.00 domestic; $5.50 additional foreign mailing, GPO. Part 3 is issued every 56 days and Part 3A is issued every 14 days. Catalog No. TD 4.12:pt. 3/.).

Part 4—Graphic Notices—Supplemental Data. ($14.40 domestic; $3.60 additional foreign mailing, GPO. Issued quarterly. Catalog No. TD 4.12:pt. 4/.).

## HANDBOOKS AND TECHNICAL MANUALS

*Pilot's Handbook of Aeronautical Knowledge.* AC 61-23A ($5.30 GPO.) Catalog No. TD 4.408:P 64/5. This handbook contains essential authoritative information used in training and guiding pilots. Subject areas in which an applicant may be tested are covered in the handbook. It tells how to use the Airman's Information Manual and the data in FAA approved airplane flight manuals, as well as basic instruments for airplane attitude control.

*Personal Aircraft Inspection Handbook.* AC 20-9 ($1.50 GPO.) Catalog No. FAA 5.8/2:Ai 7/2. This is a general guide for inspection of aircraft; Part I deals with the fundamentals of inspection and Part II covers a typical inspection in detail. As reliable inspection comes only with experience, it is emphasized that the use of this handbook by the novice does not qualify him to make final determinations regarding the airworthiness of the aircraft.

*Flight Instructor's Handbook.* AC 61-16A ($2.00 GPO.) Catalog No. TD 4.408:In 7/3. This revised handbook is one of the primary sources of information and guidance for pilots preparing for the flight instructor written test. It is basically a book which explains accepted theories and practices applicable to teaching and the learning process. Therefore, it will also prove most useful to those preparing for the Fundamentals of Instructing section of the Ground Instructor Written Test.



572-259 O - 75 - 2

*Flight Training Handbook.* AC 61-21 ($2.10 GPO.) Catalog No. FAA 1.8:F 64/4. This text deals with certain basic flight information such as load factor principles, weight and balance, and related aerodynamic aspects of flights, as well as principles of safe flight. This book also provides information and direction in the introduction and performance of training maneuvers. Thus it serves primarily as a text for student pilots, for pilots improving their qualifications or preparing for additional ratings, and for flight instructors; however, it can also be useful to the ground instructor.

*Practical Air Navigation.* 10th Edition ($4.00). This publication provides a comprehensive coverage of all subjects and areas dealing with navigation whether it be pilotage, dead reckoning, or radio and celestial navigation. Students who understand the material available in this highly recommended text will have no serious trouble with the navigation problems on their test. This text may be obtained from many book dealers or from the publisher, Jeppesen & Co., 8025 East 40th Ave., Denver, Colorado 80209.

*Aviation Weather.* AC 00-6 ($4.00 GPO). Catalog No. FAA 5.8/2:W 37. Contains information on weather phenomena for pilots and other flight operations personnel whose interest in meteorology is primarily in its application to flying.

*Federal Aviation Regulations (FARs).* The suggested Parts for study are:

Part 1, Definitions and Abbreviations. ($3.00 domestic; $0.75 additional foreign mailing. GPO.)

Part 23, Airworthiness Standards—Normal, Utility, and Acrobatic Category Airplanes ($3.55 domestic; $0.95 additional foreign mailing, (GPO.)

Part 61, Certification: Pilots and Flight Instructors, ($5.05 domestic; $1.30 additional foreign mailing, GPO.)

Part 91, General Operating and Flight Rules, ($11.30 domestic; $2.85 additional foreign mailing, GPO.)

Part 141, Pilot Schools, ($3.00 domestic; $0.75 additional foreign mailing, GPO.)

Part 143, Ground Instructors, ($0.35, GPO.)

NOTE

For the convenience of the user, the FAA is in the process of reissuing the FARs as individual Parts. For information regarding the status of this conversion, obtain a copy of:

AC 00-2 (latest revision) Advisory Circular Checklist and Status of Regulations.

This checklist may be obtained free by requesting it from:

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

*National Transportation Safety Board. NTSB Part 430.* This publication deals with notification and reporting procedures required relating to accidents and lost or overdue aircraft in the United States, its territories, and possessions. Upon request, it is free from the National Transportation Safety Board, Publications Branch, Washington, D.C. 20591.

*Commercial Pilot Written Test Guide.* AC 61-28A ($2.00 GPO.) Catalog No. TD 4.408:P 64/4. This guide gives detailed information on the scope and depth of knowledge required of the commercial pilot applicant.

*VFR and IFR Exam-O-Grams.* Brief, timely, and graphic articles developed and published on a continuing basis. They are nondirective in nature and are issued as an information service, particularly to individuals interested in airman written tests. They relate to concepts, practices, and procedures critical to aviation safety and assist in giving safety-oriented information to airman applicants and practicing airmen. Exam-O-Grams are available free of charge but are limited to single copy per request. Requests for Exam-O-Grams should be addressed to:

U.S. Department of Transportation
Federal Aviation Administration
Flight Standards Technical Division
Operations Branch, AAC-240
P.O. Box 25082
Oklahoma City, Oklahoma 73125

## HOW TO OBTAIN SALES PUBLICATIONS

Requests for FAA publications sold through the Superintendent of Documents should be submitted on an order form, if possible and submitted to:

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

A sample order form is included in the back of this Guide. In order to aid in the processing of your order, the following suggestions are offered:

1. Place orders for subscription items and single sales items on separate requests.
2. Provide the exact title of the publication, the agency number, and the catalogue number, if given.
3. A check or money order payable to Superintendent of Documents—not cash—in the correct amount should accompany your order.
4. Enclose a self-addressed mailing label if you don't have an order blank.
5. Use GPO Bookstores.

In addition to the mail-order service provided by the Office of the Superintendent of Documents, several retail bookstores have been established throughout the country which constitute a part of the operations of the Superintendent of Documents. The public is encouraged to avail themselves of the services offered by these facilities, as many of the more popular publications are stocked in these bookstores. These retail outlets are located at the following addresses:

Atlanta GPO Bookstore
Room 100 Federal Bldg.
275 Peachtree St., NE
Atlanta, Ga. 30303
Phone: 404–526–6947

Birmingham GPO Bookstore
Room 102A 2121 Bldg.
Birmingham, Ala. 35203
Phone: 205–325–6056

Boston GPO Bookstore
Room G25 John F. Kennedy Federal Bldg.
Sudbury St.
Boston, Mass. 02203
Phone: 617–223–6071

Canton GPO Bookstore
Federal Office Bldg.
201 Cleveland Ave.
Canton, Ohio 44702
Phone: 216–455–4354

Chicago GPO Bookstore
Room 1463—14th Floor
Everett McKinley Dirksen Bldg.
219 South Dearborn St.
Chicago, Ill. 60604
Phone: 312–353–5133

Cleveland GPO Bookstore
Room 171 Federal Bldg.
1240 East 9th St.
Cleveland, Ohio 44199
Phone: 216–522–4934

Dallas GPO Bookstore
Room 1C46 Federal Bldg.—U.S. Courthouse
1100 Commerce St.
Dallas, Texas 75202
Phone: 214–749–1541

Denver GPO Bookstore
Room 1421
Federal Bldg.—U.S. Courthouse
1961 Stout St.
Denver, Co. 80202
Phone: 303–837–3965

Detroit GPO Bookstore
Room 229 Federal Office Bldg.
231 W. Lafayette Blvd.
Detroit, Mich. 48226
Phone: 313–226–7816

Kansas City GPO Bookstore
Room 144 Federal Office Bldg.
601 East 12th St.
Kansas City, Mo. 64106
Phone: 816–374–2160

Los Angeles GPO Bookstore
Room 1015 Federal Office Bldg.
300 North Los Angeles St.
Los Angeles, Ca. 90012
Phone: 213–688–5841

Milwaukee GPO Bookstore
Federal Bldg.
Room 190
517 E. Wisconsin Ave.
Milwaukee, Wisconsin 53202
Phone: 414–224–1300

New York GPO Bookstore
Room 1356
26 Federal Plaza
New York, N.Y. 10007
Phone: 212–264–3826

Philadelphia GPO Bookstore
Federal Office Bldg.
Room 1214
600 Arch St.
Philadelphia, Pa. 19106
Phone: 215–597–0677

San Francisco GPO Bookstore
Room 1023 Federal Office Bldg.
450 Golden Gate Ave.
San Francisco, Ca. 94102
Phone: 415–556–6657

Seattle GPO Bookstore
Federal Bldg.
Room 1056
909 First Ave.
Seattle, Wash. 98174
Phone: 206–442–4274

In addition, persons living within the metropolitan Washington, D.C., area may contact bookstores located at the following locations:

Government Printing Office Bookstore
710 North Capitol St.
Washington, D.C. 20402
Phone: 202–541–2091

Department of Commerce Bookstore
14th & Constitution Ave., NW
Washington, D.C. 20230
Phone: 202–967–3527

USIA Bookstore
1776 Pennsylvania Ave., NW
Washington, D.C. 20547
Phone: 202–632–9668

Department of State Bookstore
21st & C Sts. NW
Washington, D.C. 20520
Phone: 202–632–1437

Pentagon Bookstore
Main Concourse, south end
Washington, D.C. 20310
Phone: 202–541–2998

Forrestal Bookstore
Rm. 1–J–001
James H. Forrestal Bldg.
1000 Independence Ave., SW
Washington, D.C. 20407
Phone: 202–426–7937

# STUDY OUTLINE

## Section 1. Fundamentals of Instructing

### I. THE LEARNING PROCESS

A. Definition of Learning.

B. Characteristics of Learning.
1. Learning is purposeful
2. Learning comes through experience
3. Learning is multifaceted
4. Learning is an active process

C. Laws of Learning.
1. Law of readiness
2. Law of exercise
3. Law of effect
4. Law of primacy
5. Law of intensity
6. Law of recency

D. How People Learn.
1. Perceptions
2. Factors which affect perception
3. Insights
4. Motivation

E. Levels of Learning.

F. Learning Skills.
1. Physical skills involve more than muscles
2. Desire to learn
3. Patterns to follow
4. Perform the skill
5. Knowledge of results
6. Progress follows a pattern
7. Duration and organization of lesson
8. Evaluation versus critique
9. Application of skill

G. Forgetting and Retention.
1. Theories of forgetting
2. Retention of learning

H. Transfer of Learning.

I. Habit Formation.

J. Obstacles to Learning During Flight Instruction.

K. The Instructor's Role in Flight Training.

### II. HUMAN BEHAVIOR

A. Control of Human Behavior.

B. Human Needs.
1. Physical needs
2. Social needs
3. Egoistic needs
4. Self-fulfillment needs

C. Defense Mechanisms.
1. Rationalization
2. Flight
3. Aggression
4. Resignation

D. The Instructor's Role in Human Relations.
1. Keep students motivated
2. Keep students informed
3. Approach students as individuals
4. Give credit when due
5. Criticize constructively.
6. Be consistent
7. Admit errors

### III. EFFECTIVE COMMUNICATION

A. Basic Elements of Communication Process.
1. Source
2. Symbols
3. Receiver

B. Barriers to Effective Communications.
1. Lack of common core of experience
2. Confusion between the symbol and the thing symbolized
3. Overuse of abstractions

### IV. THE TEACHING PROCESS

A. Preparation.

B. Presentation.

C. Application.

D. Review and Evaluation.

## V. TEACHING METHODS

A. Organizing Material.
   1. Introduction
   2. Development
   3. Conclusion

B. Lecture Method.
   1. Types of lectures
   2. Teaching lecture
   3. Preparing the teaching lecture
   4. Suitable language
   5. Types of delivery
   6. Use of notes
   7. Formal versus informal lectures
   8. Advantages and disadvantages of the lecture

C. Guided Discussion Method.
   1. Use of questions in a guided discussion
   2. Planning a guided discussion
   3. Student preparation for a guided discussion
   4. Guiding a discussion–instructor technique

D. Demonstration Performance Method.
   1. Explanation phase
   2. Demonstration phase
   3. Student performance and instructor supervision phases
   4. Evaluation phase

E. The "Telling and Doing" Technique in Flight Instruction.
   1. Instructor tells — instructor does
   2. Student tells — student does
   3. Student does — instructor evaluates

F. Programmed Instruction.

## VI. THE INSTRUCTOR AS A CRITIC

A. Purpose of a Critique.

B. Characteristics of an Effective Critique.
   1. Objectivity
   2. Flexibility
   3. Acceptability
   4. Comprehensiveness
   5. Construction
   6. Organization
   7. Thoughtfulness
   8. Specific

C. Methods of Critique.
   1. Instructor student critique
   2. Student-led critiques
   3. Small-group critiques
   4. Individual student critique
   5. Written critique
   6. Self-critique

D. Ground Rules for Critiquing.

## VII. EVALUATION

A. Oral Quizzing.
   1. Characteristics of effective questions
   2. Types of questions to avoid
   3. Answering students' questions

B. Written Tests.
   1. Characteristics of a good test
   2. Written test items
   3. Effective item writing
   4. Principles to follow

C. Performance Tests.
   1. Uses of performance testing
   2. Demonstrations of pilot ability

## VIII. INSTRUCTIONAL AIDS

A. Theory Behind Use of Instructional Aids.

B. Reasons for Using Instructional Aids.

C. Guidelines For Use of Instructional Aids.

D. Types of Instructional Aids.
   1. Chalkboard
   2. Models
   3. Charts
   4. Projected material

E. Future Developments.

## IX. FLIGHT INSTRUCTOR RESPONSIBILITIES

A. Professionalism.
   1. Sincerity
   2. Acceptance of the student
   3. Personal appearance and habits
   4. Demeanor
   5. Safety practices and accident prevention
   6. Proper language
   7. Self-improvement

B. Helping Student Pilots Learn.
   1. Providing adequate instruction
   2. Demanding an adequate standard of performance
   3. Emphasizing the "positive"

C. The Flight Instructor as a Practical Psychologist.
   1. Anxiety
   2. Normal reactions to stress
   3. Abnormal reaction to stress
   4. Instructor's actions regarding seriously abnormal students

D. Student Pilot Supervision and Surveillance.

E. Flight Instructor Endorsements.

F. Flight Test Recommendations.

G. Airplane Checkouts.

H. Refresher Training.

## X. THE INTEGRATED METHOD OF FLIGHT INSTRUCTION

A. Definition.

B. Objectives.
   1. Development of habit patterns
   2. Accuracy of flight control
   3. Operating efficiency
   4. Emergency capability

C. Procedures.

D. Precautions.

E. Flight Instructor Qualifications.

## XI. PLANNING INSTRUCTIONAL ACTIVITY

A. Course of Instruction.
   1. Determination of standards and objectives
   2. Identification of blocks of learning

B. Syllabus.
   1. Sample ground training syllabus
   2. Sample flight training syllabus

C. Lesson Plan.
   1. Characteristics of a well-planned lesson
   2. How to use a lesson plan properly
   3. Lesson plan items

### Section 2. Aeronautical Knowledge

## I. PREFLIGHT—ACTIVITIES RELATING TO A PROPOSED CROSS-COUNTRY FLIGHT

A. Lay out the route on the aeronautical chart provided.
   1. Follow the instructions given in the test and draw the course lines for the proposed route.
   2. Determine the true courses with a protractor. Measure distances, *using the mileage scale at the bottom of the chart.* For accuracy use the center of the airport symbols.
   3. Study the area along the proposed route and note the locations of the following:
      a. *Prominent* checkpoints.
      b. Radio aids to navigation (VOR, nondirectional radiobeacons, VHF/DF, and radar availability). Be certain to check this data against current information in the *Airman's Information Manual.*
      c. High terrain (particular attention should be made to note the elevations—heights above sea level—of the higher ridges and peaks along the routes that traverse rough or mountainous country).
      d. Obstructions (note the elevations of high obstructions en route and in the vicinity of destination landing fields).
      e. Control areas, control zones, and airport traffic areas.
      f. Prohibited, restricted, caution, and warning areas.

B. Check the weather. Consult with the local FAA Flight Service Station or Weather Service for preflight weather briefings. Be able to read and interpret the following data:
   1. Surface weather map. (Identify fronts and read station model data using the key furnished in the test.)
   2. Area forecasts.
   3. Terminal forecasts.
   4. Wind aloft forecasts.
   5. SIGMETS (significant meteorological developments) and AIRMETS (weather phenomena of less severity than that covered by SIGMETS).
   6. Hourly sequence reports.

C. Review the data in the flight planning publication—*the Airman's Information Manual*. Be familiar with and able to use the information pertaining to:

1. Communication frequencies: control towers, ground control, departure control, Flight Service Stations.
2. Navigation aid frequencies: VOR stations, nondirectional radio beacons, VHF/DF, radar.
3. NOTAMS (Notices to Airmen).
4. Special Notices list of Military Training Routes, good operating practices, and other helpful information.
5. Airport data: location, runway information, availability of fuel and service, availability of UNICOM and weather reporting facilities, lighting, etc.
6. Review pertinent information on:
   a. En route cruising altitudes.
   b. Airport traffic control procedures.
   c. Light signal.
   d. Radio-telephone phraseology and techniques.
   e. VOR receiver checkpoints.
   f. En route communications.
   g. U.S. Aircraft Emergency procedures, search and rescue procedures, emergency SCATANA rules (Security Control of Air Traffic and Air Navigation Aids).
   h. U.S. Weather Service office phone numbers.
   j. Aircraft accident reporting.

D. Check aircraft equipment and records, and personal qualifications to see that regulations have been met.

1. Check to see that aircraft—
   a. Has the required documents aboard.
   b. Has had the necessary inspections within the required time.
   c. Is properly equipped for flight (including operations at night and operations in and out of airports on which control towers are located).
2. Check pilot qualifications to ascertain—
   a. The proper pilot and medical certificates are current.

E. Select cruising altitude, taking into consideration—

1. Regulations with regard to the VFR cruising altitudes.
2. En route terrain and obstruction elevations.
3. VFR cloud separation requirements.
4. Winds aloft.

F. Review the *Airplane Flight Manual* and *Owner's Handbook*.

1. Understand the difference between normal and utility category.
2. Consult the weight and balance data and determine that the aircraft is properly loaded. Know how to compute empty weight, useful load, gross weight, and moments.
3. Check on the grade and quantity of fuel and oil required.
4. Review flight load factor limitations and airspeed limitations.
5. Check airplane performance charts as required for—
   a. Takeoff data (Airplane Flight Manual or Owner's Handbook charts or Denalt Performance Computer).
   b. Climb data. ($V_X$ and $V_Y$ speeds).
   c. Landing distance data.
   d. Cruise performance data (cruise power settings, approximate true airspeeds, fuel consumption rate).
   e. Airspeed calibration table.
   f. Stall speed vs. angle of bank.

G. Compute navigation data for the flight based on selected cruising altitudes, cruise performance data from the *Airplane Flight Manual* or *Owner's Handbook*, and the wind aloft.

1. Convert the forecast winds aloft which are given in knots to miles per hour (also convert, when required, temperatures given in Celsius to Fahrenheit or vice versa). Interpolate, if necessary, for winds and temperatures at intermediate altitudes.
2. Compute true headings and convert to magnetic headings by applying the appropriate magnetic variation corrections. Convert magnetic headings to compass headings by applying correction for deviation.
3. Compute estimated groundspeeds and estimated times en route.

4. Compute estimated fuel required for flight based on estimated times en route and the aircraft cruise performance charts.
5. Compute normal range and maximum range based on Cruise Performance Charts. Compute range with reserve allowance.
6. Make a thorough visual inspection. Drain a generous amount of fuel from fuel supply (fuel strainer and wing tank sump drains) and inspect for evidence of water contamination. If ice, snow, or frost is on the aircraft, remove completely.

H. Follow the recommended procedures for filing a VFR flight plan.

NOTE: Except for knowledge and interpretation of instruments in relation to *attitude control* of the airplane, the Basic and Advanced Ground Instructor Written Tests will deal only with flight under VFR conditions.

## II. PREFLIGHT—BASIC AERONAUTICAL KNOWLEDGE INDIRECTLY RELATED TO THE PROPOSED CROSS-COUNTRY FLIGHT

These subjects may not directly relate to the flight, but are pertinent to the various airman certificates and ratings. These subject areas include:

A. Weather. As a ground instructor, demonstration of a broad understanding of weather is essential. Be familiar with—
1. Basic concepts of the earth's atmosphere and the composition of air.
2. Types of clouds and associated weather phenomena.
3. General circulation patterns (winds).
4. Air masses.
5. Low- and high-pressure centers.
6. Frontal weather (weather conditions generally associated with cold fronts, warm fronts, occluded fronts, etc.).
7. Thunderstorms.
8. Ice and turbulence.
9. Fog and other visibility obscurations.
10. Meteorological terminology (definitions).

B. Navigation. Understand the following:
1. The earth and its coordinates of latitude and longitude.
2. Chart projections used for air navigation (with emphasis on the properties of the Lambert Conformal Conic Projection).
3. Map reading.
4. Dead reckoning—
   a. Wind triangle (vector) problems:
      (1) Determine true course and groundspeed.
      (2) Determine true heading and groundspeed.
      (3) Determine wind direction and velocity.
      (4) Determine true heading and true airspeed.
      (5) Off-course corrections.
   b. True course to compass heading.
   c. Compass heading to true course. (Application of wind, variation, and deviation corrections.)
   d. Speed/time/distance problems.
   e. Knots – MPH conversions.
   f. Nautical – statute conversions for both speed and distance.
   g. Rates of climb and descent computations.
   h. Airspeed and altitude corrections.
   i. Celsius – Fahrenheit conversions.
   j. Estimated time of arrival (ETA), estimated time en route (ETE).
   k. Cruise control.
   l. Use of flight log (preflight and in-flight).
5. Radio navigation as it pertains to VFR flight.
6. Navigation terminology (definitions).
7. The vital relationship between weather phenomena and problems of navigation.

C. Aerodynamics and Principles of Flight. Demonstrate a knowledge of—
1. Laws of motion.
2. Functions of the flight controls.
3. Principles of airfoils.
4. Wing planform:
   a. Area, span, and chord.
   b. Aspect ratio, taper, and sweepback.
   c. Effect of planform on stall patterns.
6. Flight controls and axes of the aircraft.
7. Lift and drag during turns.
8. Lift versus angle of attack.
9. Lift and thrust vs. air density.
10. Types of flaps, spoilers, divebrakes.
11. Effect of flaps on lift, drag, and trim.
12. Effect of ice, snow, and frost on airfoils.
13. Power vs. climb, descent, and level flight.



572-269 O - 75 - 3

14. Gyroscopic precession.
15. Types and effect of induced, parasite, and profile drag.
16. Ground effect.
17. Loads and load factors.
18. Static, dynamic, longitudinal, lateral, and directional stability.
19. Stalls and spins.
20. Relative wind and angle of attack.
21. Effect of wind during turns.
22. Torque effect – P factor.

D. Airframe and Powerplant. Have a knowledge of—

1. Aircraft structures.
2. Airframe components and control surfaces.
3. Fuel systems.
4. Oil systems.
5. Electrical systems.
6. Reciprocating engine principles and components.
7. Carburetion and fuel injection.
8. Ignition.
9. Propellers.
10. Engine instruments.
11. Engine controls.
12. Relationship between RPM and manifold pressure.
13. Brake mean effective pressure (BMEP) and its significance.

E. Radio Equipment. Understand the basic charactertistics, operations, frequency ranges, advantages, and limitations of—

1. VHF Communications Equipment.
   a. Understand the "line of sight" range of transmissions.
   b. Understand that an operative transmitter and receiver are all that are required to use VHF Direction Finding Service and radar assistance from ground stations. (In some instances, assistance may be available even when all radios are out if proper procedures are followed.)
2. VOR Equipment.
   a. Understand principles of VOR operation. Be able to recognize a usable signal.
   b. Know the components of a VOR receiver and the importance of proper tuning.
   c. Understand that a radial is a line of magnetic bearing extending from a VOR.
   d. Understand how to utilize receiver checkpoints to establish receiver accuracy.
   e. Be able to work a VOR orientation. Understand how to determine approximate position relative to the station by interpreting the setting of the omnibearing selector, the position of the LEFT-RIGHT needle, and the indication of the TO-FROM indicator. Know the importance of correct sensing.
   f. Know and understand the procedures for VOR off-course navigation and for solving time and distance problems.
3. Nondirectional Radio Beacons and ADF.
   a. Understand nondirectional beacons—their use, classification, and range.
   b. Understand how to interpret bearing information when using your ADF for tracking inbound and outbound, and for track interception:
      (1) Relative Bearings.
      (2) Magnetic Bearings.
      (3) True Bearings.

F. Flight Instruments. Understand the principles of operation and characteristics of flight instruments.

1. Know the similarity between visual and instrument flying with regard to control of aircraft attitude.
2. Be able to interpret the pitch-and-bank attitude of the aircraft by reference to the flight instruments.
3. Understand the bowl-type magnetic compass.
   a. Know the method of making turns by referring to the magnetic compass to determine the lead point at which to begin rolling out.
   b. Understand the following errors of the bowl magnetic compass:
      (1) Deviation.
      (2) Oscillation error.
      (3) Magnetic dip error. Dip error is responsible for—
         (a) *Northerly turning error* which is most pronounced on northerly and southerly headings and.
         (b) *Acceleration error* which is most pronounced on easterly and westerly headings.

4. Thoroughly understand the altimeter (sensitive altimeter adjustable for changes in barometric pressure).
   a. Know the effect of nonstandard temperature and pressure on the indications of the altimeter.
   b. Understand how to apply altimeter settings to the altimeter setting window of the altimeter.
   c. Be able to interpret the indications of the altimeter.
   d. Know how to determine pressure altitude.
5. The Airspeed Indicator. Know the airspeed ranges and limitations that are reflected by the standard marking system on the face of the airspeed indicator (white, green, and yellow arcs, and the red line).
   a. Flap operating range.
   b. Normal operating range.
   c. Caution range.
   d. Power-off stalling speed with the wing flaps and the landing gear in the landing position ($V_{SO}$).
   e. Power-off stalling speed "clean"—wing flaps up and landing gear retracted ($V_{S1}$), if equipped with a retractable landing gear.
   f. Maximum flap extended speed ($V_{FE}$).
   g. Maximum structural cruising speed ($V_{NO}$).
   h. Never-exceed speed ($V_{NE}$).

## III. PRESTARTING INSPECTIONS

A. Exterior Visual Inspection. Understand the importance of—
   1. The use of a checklist in establishing good habit patterns.
   2. Allowing sufficient time for a thorough walk-around inspection as recommended by the aircraft manufacturer.
   3. The emphasis placed on checking for, and adequate drainage of, possible contaminated fuel.
   4. Checking the pitot tube and static pressure orifice.
   5. Ice, snow, and frost removal from the aircraft.

## IV. STARTING, TAXIING, AND ENGINE RUNUP

A. Understand the need for—
   1. Following a checklist based on manufacturer's recommendations.
   2. Familiarity with emergency procedures with regard to engine or induction system fire.
   3. Ground control or tower contracts where applicable for taxi clearance.
   4. Careful observance of the oil pressure/temperature and magneto checks; where applicable, check on fuel pressure, cylinder head temperature, RPM, manifold pressure, flaps, trim, and full control travel in the proper direction.
   5. Caution in control of propeller blast in taxiing and runup where proximity of other aircraft, buildings, and personnel are involved.

## V. TAKEOFF

A. Use checklist.

B. Contact tower for takeoff clearance but check traffic carefully. Safety of the operation is still the pilot's responsibility even though a control tower gives a clearance.

C. Activate any VFR flight plan by reporting time of takeoff to appropriate facility.

D. Be certain tower instructions are clearly understood.

E. Follow tower instructions without deviation, except when cleared to do so or in an emergency.

F. Check density altitude/performance.

G. Use takeoff performance charts.

## VI. IN-FLIGHT

A. Climb to the selected altitude and complete the level-off procedures. Take necessary precautions to ensure accuracy when making readings from the magnetic compass. Reset the gyrodriven heading indicator to the magnetic compass frequently.

B. Comply with FAR 91, *General Operating and Flight Rules*, at all times. Maintain a constant vigilance for other traffic.

C. Compute true airspeeds and true altitudes. Be alert to the effects of density altitude.

D. Determine time between checkpoints and compute groundspeed. Compute ETA over various checkpoints and destinations. Keep log of time over various points.

E. Use good fuel management procedures. Keep close check on fuel consumption rate. Maintain proper fuel/air mixture setting appropriate to cruising altitude through proper use of mixture control.

F. If the winds aloft forecast proves inaccurate, and drifting off your planned course occurs, compute from present position, new headings and groundspeeds to destination.

G. Make periodic VFR position reports to Flight Service Stations. Give PIREPS (Pilot Reports) on unusual weather or erratic operation of radio navigation aids. Request weather information if necessary.

H. Be able to follow nondirectional radio beacon and VOR radials.

I. Know how to tune in and identify a radio beacon or VOR station. Understand how to utilize an air navigation radio aid, *i.e.*, VOR radial and ADF bearing.

J. Have a working knowledge of the procedures for requesting radar vectors, D/F steers, and associated en route emergency navigation assistance.

K. Monitor appropriate stations for scheduled weather broadcasts. Maintain a continuous listening watch for possible in-flight weather safety advisories (SIGMET or AIRMET).

L. When operating in the vicinity of a large aircraft, be on the alert for wingtip vortices. Take recommended action if wake turbulence is inadvertently encountered.

M. Avoid bad weather. Do not get trapped above an overcast. When necessary, use the 180° turn; but reversal is reliable only when an early decision has been made.

N. Avoid turbulent air if possible. If severe turbulence is encountered, slow the aircraft to at least the recommended maneuvering speed.

O. Monitor engine instruments. Be able to recognize symptoms of carburetor icing such as loss of power. Remember that, on aircraft equipped with constant-speed propellers, the initial loss of power will be reflected by decreased manifold pressure, not loss of RPM. The RPM will remain constant due to action of propeller governor.

P. When making in-flight power adjustments, sequence throttle and propeller controls in the correct order. Remember BMEP tolerances.

Q. Be prepared for in-flight emergencies—equipment failure, loss of orientation, or unexpected weather. Have alternate plans of action.

R. Before crossing a Military Training Route, be sure to check the current operational status with a Flight Service Station near the route.

S. If takeoff or landing is made at an airport located within an airport traffic area, follow applicable regulations.

T. Know the official sunset time over the area from which the flight takes place. Turn navigational lights on at the required time. Be familiar with airport lighting, runway lighting, and taxiway lighting.

U. Prior to starting a letdown, check to see that fuel selector is on the appropriate tank, and mixture control is in proper position. Take necessary precautions to avoid possible carburetor icing during prolonged letdowns at reduced power settings.

V. When approaching the destination airport, contact the appropriate facility for landing instructions. Be able to interpret instructions. For example, if instructed to land on "RUNWAY 22 RIGHT TRAFFIC", it should be understood that a landing on a runway with magnetic direction of 220°, using a right-hand traffic pattern should be made.

W. Use standard procedures when entering traffic. Watch for light signals from the tower, while in the air, or while on the ground if the radio receiver becomes inoperative. Maintain a constant vigilance for other traffic. Be alert for segmented marker system as indications of nonstandard traffic.

X. Run a complete prelanding check, *using checklist.*

Y. Understand the purpose and use the Visual Approach Slope Indicator (VASI).

Z. After landing, do not switch radio frequency until directed to do so by the controller, *after* turning off the active runway. Exercise caution while taxiing to the tie-down area.

## VII. POST-FLIGHT ACTIVITIES

A. Turn off all switches and secure the controls.

B. Close flight plan with the appropriate facility.

C. Refuel to capacity, to reduce condensation in the tanks and possible fuel contamination.

D. If applicable, arrange for hangar space or tie-downs.

E. Record flight time. (Not mandatory except to verify recent experience necessary for grade of certificate or rating sought.)

F. Record airframe and engine time in appropriate logbooks.

## SAMPLE TEST

The following test items are presented to familiarize the applicant with the type of questions he may expect to find on the Fundamentals of Instructing written test and Basic or Advanced Ground Instructor written tests. Performance on the sample test items should not be used as a measurement of ability or determination that the applicant is fully prepared to take either test, since all subjects on which he will be tested are not included herein.

The applicant should concentrate on the appropriate study outline provided in this guide. A knowledge of all topics listed in these outlines should be used as the criterion for determining that he is properly prepared to take the appropriate test. Proper preparation requires considerable time, effort, and the guidance of a competent instructor.

### *Section I*

### Fundamentals of Instructing

1. Test reliability refers to the
   1—characteristic of a test which indicates consistent results for a test over a period of time.
   2—measure of temporary variations influenced by chance errors.
   3—accuracy with which a test identifies the superior students.
   4—exactness with which a test measures what it is supposed to measure.

2. If an instructor wishes to do an effective job of teaching, the most important requirement is that he master
   1—only teaching methods.
   2—only his subject matter.
   3—both teaching methods and subject matter.
   4—public speaking technique.

3. One of the most significant sources of information for an instructor, with regard to the need to develop new and better ways of improving his teaching effectiveness, lies in
   1—noting whether a comparison between his methods and those used by successful teachers is favorable or unfavorable.
   2—the observations and suggestions made by supervisors and other instructors.
   3—the observation and evaluation of the difficulties which his students are having.
   4—listening to student's suggestions.

4. Good instruction techniques involve many important elements. Select the answer which includes only those items important to good instruction.
   A. Evaluate the student and recognize his difficulties as an individual.
   B. Instruct each class in exactly the same manner so as to assure a constant level of student proficiency.
   C. Set specific goals.
   D. Avoid setting standards of performance lest failure to meet them prevents progress.
   E. Acquaint the student with his progress only if he seems concerned about the matter.
   F. Keep student informed of his progress.
   G. Allow the student to participate in the class session and demonstrate his ability to anticipate mistakes and if possible, correct them before they occur.
   H. Use a teaching sequence that "makes sense" from the learner's point of view.
   I. Improve motivation through use of negative incentives.
   J. Use oral questions in the classroom to evaluate progress and level of learning.
   K. Use a lesson plan even if it is inadequate.
   L. Emphasize the lecture method of instruction.
   M. Limit classroom practice as much as possible since it consumes too much time.

The correct statements are:

1—A, C, F, H, J, K.
2—B, D, E, G, I, L, M.
3—A, D, E, H, L.
4—C, F, G, H, K.

5. True comprehension and understanding of a subject is the very essence of any learning. The best way to determine if a student really understands a subject is to

1—accept a high grade average as evidence of such understanding.

2—give tests which require high levels of retention in order to make a good grade.

3—ascertain that the student can actually apply his knowledge to all the problems covered in the classroom program.

4—test the student's ability to apply his knowledge toward solving new and difficult situations.

### *Section 2*

### Aeronautical Knowledge

This test is based on a flight within the state of Arizona.

Although this is a hypothetical cross-country, the weather data is authentic. The airplane you are assumed to be flying is a late model, 4-place, single-engine airplane. It is equipped with retractable, tricycle landing gear and a constant speed propeller. This airplane is designated as DAEDALIAN DART 2468-W. It is to be flown in accordance with FAA-approved Airplane Flight Manuals and placards that appear in the airplane.

### PROPOSED CROSS-COUNTRY FLIGHT DATA

You are a professional pilot employed by a mining company. You are scheduled for a flight originating at Greenlee County Airport, and terminating at Williams, with intermediate stops at Holbrook, and Flagstaff.

You will carry three executives who are conducting a safety survey. You have established your tentative route on the 12th Edition of the Phoenix Sectional Aeronautical Chart as follows:

LEG I

Greenlee County Airport, Arizona (see Clifton-Morenci in Airport Directory excerpts) direct to Holbrook Municipal Airport.

LEG II

Holbrook Municipal Airport direct to Winslow VORTAC; thence direct to Flagstaff Pulliam Airport.

LEG III

Flagstaff Pulliam Airport direct to Williams Municipal Airport.

* * * * * *

*COORDINATES*

Greenlee County Airport 32°57′N – 109°12′W.
Holbrook Municipal Airport 34°56′N – 110°08′W.
Flagstaff Pulliam Airport 35°08′N – 111°40′W.
Williams Municipal Airport 35°18′N – 112°12′W.

* * * * * *

Your preflight activities include:

(1) Necessary review of the *Airplane Flight Manual, Operations Placards,* and *Owner's Handbook,* with emphasis on operating speeds, power and mixture settings, weight and balance considerations, and emergency procedures.

(2) A study of pertinent information in the *Airman's Information Manual.*

(3) A review of the map with emphasis on the relationship between your route and airway structures, terrain and obstruction elevations, and airport facilities available en route in event of emergency.

(4) A review of radio checkpoints and navigational facilities.

(5) Thorough check of available weather information.

(6) Filing a flight plan.

(7) Preflight check of the airplane.

* * * * * *

STATION IDENTIFIERS

FLG—Flagstaff, Arizona
GNT—Grants, New Mexico
INW—Winslow, Arizona
PHX—Phoenix, Arizona
PRC—Prescott, Arizona
SAF—Santa Fe, New Mexico
TUS—Tucson, Arizona

1. According to the 1400Z Hourly Sequence Report, Figure 6.
   1—PHX reports a ceiling of 12,000 feet.
   2—PRC reports a pressure of 906.4 millibars.
   3—TUS reports an altimeter setting of 39.83 inches.
   4—GNT reports calm surface winds.

2. The 1500Z Hourly Sequence Report at Phoenix, Figure 6, indicates that
   1—the ceiling is 10,000 feet.
   2—the ceiling is 1,200 feet.
   3—the ceiling is 12,000 feet
   4—there is no reported ceiling at Phoenix.

3. You plan to depart at 0830 MST. After a study of all the Hourly Sequence Reports in Figure 6, you conclude that
   1—you have no weather problem with regard to the flight.
   2—you can anticipate frontal activity between 0700 MST and 0800 MST.
   3—ceilings will decrease along the route.
   4—you are unable to ascertain what the weather is likely to do in the next few hours.

4. After a study of *all* the weather information *available*, you determine that
   1—it is not possible to estimate what the weather is likely to do in the next few hours.
   2—turbulence and surface winds are likely to be your principal en route weather problems.
   3—scattered thunderstorms will probably occur along your route before 1200 MST.
   4—it would be best to fly as low as obstruction clearance will permit because of more favorable winds.

5. Suppose that pressure altitude and indicated altitude are approximately the same at 4,000 feet *above the ground* over Prescott, Arizona. Indicated airspeed is 170 MPH. If you use the PRC FD (Winds Aloft Forecast) Figure 5, you determine that
   1—TAS is approximately 200 MPH.
   2—TAS is approximately 183 MPH.
   3—TAS is approximately 190 MPH.
   4—there is not enough information available to find true airspeed.

NOTE: Assume Calibrated Airspeed (CAS) to be identical to Indicated Airspeed (IAS).

6. The statements listed below concerning the surface weather map excerpt, Figure 9, may or may not be correct.
   A. Warmer air is south and east of the front while cooler air lies north and west of the front.
   B. The front depicted on the weather map is an occluded front.
   C. The front depicted on the weather map is a stationary front.
   D. The isobar of lowest pressure that can be identified is the 1004.0 millibar line.
   E. The distance between the isobars is such that the surface winds over the area pictured should be moderately strong (30 to 35 knots).
   F. The surface wind at Winslow is from the north.
   G. The surface temperature is 60° F. and dewpoint is 23° F. at Winslow.

In selecting all the correct statements from the preceding, you would include items
   1—A, B, E, and G.
   2—A, C, D, and G.
   3—C, D, and G.
   4—B, E, and F.

7.

| | |
|---|---|
| Your weight | 165 lbs. |
| Front seat passenger weight | 150 lbs. |
| Rear seat passengers weight | 365 lbs. |
| Fuel | Full |
| Oil | Full |
| Baggage | 125 lbs. |
| Aircraft empty weight moment | 65.9 lb.-in. |

Using the above information, together with data from the Aircraft Description in Figure 13, you determine through use of the Loading Graph and Center of Gravity Envelope Graph Figure 15, that

1—the gross weight and balance requirements are both within limits.

2—the weight is in excess of maximum certificated gross limit and should be reduced before an attempt is made to determine the center of gravity condition.

3—both weight and balance conditions are outside of established limits.

4—it is not possible to determine if the weight and balance conditions are within limits on the basis of information supplied.

**8.** You plan to remain VFR at all times and to avoid turbulence as much as possible; you plan to fly more than 3,000 feet above the ground en route. Your en route altitude

1—would be indeterminable until you compute the magnetic heading.

2—should be odd thousand plus 500 feet from Greenlee County Airport to Holbrook, Arizona.

3—should be odd thousand plus 500 feet.

4—should be even thousand plus 500 feet.

LEG I

**9.** From the following conditions, compute the approximate compass heading and true airspeed.

| | |
|---|---|
| Indicated airspeed | 150 knots |
| Pressure altitude | 10,000 ft. |
| Outside air temperature | +10° C. |
| True course | 341° |
| Wind direction | 230° |
| Wind velocity | 25 knots |
| Magnetic variation | 14° E. |
| Compass deviation | +3° |

1—323° and 180 knots.

2—334° and 188 knots.

3—320° and 150 knots.

4—341° and 165 knots.

**10.** After your takeoff from Greenlee County Airport at 0830 MST, you notice as you climb on course that you are passing through 8,800 feet. Which of the altimeter illustrations in Figure 44, of the appendix indicates this altitude?

1—A.

2—B.

3—C.

4—D.

**11.** Assume that you have 33 gallons of usable fuel remaining after you reach 10,500 feet. Approximately how long can you fly with a power setting of 2,200 RPM and 19 inches of manifold pressure if you retain a 30-minute fuel reserve?

1—2 hours 52 minutes.

2—5 hours 6 minutes.

3—3 hours 21 minutes.

4—None of the above.

NOTE: Refer to the 10,000-foot Cruise Performance Chart in the appendix, Figure 18.

LEG II

**12.** If you select 10,500 feet as your cruising altitude on the flight from Holbrook to Flagstaff, and use an estimated indicated airspeed of 170 MPH, an outside air temperature of +15° C., and the winds aloft as 230° at 25 knots, you compute the estimated average groundspeed for this leg to be approximately

1—187 MPH.

2—175 MPH.

3—150 MPH.

4—None of the above.

NOTE: Assume pressure altitude and indicated altitude to be the same.

**13.** As you approach the Winslow VORTAC, you note that your course will cause you to cross approximately 3 miles behind and slightly below a four-engine jet. If you are familiar with hazards involving turbulence in the wake of large aircraft, you would select which of the following as correct statements?

A. The main source of the disturbance or turbulence is the "jet wash" or "prop wash".

B. The main source of the disturbance or turbulence is the vortex created by the wingtips.

C. Clean, heavy, slow flying aircraft produce the most violent turbulence or vortices.

D. The violent, compact, tornado-like air masses associated with this phenomena can cause loss of aircraft control or even structural failure.

E. Under the circumstances described, you are too far from the jet to be affected by this invisible hazard.

F. If you encounter this hazard in cruising flight, you should decrease speed immediately, avoid "fighting the controls," and if possible, change altitude.

G. If taking off or landing behind large aircraft, fly up-wind of their track, KEEP PLENTY OF DISTANCE, and request delay from the tower on takeoffs and landings if in doubt about wake turbulence or spacing.

H. Helicopters can create conditions of vortex turbulence similar to that produced by fixed-wing aircraft, and you should stay above their flight path.

1—B, C, D, F, G, and H.

2—A, D, E, F, and G.

3—A, C. D, E, and G.

4—B, E, F, and H.

**14.** If, for some reason, you were to lose your visual references while taking evasive action with regard to the jet, and a check of your instruments showed the readings pictured in F, Figure 19, in the appendix, which of the following statements are true? You are in a—

A. Slipping, descending turn to the right and should first reduce power and bank to return to level flight.

B. Coordinated, descending turn to the right and should first add power and increase back pressure to return to level flight.

C. Skidding, climbing turn to the left.

D. Nose-high attitude.

E. Nose-low attitude.

F. 40° bank, approximately.

G. 3° per/sec. rate turn.

The correct statements are:

1—A, D, F, and G.

2—B, E, F, and G.

3—A, E, F, and G.

4—C and D only.

**15.** Assume that you now find yourself in a coordinated level turn with a 40° bank. Your present gross weight, when in straight-and-level flight, is 2,800 lbs. Referring to Figures 40 and 41, which of the following statements are correct?

A. In the situation depicted in illustration X, your approximate effective gross weight is 3,640 lbs.

B. Your rate of turn is the same for situation X, Y, and Z, but the radius of turn increases as the speed increases.

C. The radius of turn remains constant for situations A, B, and C, but the rate of turn will increase as the speed increases.

D. The radius of turn is less, but the rate of turn is greater in situation A than in either B or C.

E. The load factor increases as the speed increases.

The correct statements are:

1—B and C.

2—A, C, and D.

3—A, B, and D.

4—A and D.

**16.** Soon after leveling off on-course you encounter moderate turbulence. To remain at or below a speed that would decrease the possibility of structural damage, you should not exceed the speed indicated by the

1—red radial line.

2—upper limit of the white arc.

3—upper limit of the green arc.

4—upper limit of the yellow arc.

**17.** You are ready to land on Runway 21 at Flagstaff Pulliam Airport, after a total flying time of 1 hour 15 minutes since leaving Greenlee County Airport. Fuel consumption has been at the rate of 10 gallons per hour. Surface wind is 20 knots from 210°, and surface temperature is 75° F. You will use 40° of flaps for the landing. Referring to the landing table in Figure 17, your landing distance for clearing a 50-foot obstacle is approximately

1—834 feet, if the temperature were standard at your altitude.

2—973 feet, regardless of the temperature.

3—1,390 feet.

4—645 feet.

NOTE: Interpolate weight to the closest 500 lbs, altitude to the closest 500 feet, and wind to the closest 6 MPH. Assume takeoff gross weight was 2,900 lbs.

LEG III

**18.** After departing Flagstaff, you wish to "dog-leg" your direct route so as to stay away from the Restricted Area (R-2302), 7 miles west of Flagstaff, and yet stay close to the highway and railroad leading into Williams You tune in and identify the Flagstaff VOR with the omnibearing selector set on 270 while maintaining a magnetic heading of 300°. If you did not know your position and used *only* your omni, which reads as illustrated in Figure 45, you would know that you are

1—on the 090 radial and flying directly toward the station.

2—crossing the 270 radial and flying away from the station.

3—unable to determine your position at the moment, but you are on the 090 radial.

4—unable to determine *anything* about where you are or where you are going.

**19.** Assume that while taxiing on Williams Municipal Airport your nosewheel collapses. If you were unsure about accident reporting procedures, you could find the necessary information in

1—Federal Aviation Regulations, Part 61.

2—Federal Aviation Regulations, Part 67.

3—Federal Aviation Regulations, Part 1.

4—National Transportation Safety Board, Part 430.

## ANSWERS AND EXPLANATIONS

### Fundamentals of Instructing

1. (1) Response #2 is incorrect because it refers only to one of the factors which affect reliability, not the complete evaluation of reliability. Response #3 has nothing to do with reliability of a test. Response #4 is the definition for validity.

2. (3) Responses #1 and #2 are not complete. Response #4, while useful, is not as essential to success in teaching as item #3.

3. (3) All of the other responses are means of effecting improvement, not clues to determining the need for improvement.

4. (1) The statements made in this question cover a broad range of items; however, the correct response may be found in *Flight Instructor's Handbook*, AC 61-16A. Response #2 is incorrect because every item included in it is incorrect. Response #3 is incorrect because items D, E, and L are incorrect. Response #4 is incorrect because it includes item G.

5. (4) All other responses will test for rote memory or ability to deal with familiar problems which, in themselves, will not effectively prove that the student *understands* what he knows.

### Aeronautical Knowledge

1. (4) The 1400Z Sequence Report for GNT shows the numbers " 0 0 0 0" in the space for surface wind and denotes a calm wind condition.

2. (4) The reported layer of *thin* scattered clouds at 12,000 feet does not constitute a ceiling. (*Aviation Weather*, AC 00-6, and Part 1 of the Federal Aviation Regulations.)

3. (4) The study of only hourly sequence reports will not furnish sufficient information to make a route forecast. (*Aviation Weather*, AC 00-6.)

4. (2) The terminal forecasts call for surface winds in this area to be 20 to 30 knots. The in-flight advisory calls for light to moderate turbulence below 8,000 feet until AIRMET is canceled. The 1300Z Pilot Report Summary supports the Terminal Forecasts and In-Flight Advisory.

5. (1) Using a pressure altitude of 9,042 (4,000 feet plus ground elevation at PRC) and a forecast temperature of +12° C., your computer should indicate approximately 200 MPH TAS opposite a CAS of 170 MPH.

6. (2) The air mass to the south and east of the front is composed of warmer air as represented by the station symbols at the 10 o'clock position. The air mass to the northwest of the front is composed of cooler air. (*Aviation Weather*, AC 00-6.) The front is stationary as indicated by the location of the warm and cold front symbols on the frontal line.

   Isobars are lines connecting points of equal pressure. The isobar curving southward from Casper, Wyoming, and northward into Nebraska; the isobar surrounding Grand Junction, Colorado; the isobar around the low pressure area over Las Vegas, Nevada, represent a pressure of 1004.0 millibars.

   The figure "60" at the 10 o'clock position and the figure "23" at the 8 o'clock position on the Winslow station model represents a temperature of 60° F. and a dewpoint of 23° F. respectively.

7. (2) The empty weight, including unusable fuel, is 1,839 lbs. Figure 13. The empty weight moment is approximately 65,873 pound-inches (empty weight × empty C.G. in inches or 1,839×35.82).



572-269 O - 75 - 4

LOADING PROBLEM

| | *Weight (lbs.)* | *Moment (lb.-in.) Thousands* |
|---|---|---|
| Airplane (empty) | 1,839.0 | 65.9 |
| Pilot and front seat passenger | 315.0 | 11.5 |
| Rear seat passengers | 365.0 | 25.4 |
| Fuel (55 gal. @ 6 lbs. per gal., Fig. 14) | 330.0 | 15.8 |
| Oil (3 gal. @ 7.5 lbs. per gal., Fig. 14) | 22.5 | −.4 |
| Baggage | 125.0 | *11.5 |
| TOTAL | 2,996.5 | 129.7 |

* Taken from Loading Graph, Figure 15.

Your gross weight is 96.5 lbs. in excess of the maximum allowable gross weight; therefore, you must reduce the load to 2,900 lbs., or less, and compute the center of gravity.

**8.** (4) When an aircraft is operated in level cruising flight at an altitude of more than 3,000 feet above the surface, the following altitudes shall be observed:

a. Below 18,000 feet. At an altitude appropriate to the magnetic course being flown as follows—

(1) Zero degrees to 179° inclusive, at odd thousands plus 500 (3,500; 5,500; etc.).

(2) 180° to 359° inclusive, at even thousands plus 500 (4,500; 6,500; etc.). (Reference FAR 91.109.)

**9.** (1) Given: Indicated Airspeed 150 knots
Given: Pressure Altitude 10,000 feet
Given: Outside Air Temperature +10° C.
Computed: True Airspeed 180 knots
Plotted: True Course 341°
Wind 230°/25 knots
Computed: Wind Correction Angle −7°
Computed: True Heading 334°
Magnetic Variation 14° E.
Computed: Magnetic Heading 320°
Compass Deviation +3°
Computed: Compass Heading 323°

**10.** (2) The altitudes indicated by the four altimeters are as follows:

A. 880 feet.
B. 8,800 feet.
C. 18,800 feet.
D. 7,880 feet.

**11.** (1) Figure 18 shows a fuel consumption of 9.8 gal./hr. at 10,000 feet with a power setting of 2,200 RPM and 19 inches of manifold pressure. Subtracting the 30-minute fuel reserve from the total of 33 gals. leaves 28.1 gals. of fuel (33 gals. minus 4.9 gals). Burning 28.1 gals. of fuel at the rate of 9.8 gals. per hour would permit 2 hours 52 minutes of flying. Study the charts until you understand their use.

**12.** (1) You must first correct indicated airspeed to true airspeed. An indicated airspeed of 170 MPH at 10,500 feet and +15°C. results in a true airspeed of 207 MPH. To compute the average groundspeed you could either use an average true course and apply the wind to each segment of the leg or average the resulting groundspeeds. Averaging true courses is not always absolutely accurate; however, in this case the difference in groundspeeds over the two segments is negligible; therefore, the time difference would be slight. The winds aloft forecast at 10,000 feet is from 230° true, at approximately 29 MPH. Whether you apply this wind to an average true course of 279° or to the exact true course for each segment and average the resulting groundspeeds, the answer is approximately the same—187 MPH.

**13.** (1) This problem is covered in detail in AC 90–23D, *Wake Turbulence*. You should study this publication.

**14.** (3) The quality of a turn (slipping, skidding, coordinated) is indicated by the position of the ball in the turn-and-bank indicator. If the ball is to the inside of the turn, the airplane is slipping. The aircraft is in a nose-low attitude since the attitude indicator (artificial horizon) shows the nose below the horizon and the other instruments show a descent. Even if the attitude indicator were malfunctioning, it is scarcely possible to be in other than a nose-low attitude in your airplane with the airspeed, vertical speed, and altimeter indicating as illustrated. The attitude indicator shows a 40° bank to the right. The turn needle also indicates a turn to the right at a rate of 3°/sec. Reduce power, decrease bank, and then apply back pressure as necessary to recover when the nose is low and the airspeed is increasing. This is much safer than adding back pressure first which might well increase the load factor beyond safe limits.

**15.** (4) The load factor for a 40° bank is determined by using the graph in Figure 40. This graph gives a load factor of approximately 1.3 for a 40° bank. Multiplying 2,800 by 1.3 results in an effective gross weight of 3,640 lbs. In order to maintain a given rate of turn, the angle of bank must be varied with the TAS. If, for example, you wish to hold a standard rate turn of 3°/second at a true airspeed of 100 MPH, your angle of bank will be 13.5°. The bank required to produce this same rate of turn at 200 MPH TAS is nearly double the bank required at 100 MPH. It now becomes 25.6°; therefore, the rate of turn must decrease if the TAS increases while the bank remains constant. It then follows that any given bank at slow speed provides a higher rate of turn and results in a smaller radius of turn than the same degree of bank at higher speeds.

**16.** (3) Maximum structural speed ($V_{NO}$) is the maximum speed for normal operation. It is located at the juncture point of the lower limit of the yellow arc (caution) and the upper limit of the green arc (normal operating range) on the face of the airspeed indicator. Study FAR 23.1505.

**17.** (1) Flying for 1 hour and 15 minutes and burning fuel at the rate of 10 gals. per hour, would mean a gross weight reduction of approximately 75 lbs. Interpolating weight to the closest 500 lbs. would mean using a weight of 2,900 lbs. for the following computation:

(a) A 20-knot headwind equals 23 MPH.

(b) 24 MPH means a 40% reduction in landing distance.

(c) Field elevation of Flagstaff is 7,012 feet; thus the closest 1,000-foot value is 7,000 feet.

(d) Interpolating on the chart, with a gross weight of 2,900 lbs. at 7,000 feet and standard temperature, the landing distance to clear a 50-foot obstacle is 1,390 feet.

(e) A 40% reduction of 1,390 feet is 565 feet.

(f) Subtracting 556 feet from 1,390 feet equals 834 feet.

(g) This figure is valid only if the temperature is standard at 7,000 feet.

**18.** (2) With the information supplied you cannot fix your location by use of omni alone, but under the circumstances given here you can only determine that you are on the 270 radial. At any given moment, omni alone tells you only which radial you are on and not where you are going. Only by relating the course selector value and the **TO-FROM** indication to the magnetic compass reading can you determine whether you are actually going **TO** the station or **FROM** the station on the selected radial or simply crossing that radial. Even after you have determined which radial you are on, you can determine your position or "fix" along this radial only by use of geographical landmarks, or an accurate groundspeed estimate, or by a cross-bearing from another station. For a more detailed explanation of omni (VOR) and its use, study *Pilot's Handbook of Aeronautical Knowledge, Practical Air Navigation,* and VFR Exam-O-Grams 15 and 16.

**19.** (4) Figure 54, gives an explanation of how to report an accident and refers to the NTSB Regulation which pertains to this requirement.

### Additional Questions for Study

Answers and explanations are included with the following questions. These questions are intended to direct study to selected areas, but by no means cover all subject areas.

1. What safety precautions should be observed when in the vicinity of aircraft oxygen systems and pressurized oxygen containers?

2. How does "ground effect" affect aircraft performance?

3. How are wingtip vortices generated and why is this turbulence hazardous?

4. What is the function of the static system in an airplane?

5. Explain the difference between preignition and detonation?

6. What is hypoxia and how does the inhalation of tobacco smoke or other toxic fumes affect tolerance to hypoxia?

7. What are the forces acting on an airfoil in flight?

8. How do the forces acting on an airplane in flight change when establishing a climb, descent, or turn?

9. What are the similarities and differences between a propeller and a wing of an airplane?

10. Explain "load factor". How do various flight maneuvers affect load factor?

11. Explain dynamic stability? Static stability?

12. What is the significance of the color coding found on an airspeed indicator?

13. In-flight carburetor icing indications differ between various types of propellers. What are the reasons for these differences?

14. What effect does an increase in altitude have on indicated airspeed?

15. How does the term "cabin pressure altitude" apply to the use of supplemental oxygen?

16. Why is proper loading of an airplane important?

17. What causes an airplane to turn to the left during certain flight maneuvers?

18. What effect does the addition of water vapor to the atmosphere have on airplane performance?

19. How does a magnetic compass function, and what are its errors?

20. Why is poor flying weather more likely to be associated with a low pressure area than a high pressure area?

## APPENDIX

STATION IDENTIFIERS

ABQ - Albuquerque, New Mexico
FMN - Farmington, New Mexico
FLG - Flagstaff, Arizona
GNT - Grants, New Mexico
INW - Winslow, Arizona
PHX - Phoenix, Arizona
PRC - Prescott, Arizona
SAF - Santa Fe, New Mexico
TUS - Tucson, Arizona
ZUN - Zuni, New Mexico

FIGURE 1

LETTER DESIGNATORS FOR REPORTS AND FORECASTS

FT - Terminal Forecasts
FA - Area Forecasts
FD - Winds Aloft Forecasts
WS - SIGMET - Weather significant to safety of all aircraft
WA - AIRMET - Weather phenomena of operational interest to all aircraft, but potentially hazardous to aircraft of limited capability.
UA - Pilot Report
SA - Hourly Sequence Report
WW - Severe Weather Forecasts
AC - Severe Weather Outlooks
SD - Individual Single Station Radar Report

FIGURE 2.

## EXCERPTS FROM SLC AREA FORECAST

```
SLC FA 111240
13Z FRI - 07Z SAT
OTLK 07Z SAT - 19Z SAT

UTAH NEV IDA MONT ARIZ CALIF ORE WASH CSTL WTRS

HGTS ASL UNLESS NOTED

SYNS.  LO PRES OVR SRN NEV WL MOV TO SWRN UTAH BY 01Z.
WK DFUS STNRY FNT WL CONT EXTRM WRN ARIZ.

SIGCLD AND WX.

. . . . . .

ARIZ.  CLR UNTIL SCTD CU DVLP OVR MTNS DURG AFTN.  120-
140 SCT WITH A FEW HIGH LVL SHWRS MTNS UNTIL 03Z.  SFC WNDS
LCLY 2325G35 BY 18Z.  OTLK. VFR.

. . . . . .

ICG.  LGT ICGIC.  FRZG LVL 135-145.
```

FIGURE 3

## SELECTED TERMINAL FORECASTS

```
FT 111040

INW 111111 O. 19Z 80@1200 2525G35. 02Z 1000. 05Z VFR..
PRC 111111 O. 17Z 800C1200 2320G30. 02Z C1500. 05Z VFR..
FLG 111111 O. 17Z 800C1200 2020G30. 02Z C1200 2315G25.
 05Z VFR..
FMN 111111 O. 19Z C800 2320 OCNLY C700 BRF RW- VCNTY.
 03Z C1000. 05Z VFR..
ABQ 111111 O. 19Z 8001200 2020 OCNLY C800 2525G30. 02Z 1000.
 05Z VFR..
```

FIGURE 4

WINDS ALOFT FORECASTS (FD)

10Z - 22Z (0300MST - 1500MST)

| FT | 3000 | 6000 | 9000 | 12000 | 18000 |
|---|---|---|---|---|---|
| ABQ | | 2020 | 2325+10 | 2730+03 | 2740-10 |
| FMN | 1915 | 1920+18 | 2030+10 | 2040+02 | 2140-10 |
| PRC | | 2715+20 | 2830+12 | 2940+05 | 3040-10 |
| BLD | | 2816+22 | 3032+14 | 3131+07 | 3242-12 |
| BCE | | 3018+24 | 3234+16 | 3444+09 | 3444-14 |

FIGURE 5.

SELECTED AVIATION WEATHER REPORTS
0700 MST

SA 111400Z
PRC 140-02Ø+Ø64/6Ø/32/181Ø/985
FLG 12Ø-015+ Ø55/55/18/1812G18/993
INW 1ØØ06Ø Ø45/55/26/181Ø/998
ZUN 12Ø02Ø+ Ø7Ø/55/3Ø/2ØØ5/995
GNT 12Ø-035 Ø65/55/31/ØØØØ/ØØ1
PHX 9Ø012Ø-045 Ø75/7Ø/3Ø/27Ø4/HK ALQDS
TUS E150030005Ø Ø6Ø/75/35/181Ø/983

SELECTED AVIATION WEATHER REPORTS
0800 MST

SA 111500Z
PRC 13Ø045 Ø67/68/31/2728/991
FLG 12Ø02Ø+ Ø65/6Ø/3Ø/2Ø15/993
INW 1ØØ06Ø+ Ø47/65/31/1815/989
ZUN 1ØØ-025 Ø65/6Ø/33/231Ø/999
GNT 12003ØØ-035 Ø6Ø/65/32/181ØG15/ØØØ
PHX 1ØØ012Ø-035 Ø82/75/33/27Ø5/HK ALQDS
TUS E150030070 Ø75/75/32/2315/985

FIGURE 6

PILOT REPORTS

UA 111300Z

N MEX
GNT 40 W GNT MDT TURBC 105 BN35. FLG AREA LGT TURBC SFC TO 104 PA23. ZUN-INW MDT TURBC 95 C310
ZUN V-62 SAF MDT TURBC 120 C182
ZUN-GNT MDT TURBC INCRG 95 C172
ARIZ
50 E PRC LGT-MDT TURBC 105 PA24
ZUN-INW MDT TURBC 95 C310
INW-PRC MDT OCNLY SVR TURBC 105 PA22

FIGURE 7

IN-FLIGHT ADVISORIES

SLC WAC 111345
111345-UFN

AIRMET ALPHA 1. FLT PRCTN. NRN ARIZ AND W OF CONTDVD IN NRN N MEX LGT TO MDT TURBC BLO 80 WITH STRONG DWNDRFTS OVR LEE SLPS. CONT AIRMET UNTIL CNCL NOTICE IS RCVD

SLC WA 112320
112320-120200

AIRMET ALPHA 2. CNCL AIRMET ALPHA 1. FLT PRCTN. NRN ARIZ NRN N MEX MDT TURBC BLO 140 DCRG TO LGT BY 02Z

FIGURE 8

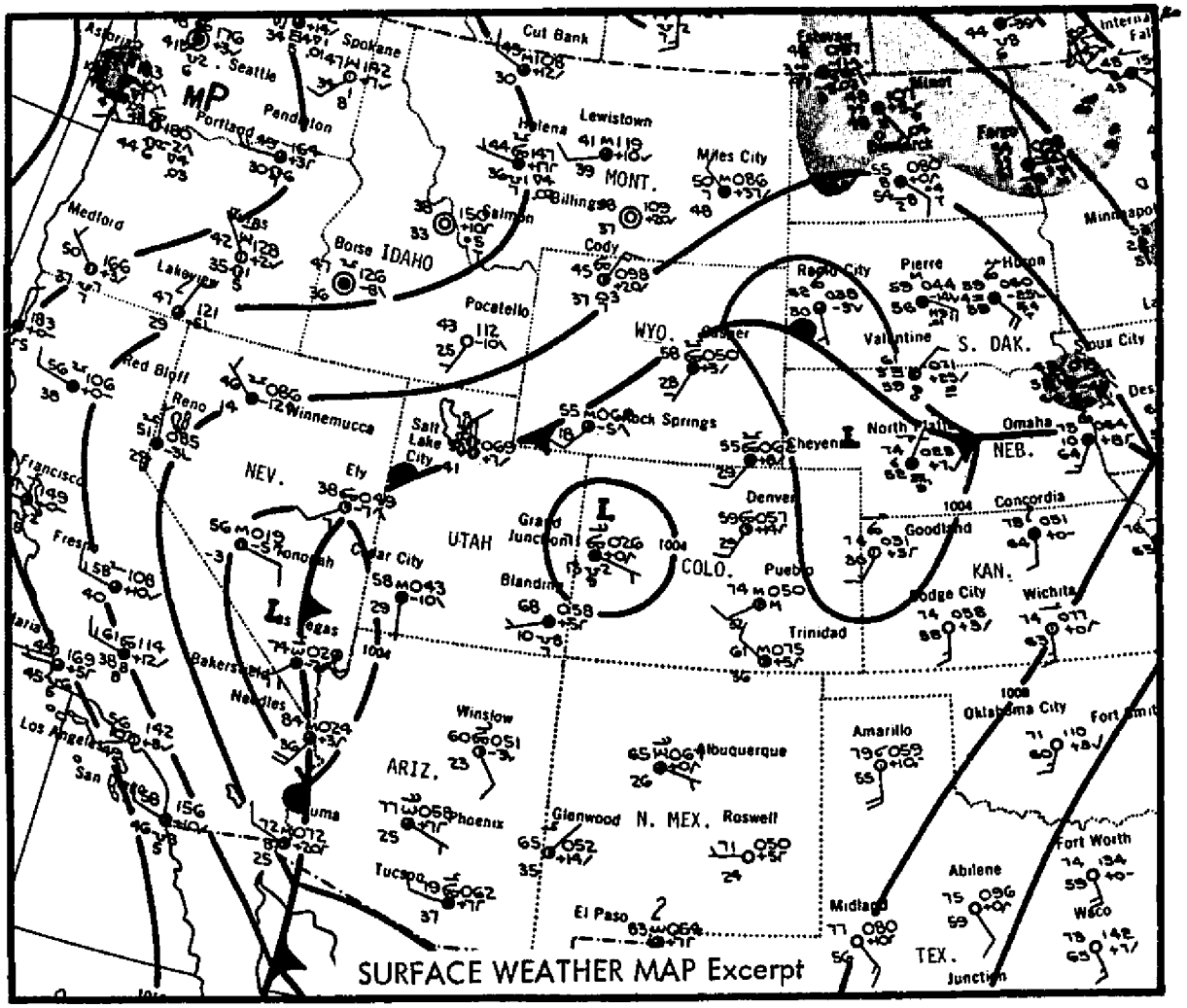
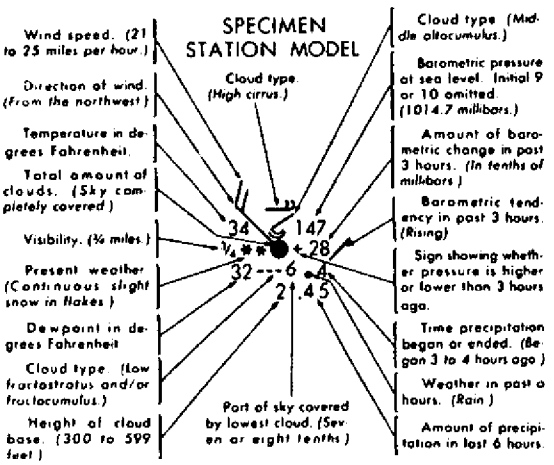

SURFACE WEATHER MAP Excerpt
Cut Bank
Spokane
Seattle
Portland
Pendleton
Helena
Lewistown
Miles City
MONT.
Billings
Salmon
Boise
IDAHO
Medford
Lakeview
Cody
Pocatello
WYO.
Rapid City
Pierre
Huron
Valentine
S. DAK.
Sioux City
Red Bluff
Reno
Winnemucca
Salt Lake City
Rock Springs
Cheyenne
North Platte
Omaha
NEB.
NEV.
Ely
Denver
Concordia
Goodland
Grand Junction
UTAH
COLO.
Pueblo
KAN.
Dodge City
Wichita
Las Vegas
Cedar City
Blandin
Trinidad
Bakersfield
Needles
Winslow
Albuquerque
Amarillo
Oklahoma City
Fort Smith
ARIZ.
Phoenix
Glenwood
N. MEX.
Roswell
Tucson
El Paso
Midland
Abilene
Fort Worth
Waco
TEX.
Junction

FIGURE 9


SPECIMEN
STATION MODEL
Wind speed. (21 to 25 miles per hour.)
Direction of wind. (From the northwest.)
Temperature in degrees Fahrenheit.
Total amount of clouds. (Sky completely covered.)
Visibility. (⅝ miles.)
Present weather. (Continuous slight snow in flakes.)
Dewpoint in degrees Fahrenheit
Cloud type. (low fractostratus and/or fractocumulus.)
Height of cloud base. (300 to 599 feet.)
Cloud type. (High cirrus.)
Part of sky covered by lowest cloud. (Seven or eight tenths.)
Cloud type. (Middle altocumulus.)
Barometric pressure at sea level. Initial 9 or 10 omitted. (1014.7 millibars.)
Amount of barometric change in past 3 hours. (In tenths of millibars.)
Barometric tendency in past 3 hours. (Rising)
Sign showing whether pressure is higher or lower than 3 hours ago.
Time precipitation began or ended. (Began 3 to 4 hours ago.)
Weather in past 6 hours. (Rain.)
Amount of precipitation in last 6 hours.
34
147
28
32
6
4
21
45

## KEY TO AVIATION WEATHER REPORTS.....

| LOCATION IDENTIFIER AND TYPE OF REPORT* | SKY AND CEILING | VISIBILITY WEATHER AND OBSTRUCTION TO VISION | SEA-LEVEL PRESSURE | TEMPERATURE AND DEW POINT | WIND | ALTIMETER SETTING | RUNWAY VISUAL RANGE | CODED PIREPS |
|---|---|---|---|---|---|---|---|---|
| MKC | 15ØM25Ø | 1R-K | 132 | /58/56 | /18Ø7 | /993/ | RØ4LVR2ØV4Ø | /ØS5 |

**SKY**

Sky cover symbols are in ascending order. Figures preceding symbols are heights in hundreds of feet above station.

Sky cover symbols are:

- ○ Clear. Less than 0.1 sky cover
- ① Scattered. 0.1 to less than 0.6 sky cover
- ① Broken. 0.6 to 0.9 sky cover
- ● Overcast. More than 0.9 cover
- – Thin (When prefixed to the above symbols)
- –⊗ Partly obscured. 0.1 to less than 1.0 sky hidden by precipitation or obstruction to vision (bases at surface)
- ⊗ Obscured. 1.0 sky hidden by precipitation or obstruction to vision (bases at surface)

**CEILING**

Letter preceding height of layer identifies ceiling layer and indicates how ceiling height was obtained. Thus:

| | | | |
|---|---|---|---|
| A | Aircraft | R | Radar |
| B | Balloon (ceiling, pilot or radar) | W | Indefinite |
| E | Estimated | V | Immediately following numerical value indicates a variable ceiling height |
| M | Measured | | |

**VISIBILITY**

Reported in Statute Miles and Fractions (V-Variable)

**WEATHER AND OBSTRUCTION TO VISION SYMBOLS**

| | | | | | |
|---|---|---|---|---|---|
| A | Hail | IC | Ice Crystals | RW | Rain Showers |
| BD | Blowing Dust | IF | Ice Fog | S | Snow |
| BN | Blowing Sand | IP | Ice Pellets | SG | Snow Grains |
| BS | Blowing Snow | IPW | Ice Pellet Showers | SP | Snow Pellets |
| D | Dust | | | SW | Snow Showers |
| F | Fog | K | Smoke | T | Thunderstorm |
| GF | Ground Fog | L | Drizzle | T+ | Severe Thunderstorm |
| H | Haze | R | Rain | ZL | Freezing Drizzle |
| | | | | ZR | Freezing Rain |

Precipitation intensities are indicated thus:
– Very Light; - Light (no sign) Moderate + Heavy

**WIND**

Direction in tens of degrees from true north, speed in knots. ØØØ indicates calm. G indicates gusty. Peak speed follows G or Q when gusts or squalls are reported. The contraction WSHFT followed by local time group in remarks indicates windshift and its time of occurrence. (Knots X 1.15 = statute mi/hr.)

EXAMPLES: 3627 360 Degrees, 27 Knots.
3627G40 360 Degrees, 27 Knots. Peak speed in gusts 40 knots.

**ALTIMETER SETTING**

The first figure of the actual altimeter setting is always omitted from the report.

**RUNWAY VISUAL RANGE (RVR)**

RVR is reported from some stations. Extreme values for 10 minutes prior to observation are given in hundreds of feet. Runway identification precedes RVR report.

**CODED PIREPS**

Pilot reports of clouds not visible from ground are coded with MSL height data preceding and/or following sky cover symbol to indicate cloud bases and/or tops respectively.

**DECODED REPORT**

Kansas City. Record observation. 1500 feet scattered, measured ceiling 2500 feet overcast, visibility 1 mile, light rain, smoke, sea level pressure 1013.7 millibars, temperature 58°F, dewpoint 56°F, wind 180°, 7 knots, altimeter setting 29.93 inches, runway 04 left, visual range 2000 ft. variable to 4000. Pilot reports top of overcast 5500 feet (MSL).

**TYPE OF REPORT**

The omission of type-of-report data identifies a scheduled record observation for the hour specified in the sequence heading; the time of an out of sequence special observation is given as S followed by a time group (24-hour clock GMT) e.g. PIT S 0715 1M1/2 A special indicates a significant change in one or more elements. Local reports are identified by LCL and a time group. Locals are transmitted on local teletypewriter circuits only.

**TERMINAL FORECASTS** contain information for specific airports on ceiling, cloud heights, cloud amounts, visibility, weather condition and surface wind. They are written in a form similar to the AVIATION WEATHER REPORT.

CEILING: Identified by the letter "C"
CLOUD HEIGHTS: In hundreds of feet above the station (ground).
CLOUD LAYERS: Stated in ascending order of height.
VISIBILITY: In statute miles, but omitted if over 8 miles.
SURFACE WIND: In tens of degrees and knots, omitted when less than 10.

**EXAMPLE OF TERMINAL FORECASTS**

| | | | |
|---|---|---|---|
| C15① | Ceiling 1500', broken clouds | O11/2GF | Clear, visibility one and one half miles, ground fog |
| C5X1/4S+ | Sky obscured, vertical visibility 500 ft, visibility one-fourth mile, heavy snow | 20DC70①8K 3230G | Scattered clouds at 2000', ceiling 7000' overcast, visibility 6 miles, smoke, surface wind 320 degrees 30 knots, gusty |

**AREA FORECASTS** are 18-hour forecasts plus 12-hour OUTLOOKS of cloud, weather and frontal conditions for an area the size of several states. Heights of cloud tops, and icing are ABOVE SEA LEVEL (ASL); ceiling heights, ABOVE GROUND LEVEL (AGL); bases of cloud layers are ASL unless indicated.

**SIGMET or AIRMET** warns airmen in flight of potentially hazardous weather such as squall lines, thunderstorms, fog, icing and turbulence. SIGMET concerns severe and extreme conditions of importance to all aircraft. AIRMET concerns less severe conditions which may be hazardous to some aircraft or to relatively inexperienced pilots. Both are broadcast by FAA on NAVAID voice channels.

**WINDS AND TEMPERATURES ALOFT (FD) FORECASTS** are computer prepared forecasts of wind direction (nearest 10° true N) and speed (knots) for selected flight levels. Temperatures are forecast for all levels shown except that no forecasts are issued for the 3000 ft. level or other levels within 2500 feet of a station's elevation.

**EXAMPLES OF WINDS AND TEMPERATURES ALOFT (FD) FORECASTS**

FD WBC 121745
BASED ON 1212002 DATA
VALID 1300002 FOR USE 1800-0300Z. TEMPS NEG ABV 24000

| FT | 3000 | 6000 | 9000 | 12000 | 18000 | 24000 | 30000 | 34000 | 39000 |
|---|---|---|---|---|---|---|---|---|---|
| BOS | 3127 | 3425-07 | 3438-11 | 3421-16 | 3516-27 | 3513-38 | 311649 | 292451 | 283451 |
| JFK | 3826 | 3527-08 | 3326-13 | 3322-16 | 3128-27 | 2933-38 | 286248 | 285158 | 283749 |

At 6000 feet ASL over JFK wind from 330° at 27 knots and temperature minus 8° C.

**PILOTS** . . . report in-flight weather to nearest FSS

FIGURE 10

## SEGMENTED CIRCLE

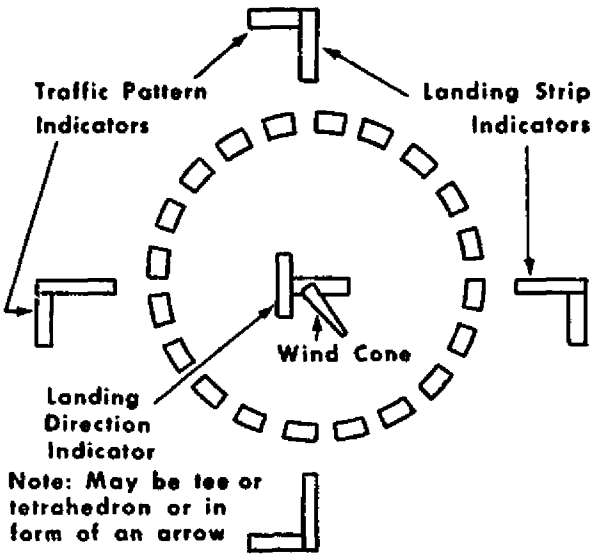
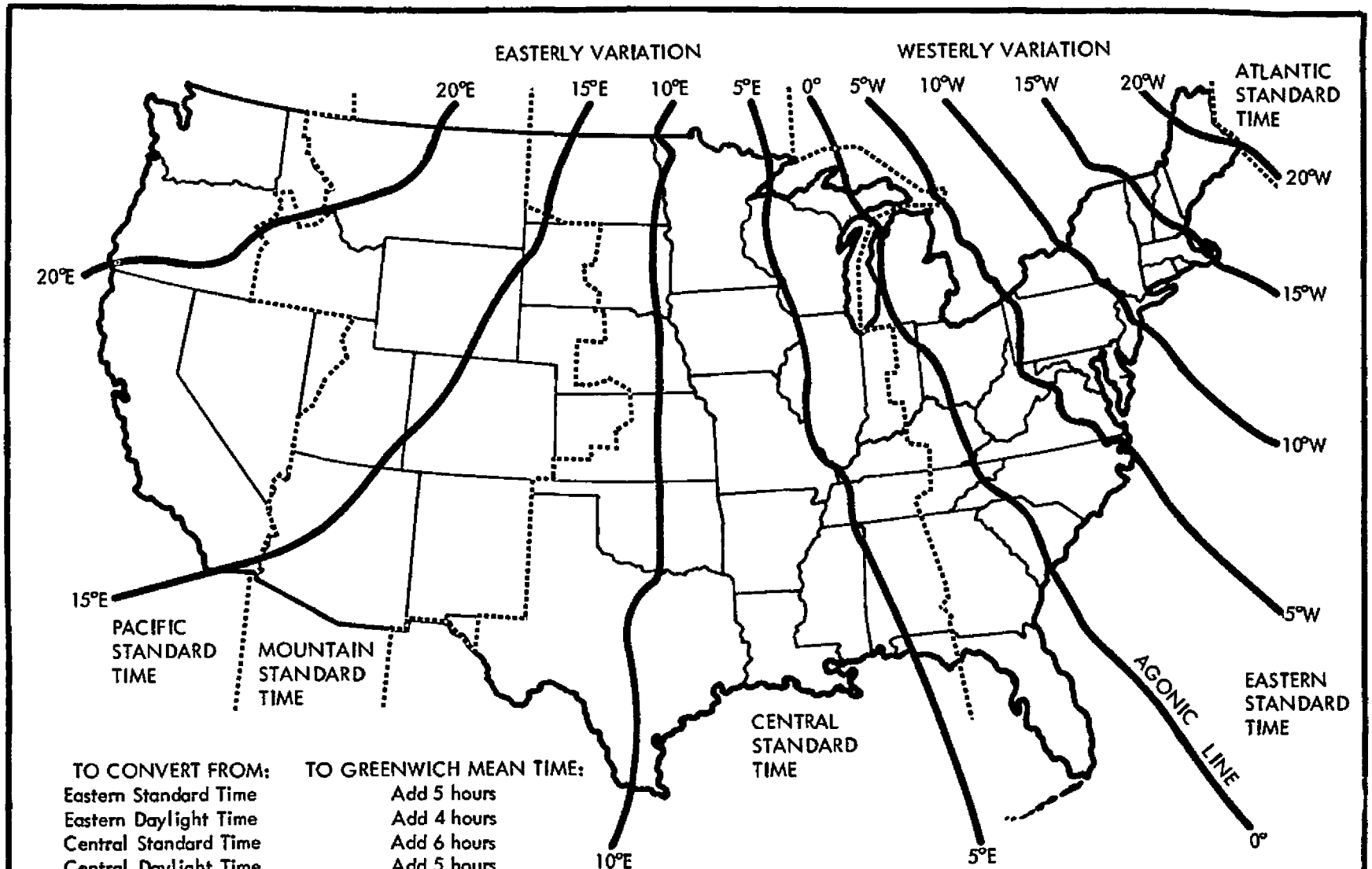



FIGURE 11




| TO CONVERT FROM: | TO GREENWICH MEAN TIME: |
|---|---|
| Eastern Standard Time | Add 5 hours |
| Eastern Daylight Time | Add 4 hours |
| Central Standard Time | Add 6 hours |
| Central Daylight Time | Add 5 hours |
| Mountain Standard Time | Add 7 hours |
| Mountain Daylight Time | Add 6 hours |
| Pacific Standard Time | Add 8 hours |
| Pacific Daylight Time | Add 7 hours |

MAGNETIC VARIATION CHART - TIME CONVERSION TABLE

FIGURE 12

# AIRCRAFT DESCRIPTION
# PLACARDS IN THE AIRPLANE

THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE. NO ACROBATIC MANEUVERS (INCLUDING SPINS) APPROVED

*IDENTIFICATION:* N 2468W.

*MAXIMUM GEAR OPERATING SPEED:* 135 mph, CAS.

*MANEUVERING SPEED:* 130 mph, CAS.

*MAXIMUM ALLOWABLE WEIGHT IN BAGGAGE COMPARTMENT:* 125 lbs.

The following information is excerpted from the AIRPLANE FLIGHT MANUAL.

*ENGINE OPERATION LIMITATION:*
Power and Speed 260 bhp at 2625 rpm.

*FUEL SYSTEM:* The engine is approved for 100/130 fuel only. Fuel is supplied from 2 tanks of 32.5 gallons total capacity each.

Separate electric gauges indicate the quantity in each tank. The gauges read empty when the level is down to 5 gallons since the last 5 gallons in each tank are unusable. The airplane is equipped with an electrically-driven auxiliary fuel pump for standby use in the event the engine-driven pump fails.

*OIL:* The engine uses a wet-sump, full-pressure oil system. The oil capacity is 12 quarts.

For temperature above 40° F use SAE 50; below 40° F use SAE 30.

*PROPELLER:* The propeller is a single-acting, hydraulic constant-speed type with two forged aluminum blades, controlled by an engine-driven governor.

*HYDRAULIC SYSTEM:* The landing gear and flaps are extended and retracted by hydraulic actuators, powered by an engine-driven hydraulic pump and a pressure accumulator.

*ENGINE INSTRUMENT MARKINGS:*

| | |
|---|---|
| Oil Pressure Gauge | |
| Idling | 10 psi (red line) |
| Normal Operating Range | 30-60 psi (green arc) |
| Maximum Pressure | 100 psi (red line) |
| Manifold Pressure Gauge | |
| Normal Operating Range | 15-24 in. Hg (green arc) |
| Cylinder Head Temperature | |
| Normal Operating Range | 300-460° F (green arc) |
| Do Not Exceed | 460° F (red line) |
| Tachometer | |
| Normal Operating Range | 2200-2450 rpm (green arc) |
| Maximum (Engine-rated speed) | 2625 rpm (red line) |
| Fuel Quantity Indicators | |
| Less than one-quarter tank remaining | red arc to red line |
| Empty (includes 5 gallons each tank unusable) | E (red line) |

*EMPTY WEIGHT:* 1839 lbs.

*MAXIMUM GROSS WEIGHT:* 2900 lbs.

*FLIGHT LOAD FACTORS:*

| | |
|---|---|
| Flaps Up | +3.8, − 1.52 |
| Flaps Down | +3.5 |

*EMERGENCY PROCEDURES:*

Emergency Gear Extension Procedure.

When the landing gear will not extend hydraulically, it may be extended manually as follows:

(1) Place the gear handle in the full down position.

(2) Pull the auxiliary pump handle out its full extension.

(3) Operate the auxiliary pump handle up and down until the green gear-down light comes on.

*AVIONICS EQUIPMENT:*

Transceiver with 360 communications channels

Nav/Com 360 channel with remote VOR/ILS and glide slope indicator

ADF receiver with fixed Azimuth

Transponder with 4096 code capability

DME

Marker Beacon

☆☆☆☆☆

FIGURE 13

## WEIGHT AND BALANCE

All airplanes are designed for certain limit loads and balance conditions. These limits for your aircraft are shown on the graphs for Figure 15.

An individual weight and balance report and equipment list is furnished with each airplane; these documents list the empty weight and empty weight center of gravity of the individual airplane as equipped when it left the factory. *Changes in equipment which affect the empty weight and empty weight center of gravity must be entered in the aircraft maintenance records in accordance with Federal Aviation Regulations.*

To determine that your gross weight and center of gravity for a given flight are within limits, use the following procedure:

(1) From the weight and balance report or the latest entry pertaining to weight and balance in the aircraft maintenance record.

(2) Determine the weights and moments of your disposable load items, using the loading graph.

(3) Add these items, as shown in the sample problem.

(4) Plot the totals on the center of gravity envelope graph.

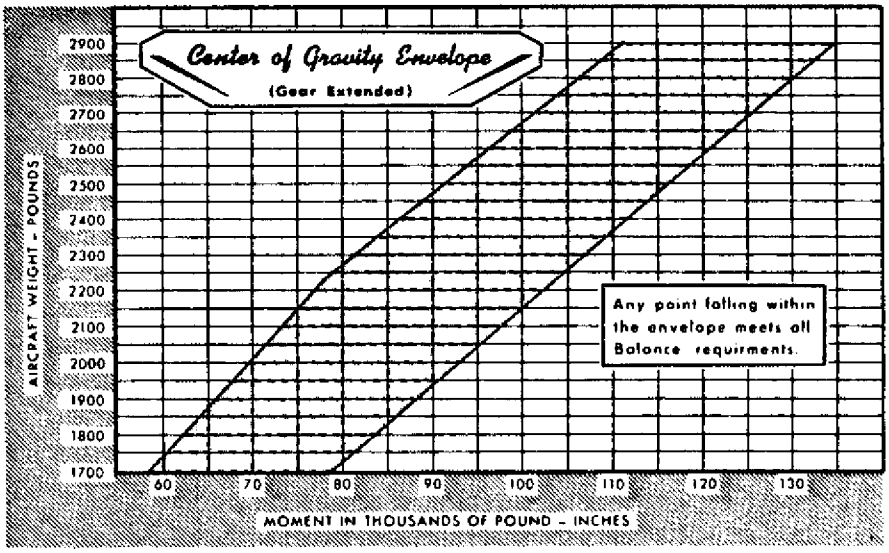
### EXAMPLE PROBLEM

Example for an airplane with a licensed empty weight of 1839 pounds and a moment of 65,873 pound-inches: (Empty weight of 1,839 lbs. multiplied by the number of inches the empty C. G. is from the datum—in this airplane 35.82 inches. The figure thus obtained is arbitrarily divided by 1,000, the moment in pound inches.)

| | *Weight Pounds* | *Moment (lb-in) 1000* |
|---|---|---|
| Empty Weight (licensed) | 1839.0 | 65.9 |
| Oil (12 qts.) | 22.5 | −0.4 |
| Pilot and Front Seat Passenger | 340.0 | 12.2 |
| Rear Seat Passengers | 340.0 | 23.8 |
| Full Fuel (55 gal.) | 330.0 | 15.8 |
| Baggage | 28.5 | 2.7 |
| TOTAL | 2900.0 | 120.0 |

Locate this point (2900 – 120.0) on the center of gravity envelope graph. Since the point falls within the envelope the above loading meets all the balance requirements.

FIGURE 14



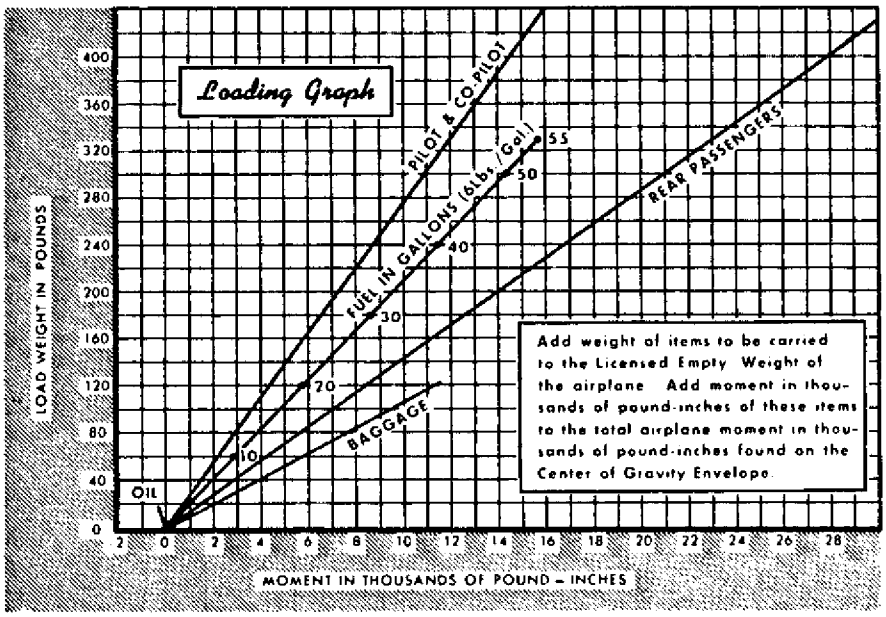




FIGURE 15

| COMPASS CORRECTION CARD | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FOR(MH) 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 |
| STEER(CH) 0 | 28 | 56 | 88 | 120 | 151 | 183 | 216 | 240 | 268 | 296 | 328 |

FIGURE 16

# LANDING DISTANCE TABLE

| GROSS WEIGHT LBS. | APPROACH IAS MPH | AT SEA LEVEL & 59°F | | AT 2500 FT & 50°F | | AT 5000 FT & 41°F | | AT 7500 FT & 32°F | |
|---|---|---|---|---|---|---|---|---|---|
| | | GROUND ROLL | TO CLEAR 50' OBSTACLE | GROUND ROLL | TO CLEAR 50' OBSTACLE | GROUND ROLL | TO CLEAR 50' OBSTACLE | GROUND ROLL | TO CLEAR 50' OBSTACLE |
| 2300 | 68 | 415 | 1015 | 445 | 1070 | 480 | 1130 | 520 | 1190 |
| 2600 | 73 | 470 | 1105 | 505 | 1165 | 545 | 1230 | 590 | 1300 |
| 2900 | 78 | 520 | 1190 | 560 | 1260 | 605 | 1330 | 655 | 1405 |

**NOTE: REDUCE LANDING DISTANCES 10% FOR EACH 6 MPH HEADWIND. FLAPS 40° AND POWER OFF.**

# CLIMB DATA

| GROSS WEIGHT LBS. | AT SEA LEVEL & 59°F | | | AT 5000 FT. & 41°F | | | AT 10000 FT. & 23°F | | | AT 15000 FT. & 5°F | | | AT 20000 FT. & -12°F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BEST CLIMB IAS MPH | RATE OF CLIMB FT/MIN | GAL. OF FUEL USED | BEST CLIMB IAS MPH | RATE OF CLIMB FT/MIN | FROM S.L. FUEL USED | BEST CLIMB IAS MPH | RATE OF CLIMB FT/MIN | FROM S.L. FUEL USED | BEST CLIMB IAS MPH | RATE OF CLIMB FT/MIN | FROM S.L. FUEL USED | BEST CLIMB IAS MPH | RATE OF CLIMB FT/MIN | FROM S.L. FUEL USED |
| 2300 | 97 | 1770 | 2.0 | 94 | 1415 | 3.0 | 91 | 1065 | 4.0 | 88 | 715 | 5.1 | 85 | 370 | 6.3 |
| 2600 | 100 | 1510 | 2.0 | 98 | 1190 | 3.1 | 95 | 875 | 4.4 | 92 | 560 | 5.8 | 89 | 250 | 7.5 |
| 2900 | 104 | 1300 | 2.0 | 101 | 1010 | 3.3 | 98 | 720 | 4.8 | 96 | 430 | 6.7 | 94 | 140 | 9.3 |

**NOTE:** THROTTLE, 2625 RPM. MIXTURE AT RECOMMENDED LEANING SCHEDULE-FLAPS AND GEAR UP. FUEL USED INCLUDES WARM-UP AND TAKE-OFF ALLOWANCE.

# TAKE-OFF DATA

TAKE-OFF DISTANCE WITH 20° FLAPS FROM HARD-SURFACED RUNWAY

| GROSS WEIGHT LBS. | IAS AT 50 FT. MPH | HEAD WIND MPH | AT SEA LEVEL & 59°F | | AT 2500 FT. & 50°F | | AT 5000 FT. & 41°F | | AT 7500 FT. & 32°F | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | GROUND RUN | TO CLEAR 50' OBSTACLE | GROUND RUN | TO CLEAR 50' OBSTACLE | GROUND RUN | TO CLEAR 50' OBSTACLE | GROUND RUN | TO CLEAR 50' OBSTACLE |
| 2300 | 58 | 0 | 435 | 695 | 515 | 805 | 615 | 950 | 740 | 1145 |
| | | 15 | 265 | 465 | 320 | 545 | 390 | 650 | 480 | 800 |
| | | 30 | 135 | 270 | 170 | 330 | 215 | 400 | 270 | 505 |
| 2600 | 63 | 0 | 570 | 885 | 680 | 1040 | 815 | 1250 | 985 | 1550 |
| | | 15 | 360 | 605 | 435 | 720 | 530 | 880 | 655 | 1105 |
| | | 30 | 195 | 365 | 240 | 445 | 305 | 560 | 385 | 725 |
| 2900 | 65 | 0 | 740 | 1135 | 880 | 1355 | 1055 | 1655 | 1285 | 2155 |
| | | 15 | 480 | 790 | 580 | 950 | 705 | 1200 | 875 | 1580 |
| | | 30 | 270 | 500 | 335 | 615 | 435 | 795 | 540 | 1080 |

**NOTE:** INCREASE DISTANCES 10% FOR EACH 25°F ABOVE STANDARD TEMPERATURE FOR PARTICULAR ALTITUDE.

FIGURE 17

## CRUISE PERFORMANCE — 10000

NORMAL LEAN MIXTURE

Standard Atmosphere
Zero Wind

Gross Weight - 2900 Pounds
55 Gallons - No Reserve

10,000 FEET

| RPM | MP | % BHP | Fuel Press. | MPH TAS | Gal/ Hour | Endurance Hours | Range Sta. Miles |
|---|---|---|---|---|---|---|---|
| 2450 | 20 | 65 | 7.5 | 184 | 12.2 | 4.5 | 830 |
| | 19 | 60 | 6.8 | 179 | 11.4 | 4.8 | 860 |
| | 18 | 56 | 6.2 | 174 | 10.6 | 5.2 | 900 |
| | 17 | 52 | 5.6 | 169 | 9.9 | 5.6 | 940 |
| 2300 | 20 | 59 | 6.5 | 177 | 11.0 | 5.0 | 885 |
| | 19 | 55 | 6.0 | 172 | 10.4 | 5.3 | 910 |
| | 18 | 51 | 5.5 | 167 | 9.7 | 5.7 | 950 |
| | 17 | 47 | 5.1 | 162 | 9.1 | 6.0 | 975 |
| 2200 | 20 | 55 | 5.9 | 172 | 10.3 | 5.3 | 915 |
| | 19 | 51 | 5.5 | 168 | 9.8 | 5.6 | 940 |
| | 18 | 48 | 5.1 | 163 | 9.1 | 6.0 | 985 |
| | 17 | 44 | 4.8 | 157 | 8.6 | 6.4 | 1005 |
| 2100 | 20 | 50 | 5.3 | 165 | 9.5 | 5.8 | 955 |
| | 19 | 47 | 5.0 | 161 | 9.0 | 6.1 | 980 |
| | 18 | 43 | 4.7 | 156 | 8.5 | 6.5 | 1010 |
| | 17 | 40 | 4.4 | 151 | 8.0 | 6.9 | 1035 |
| | 16 | 37 | 4.2 | 145 | 7.6 | 7.2 | 1050 |
| | 15 | 34 | 4.0 | 138 | 7.1 | 7.8 | 1070 |
| | 14 | 30 | 3.8 | 129 | 6.6 | 8.3 | 1075 |

FIGURE 18

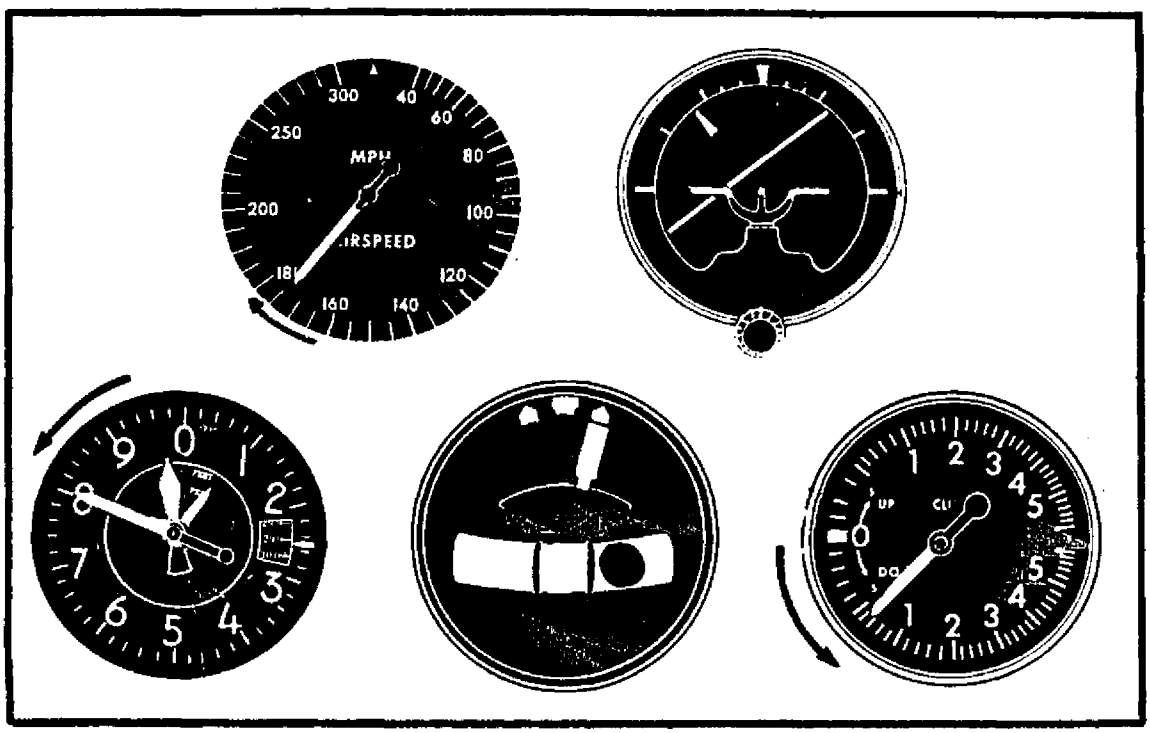



FIGURE 19

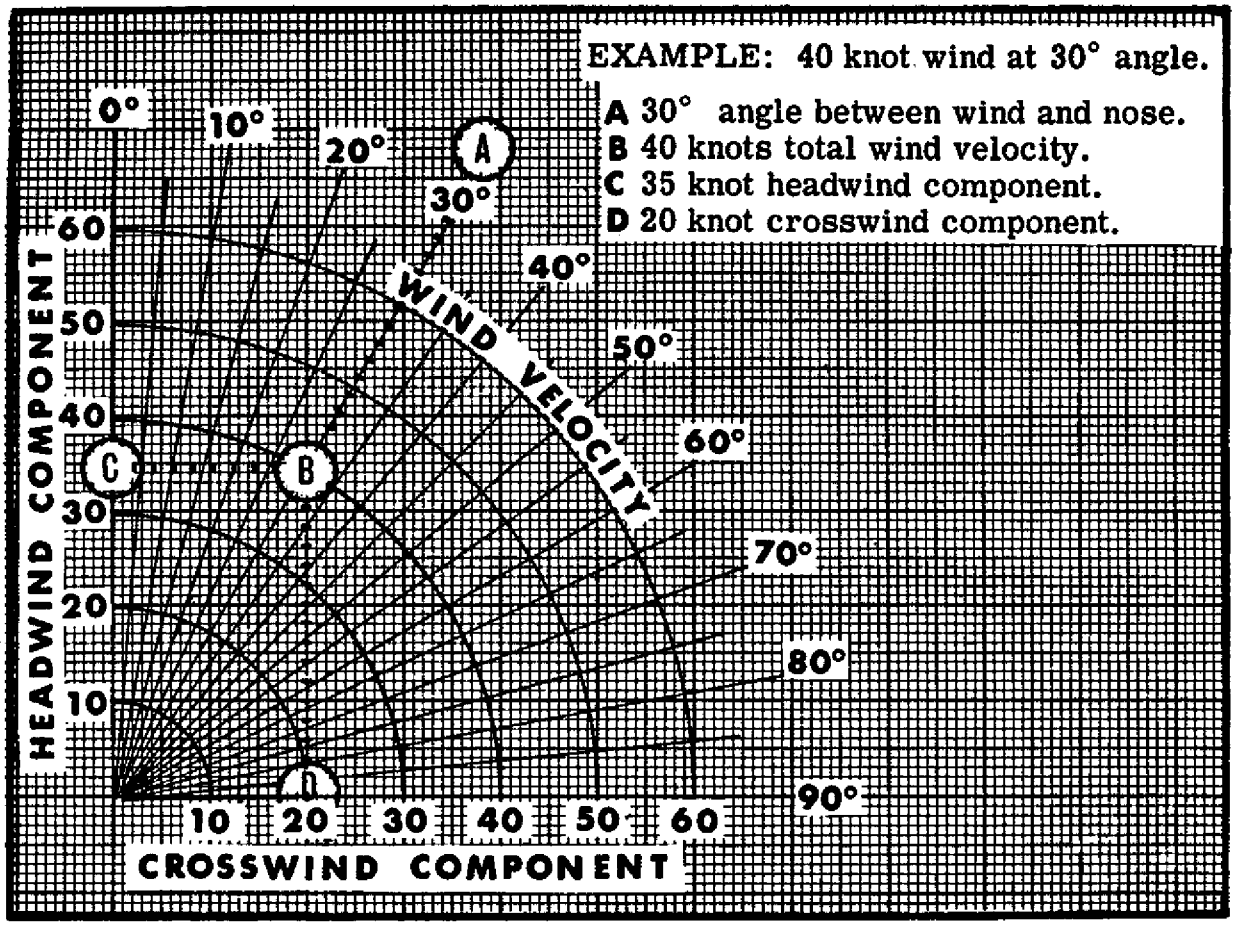
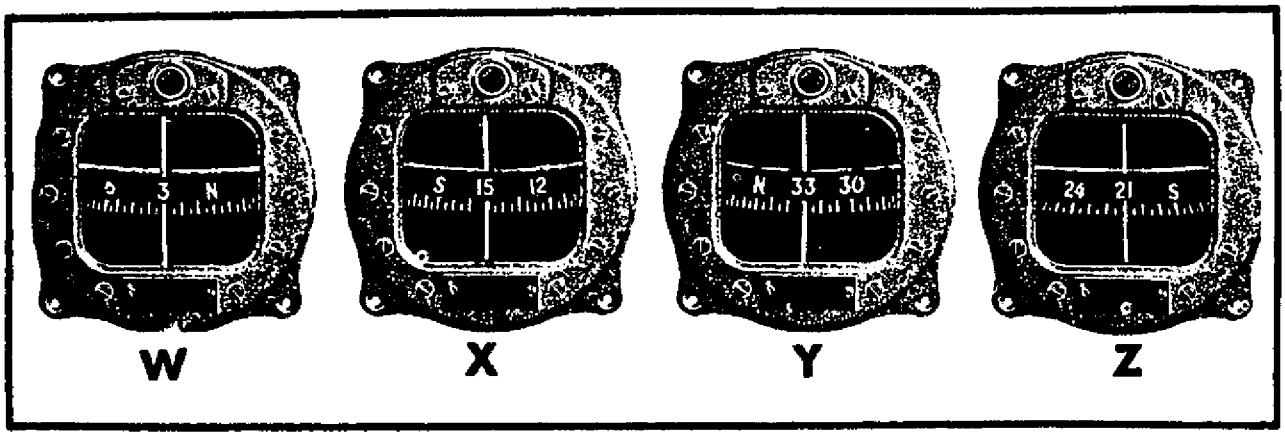



FIGURE 20




MAGNETIC COMPASS INDICATIONS

FIGURE 21

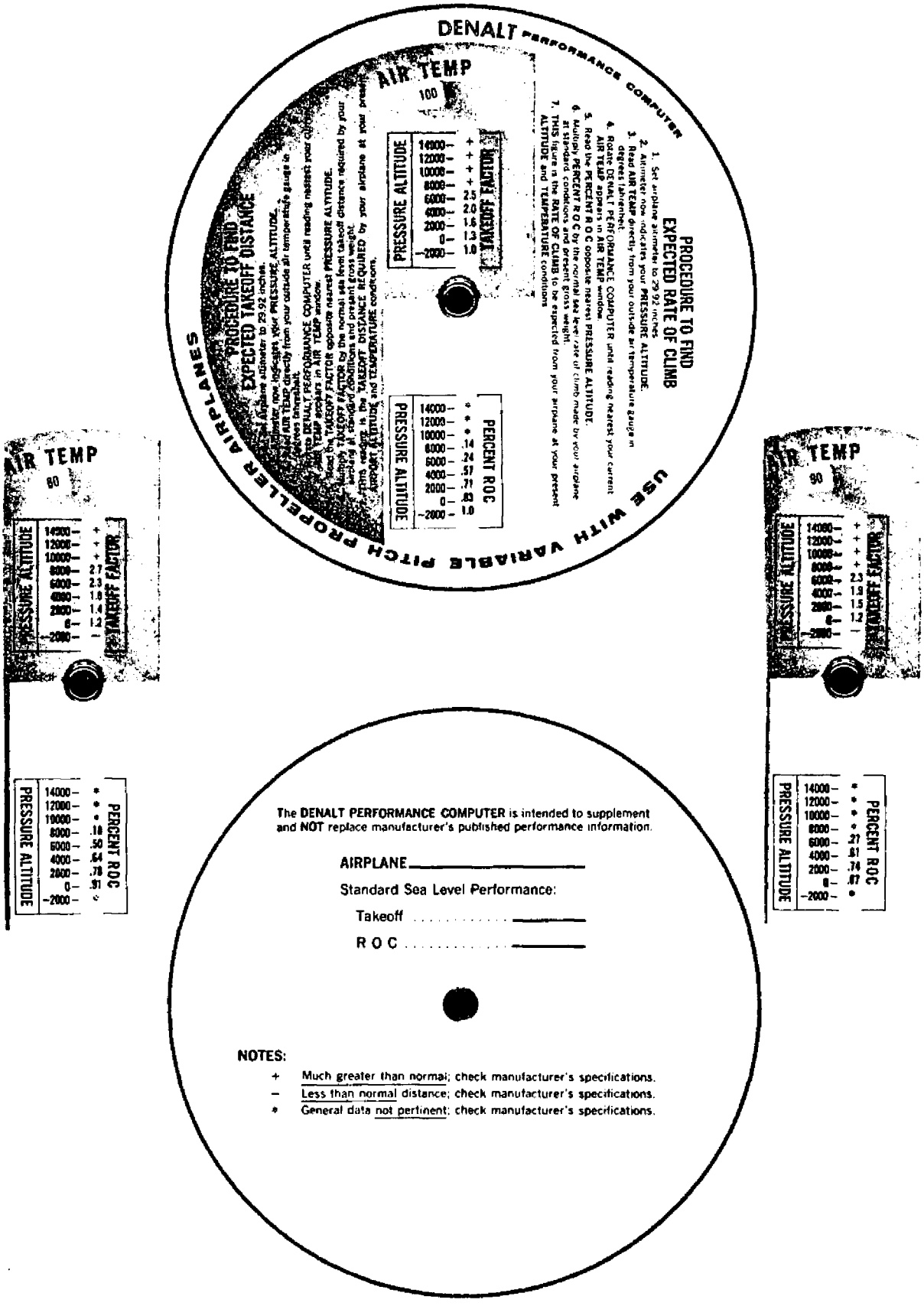

DENALT PERFORMANCE COMPUTER
USE WITH VARIABLE PITCH PROPELLER AIRPLANES
PROCEDURE TO FIND EXPECTED TAKEOFF DISTANCE
PROCEDURE TO FIND EXPECTED RATE OF CLIMB
AIR TEMP
PRESSURE ALTITUDE
TAKEOFF FACTOR
PERCENT ROC
The DENALT PERFORMANCE COMPUTER is intended to supplement and NOT replace manufacturer's published performance information.
AIRPLANE
Standard Sea Level Performance:
Takeoff
R O C
NOTES:
+ Much greater than normal; check manufacturer's specifications.
– Less than normal distance; check manufacturer's specifications.
* General data not pertinent; check manufacturer's specifications.

FIGURE 22

DEPARTMENT OF TRANSPORTATION — FEDERAL AVIATION ADMINISTRATION

# FLIGHT PLAN

Form Approved
OMB No. 04-R0072

| 1. TYPE | 2. AIRCRAFT IDENTIFICATION | 3. AIRCRAFT TYPE/ SPECIAL EQUIPMENT | 4. TRUE AIRSPEED | 5. DEPARTURE POINT | 6. DEPARTURE TIME | | 7. CRUISING ALTITUDE |
|---|---|---|---|---|---|---|---|
| | | | | | PROPOSED (Z) | ACTUAL (Z) | |
| VFR | | | | | | | |
| IFR | | | | | | | |
| DVFR | | | KTS | | | | |

8. ROUTE OF FLIGHT

| 9. DESTINATION (Name of airport and city) | 10. EST. TIME ENROUTE | | 11. REMARKS |
|---|---|---|---|
| | HOURS | MINUTES | |

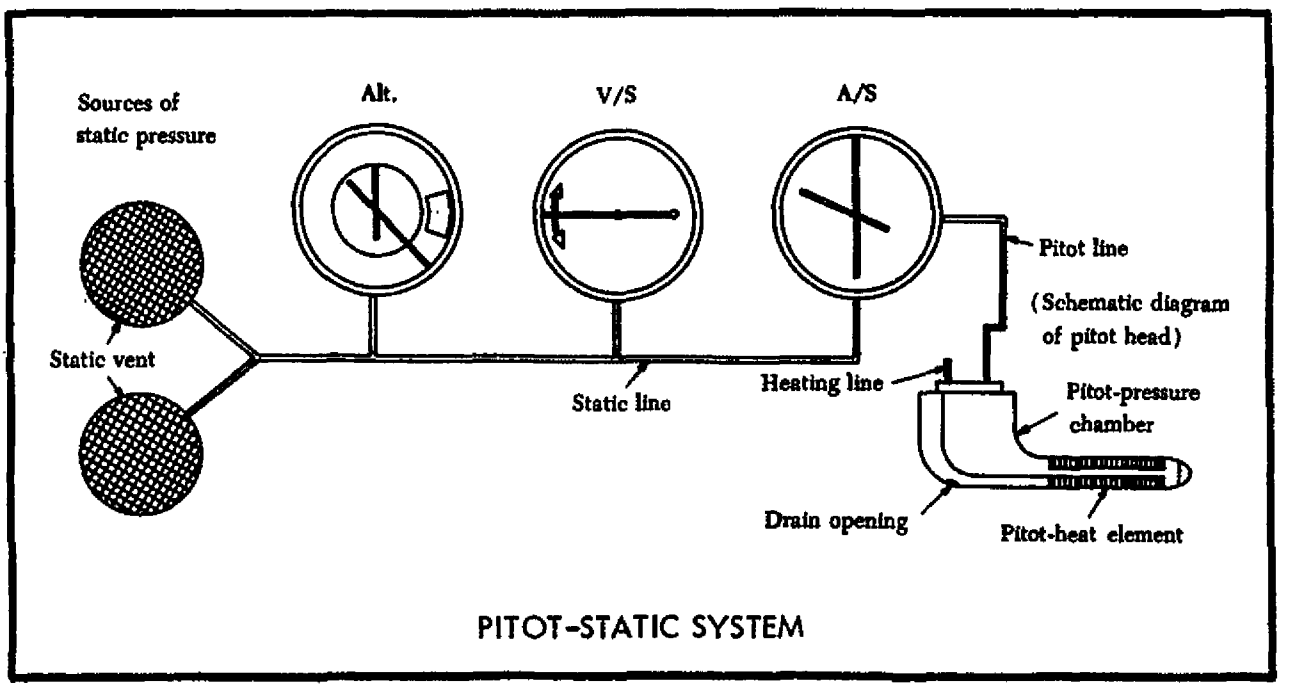
| 12. FUEL ON BOARD | | 13. ALTERNATE AIRPORT (S) | 14. PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE | 15. NUMBER ABOARD |
|---|---|---|---|---|
| HOURS | MINUTES | | | |

16. COLOR OF AIRCRAFT

CLOSE VFR FLIGHT PLAN WITH _____ FSS ON ARRIVAL

FAA Form 7233-1

FIGURE 23




PITOT-STATIC SYSTEM

FIGURE 24

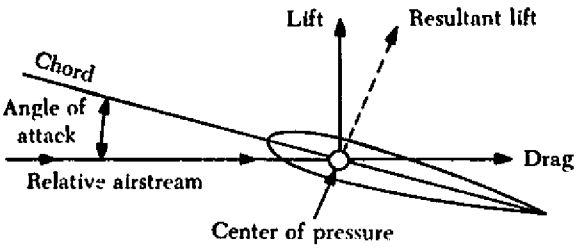



FIGURE 25

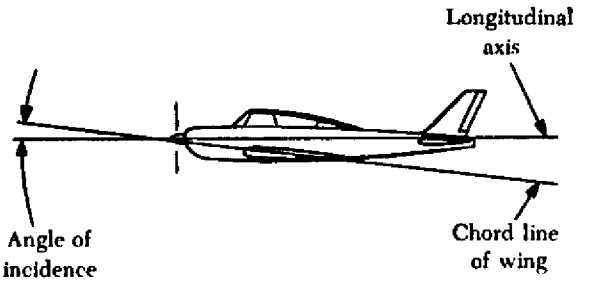



FIGURE 26

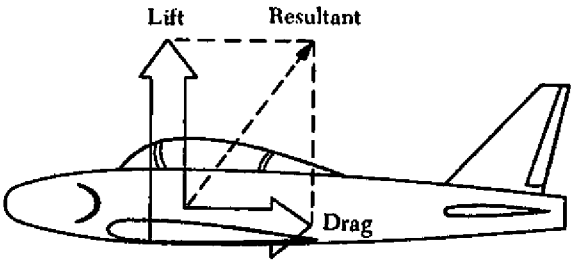



FIGURE 27.

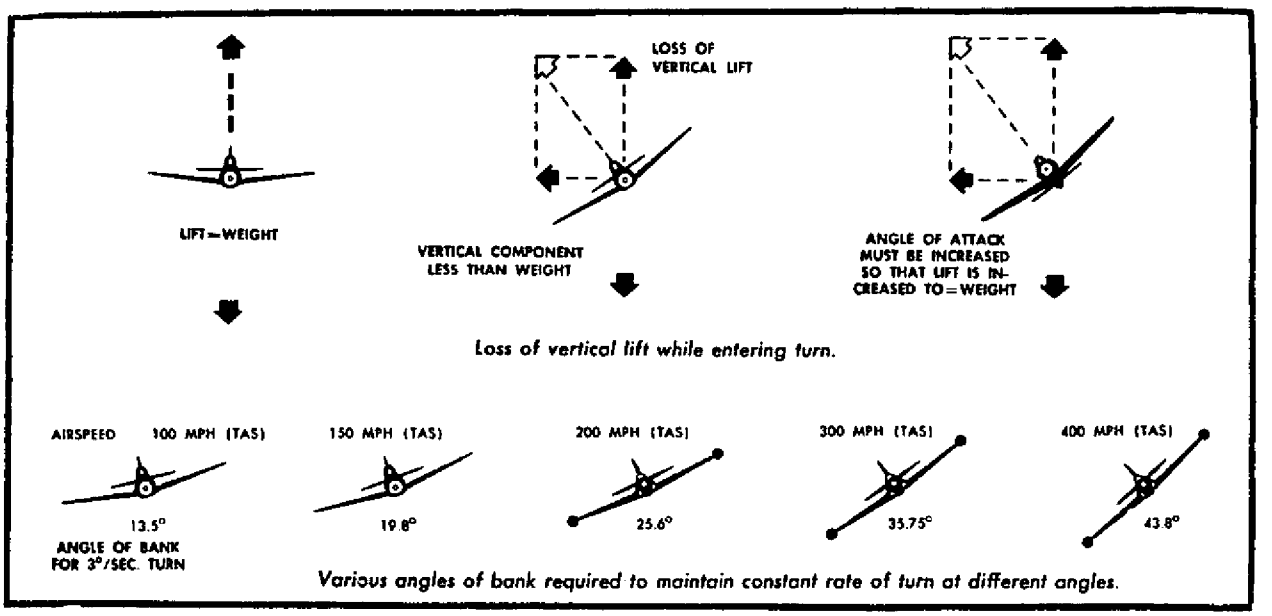



FIGURE 28

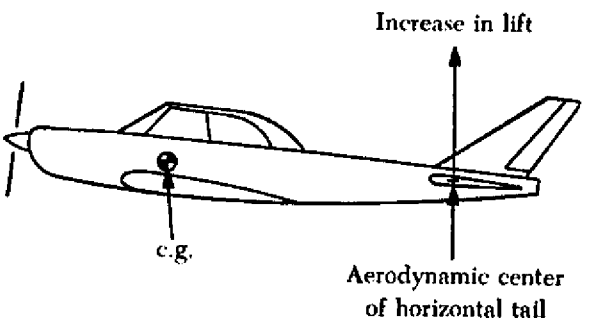
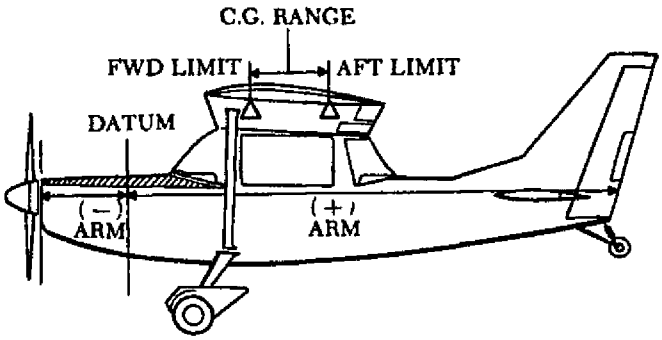


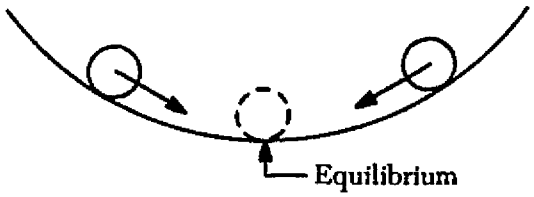

FIGURE 29.



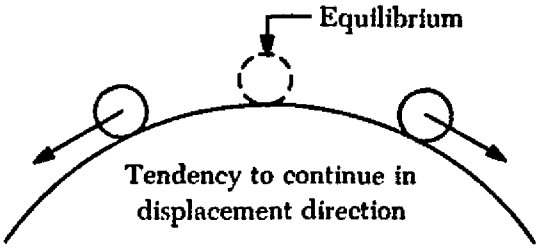

Weight and Balance

FIGURE 30

Static Stability




A. Positive Static Stability

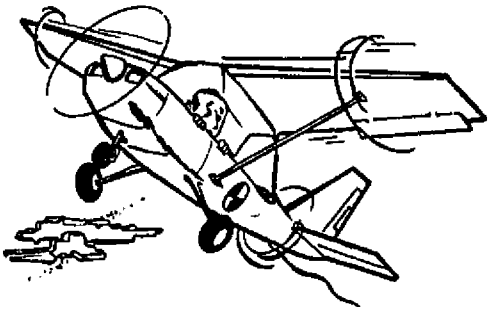



B. Negative static stabiliy or
static instability

Equilibrium encountered at
any point of displacement

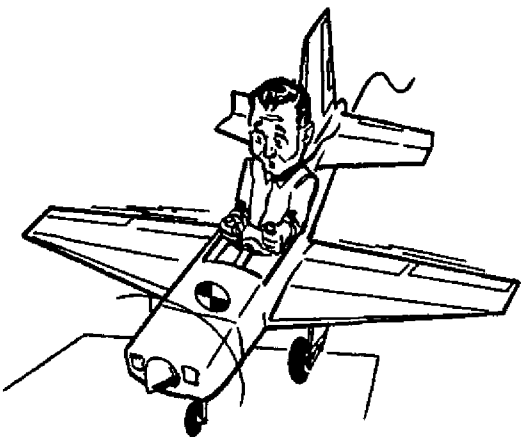
C. Neutral static stability

FIGURE 31



Aft c.g. critical in a stall.

FIGURE 32



Forward c.g. critical on landing.

FIGURE 33

SLIPSTREAM'S CORKSCREWING EFFECT

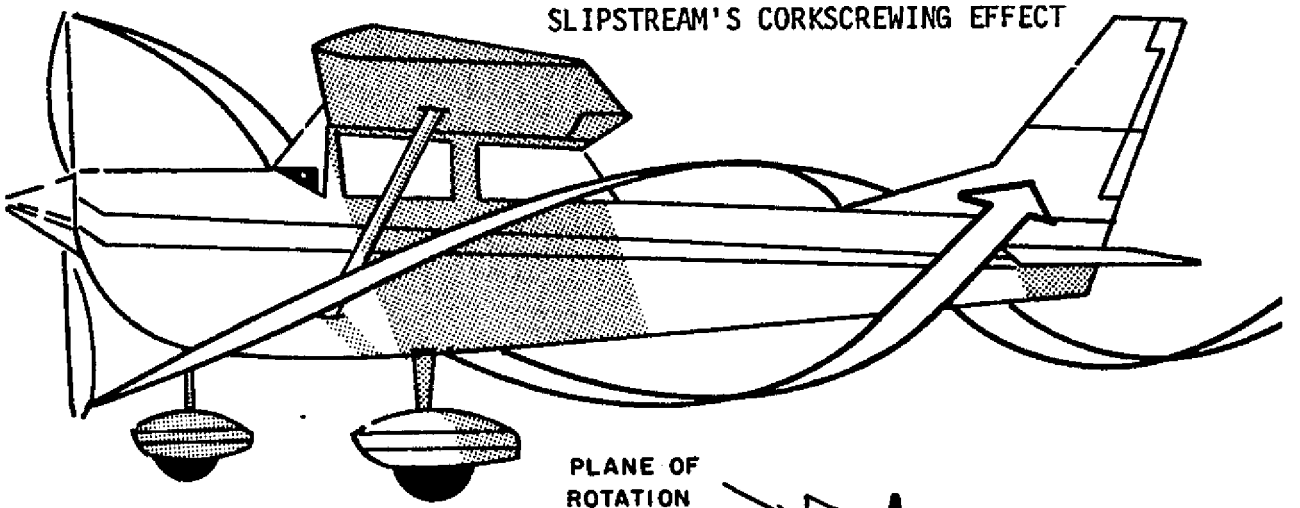
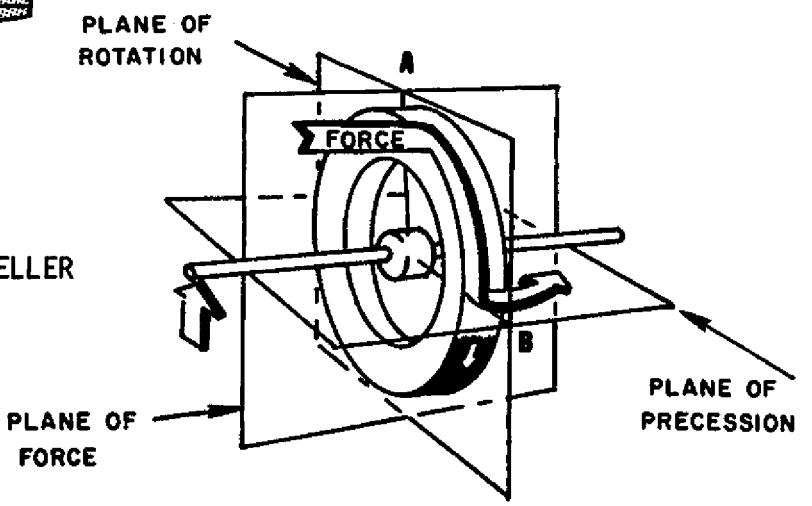


FIGURE 34

GYROSCOPIC ACTION OF THE PROPELLER



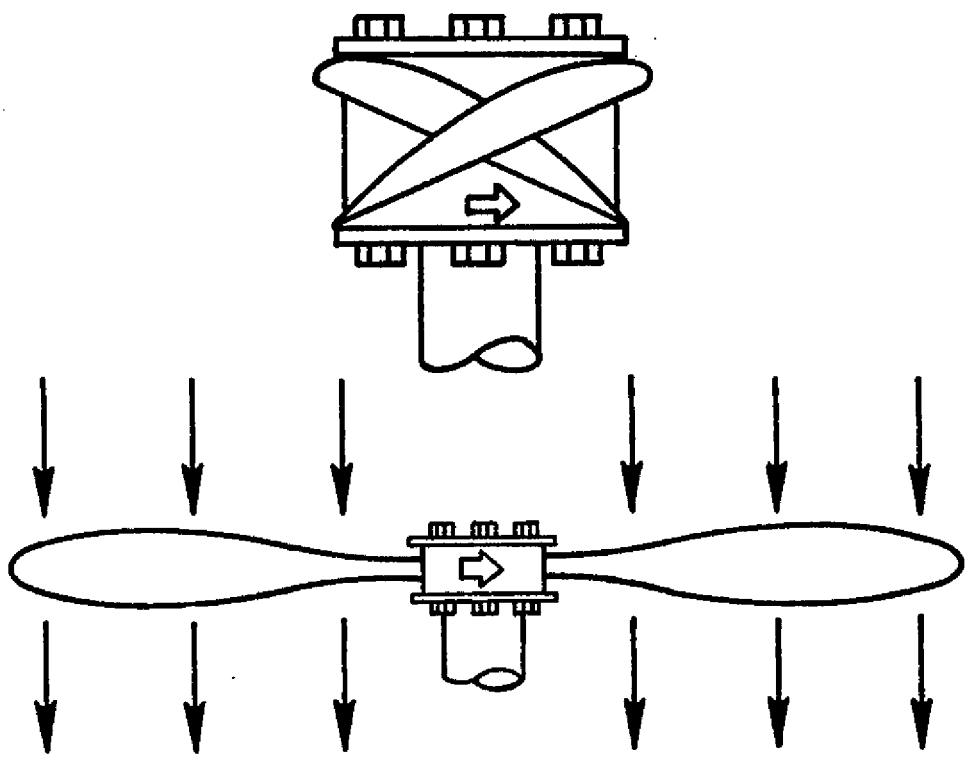



FIGURE 35

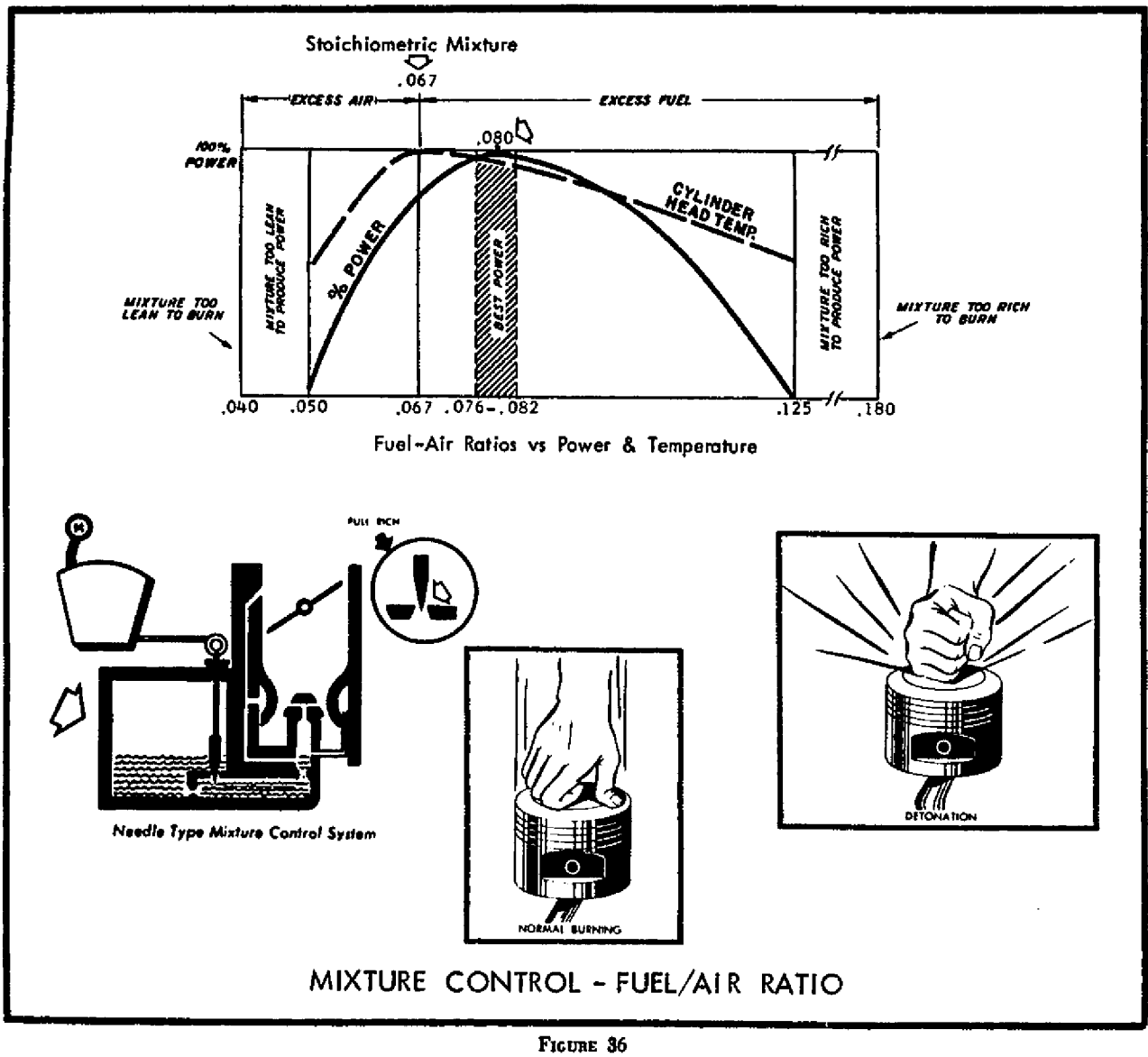



FIGURE 36

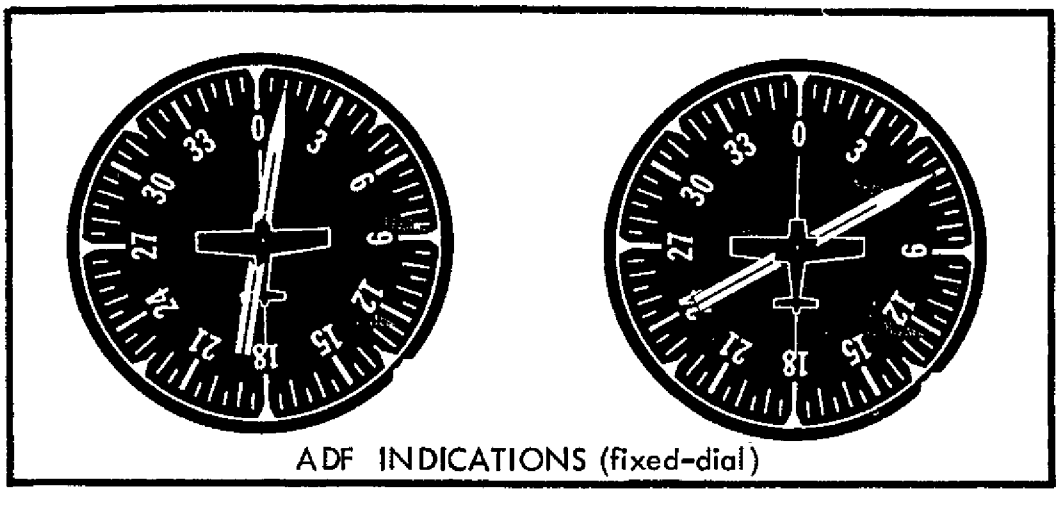



FIGURE 37

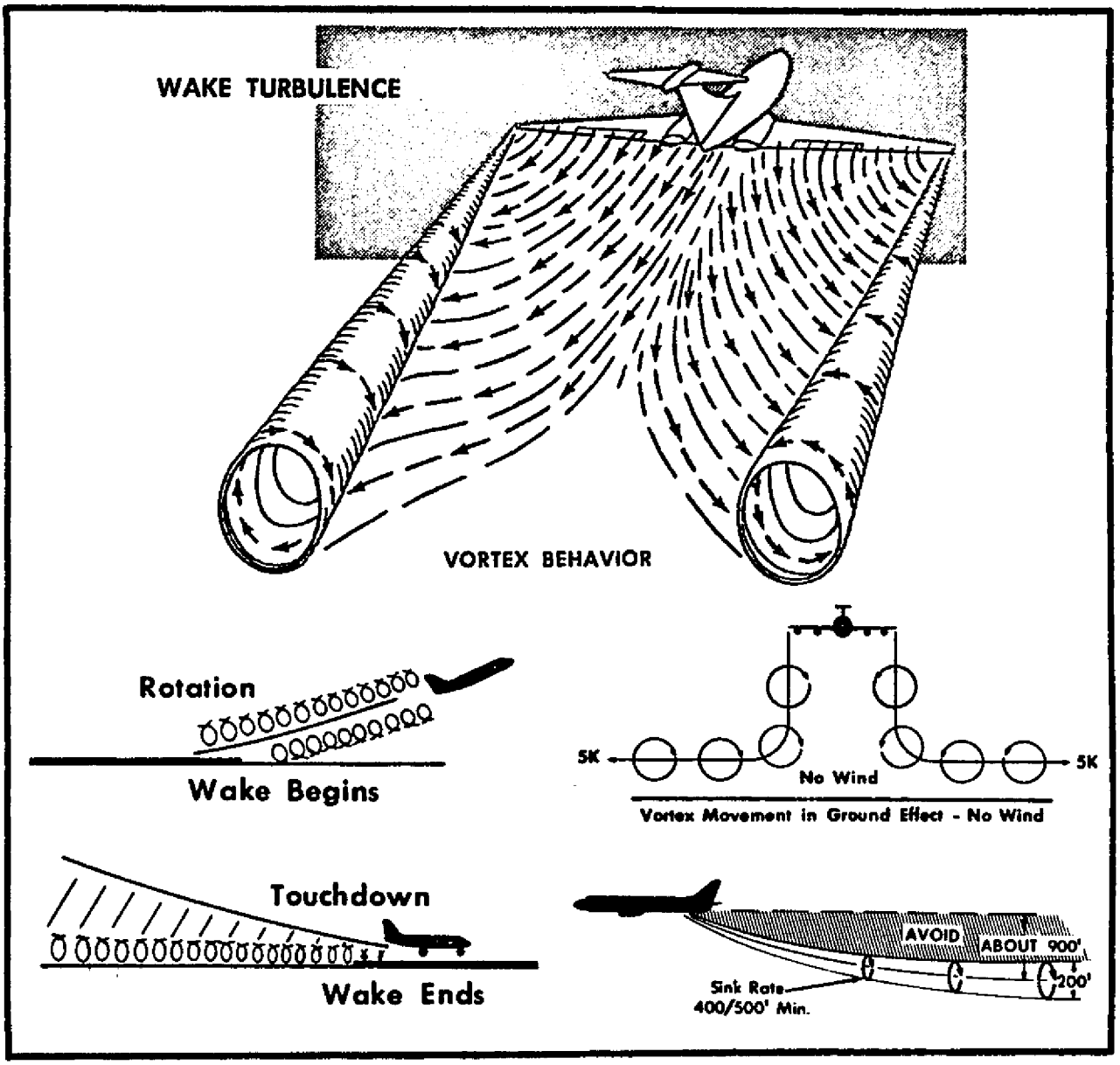



FIGURE 38

## AIRSPEED CORRECTION TABLE

| | IAS | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FLAPS UP | CAS | 55 | 58 | 65 | 72 | 82 | 91 | 101 | 110 | 120 | 129 | 139 |
| FLAPS DOWN | CAS | 48 | 54 | 63 | 72 | 82 | 93 | 105 | • | • | • | • |

FIGURE 39

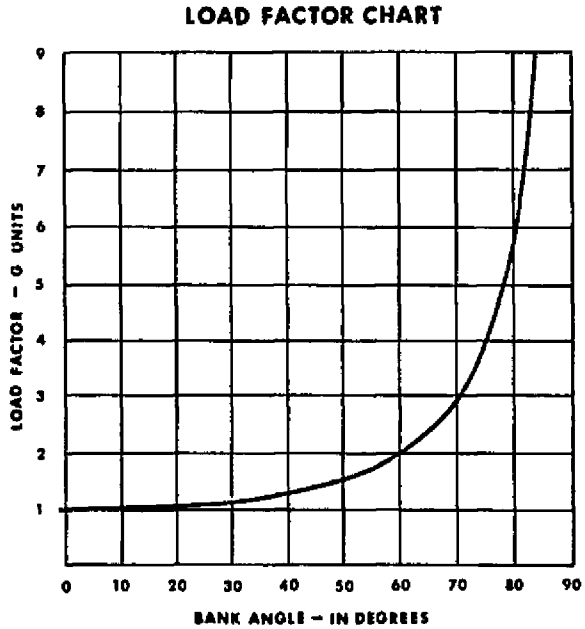



FIGURE 40

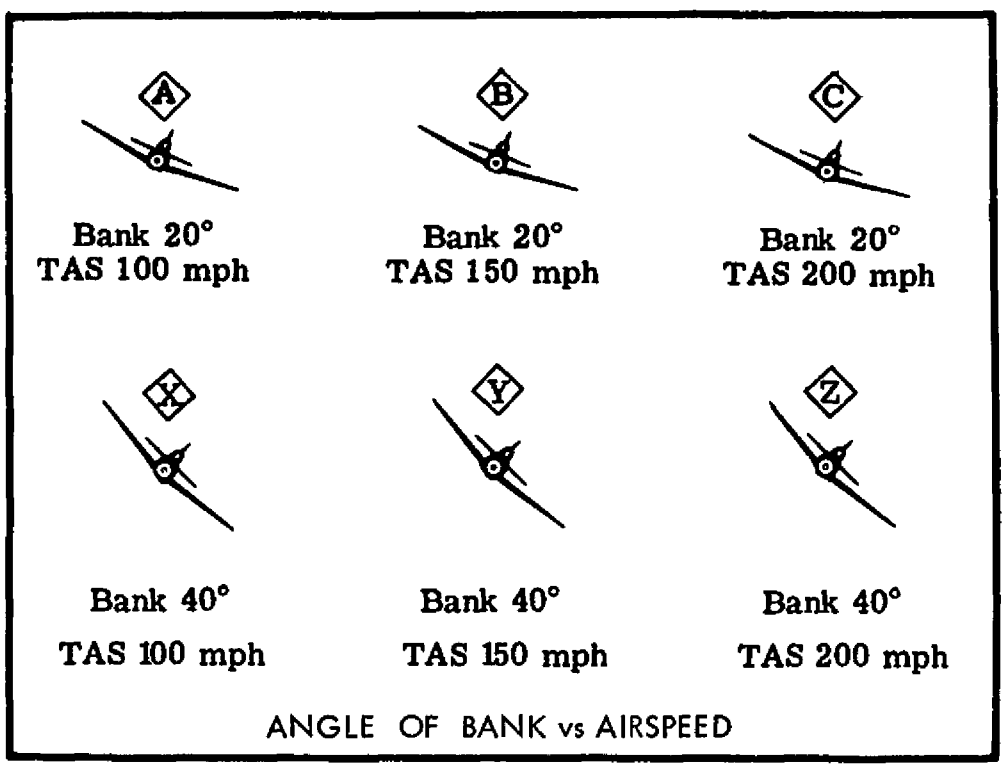



FIGURE 41

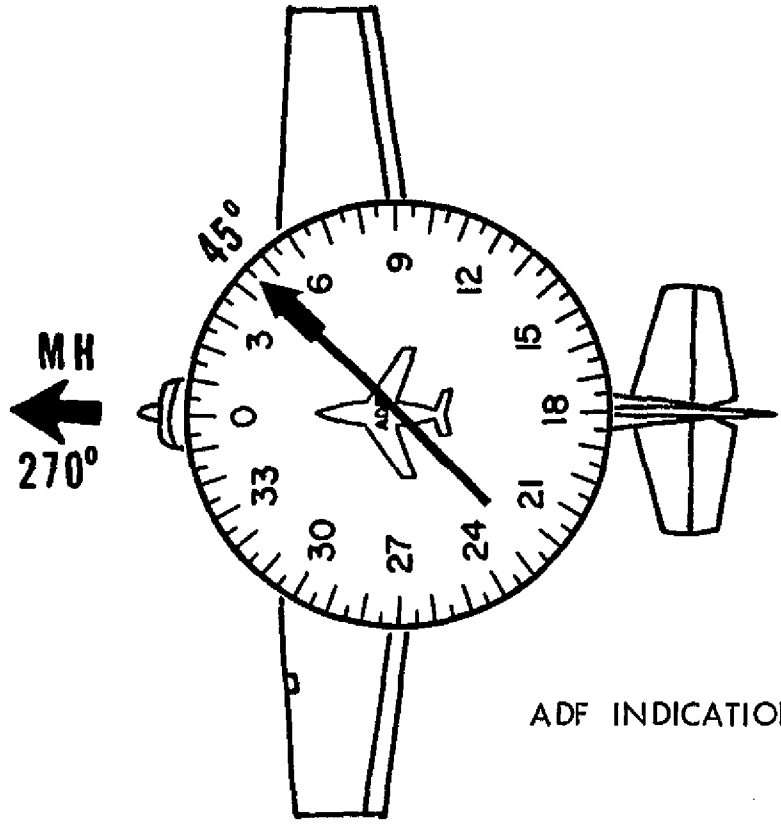



FIGURE 42

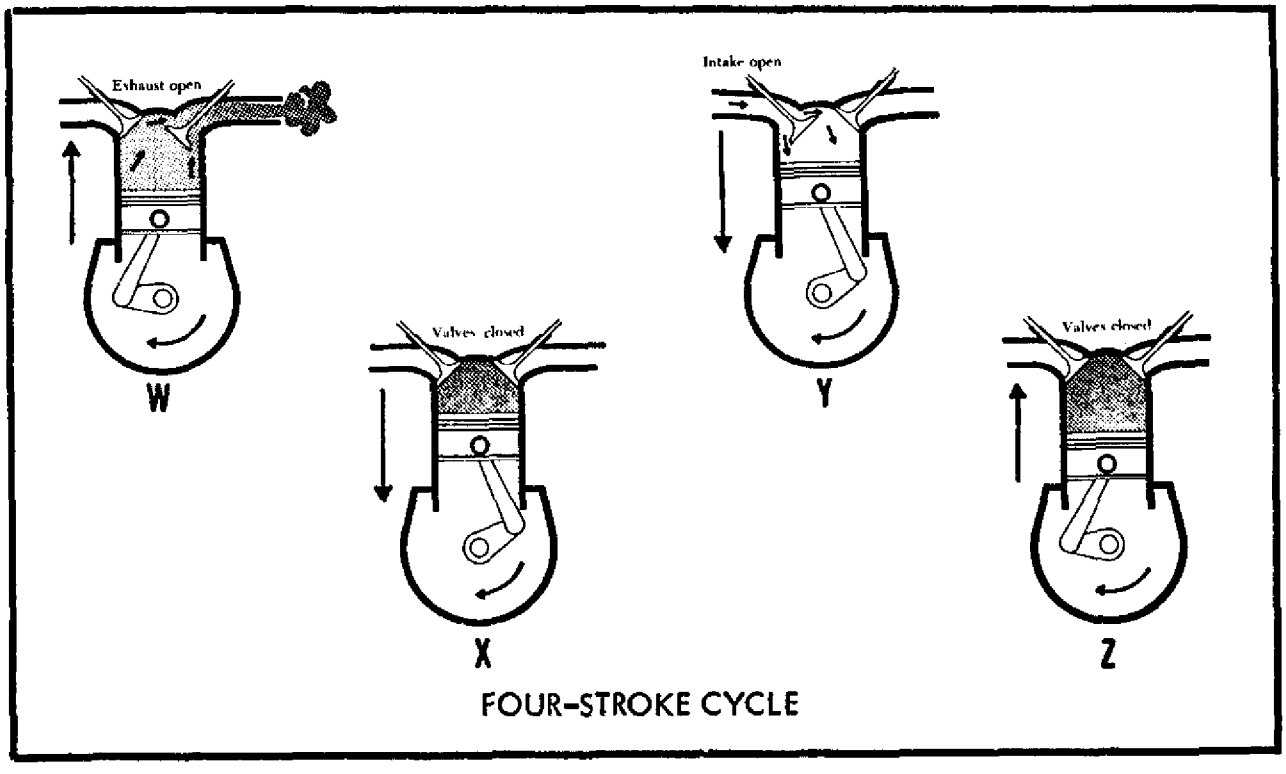
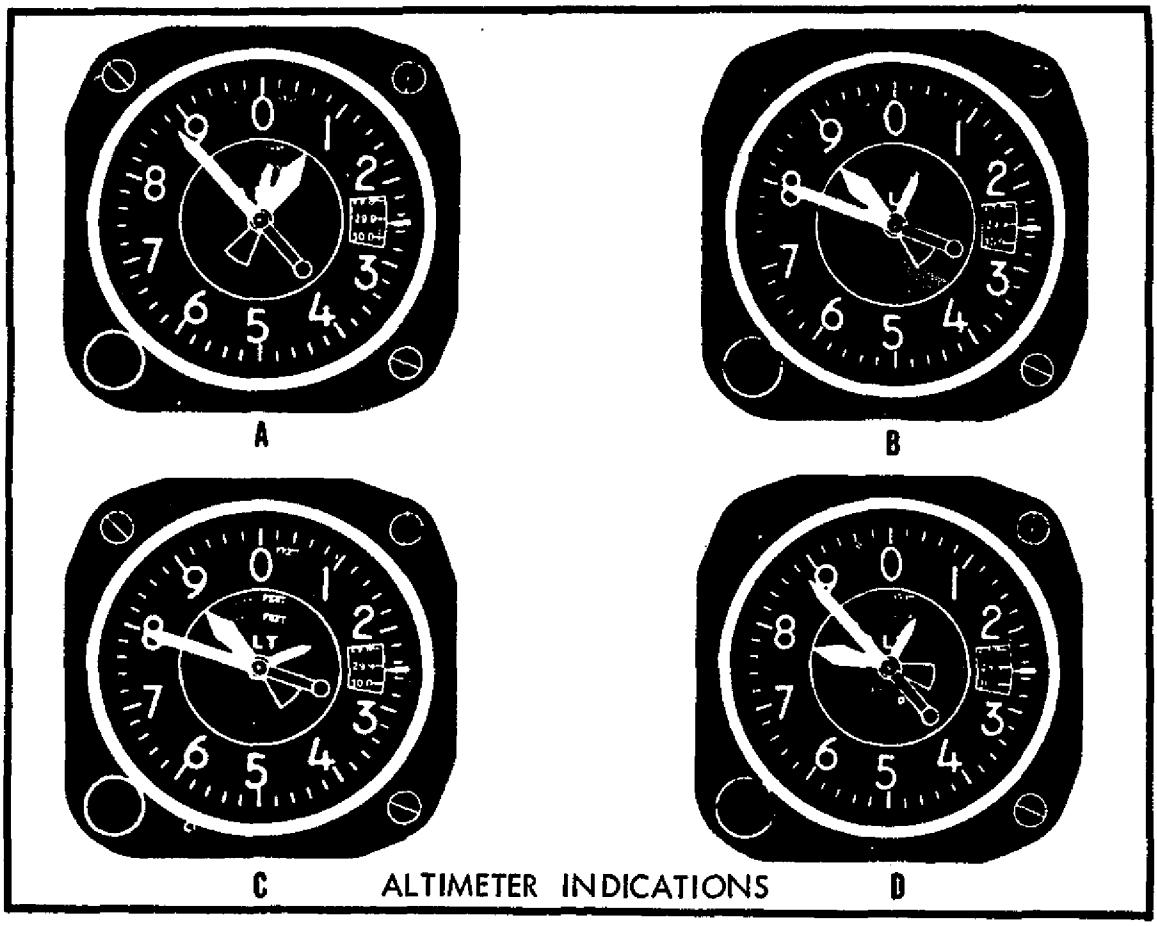
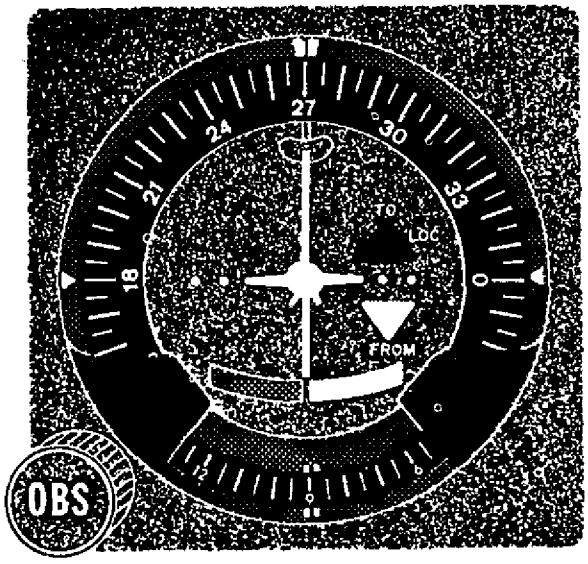



FIGURE 43




ALTIMETER INDICATIONS

FIGURE 44




OMNIBEARING - COURSE DEVIATION INDICATOR

FIGURE 45

AIRMAN'S INFORMATION MANUAL (AIM)

Excerpt

# AIRPORT/FACILITY DIRECTORY

The Airport Directory in this publication is limited to airports with control towers and/or instrument landing systems. See Part 2 for a complete listing of all public use airports.
NOTE: All times are local time unless otherwise indicated.

## LOCATION

The airport location is given in nautical miles (to the nearest mile) and direction from center of referenced city.

## ELEVATION

Elevation is given in feet above mean sea level and is based on highest usable portion of the landing area. When elevation is sea level, elevation will be indicated as "00." When elevation is below sea level, a minus sign (−) will precede the figure.

## RUNWAYS

The runway surface length, and weight bearing capacity are listed for the longest instrument runway or sealane, or the longest active landing portion of the runway or strip, given to the nearest hundred feet, using 70 feet as the division point, i.e., 1469 feet would be shown as "14"; 1470 feet would be shown as "15". Runway lengths prefixed by the letter "H" indicates that runways are hard surfaced (concrete; asphalt; bitumen, or macadam with a seal coat). If the runway length is not prefixed, the surface is sod, clay, etc. The total number of runways available is shown in parenthesis. (However, only hard surfaced runways are counted at airfields with both hard surfaced and sod runways.)

## RUNWAY WEIGHT BEARING CAPACITY

Runway strength data shown in this publication is derived from available information and is a realistic estimate of capability at an average level of activity. It is not intended as a maximum allowable weight or as an operating limitation. Many airport pavements are capable of supporting limited operations with gross weights of 25–50% in excess of the published figures. Permissible operating weights, insofar as runway strengths are concerned, are a matter of agreement between the owner and user. When desiring to operate into any airport at weights in excess of those published in this publication, users should contact the airport management for permission.

Add 000 to figure following S, D, DT and MAX for gross weight capacity, e.g., (S–000).

S–Runway weight bearing capacity for aircraft with single-wheel type landing gear. (DC–3), etc.

D–Runway weight bearing capacity for aircraft with dual-wheel type landing gear. (DC–6), etc.

DT–Runway weight bearing capacity for aircraft with dual-tandem type landing gear. (707), etc.

Quadricycle and dual-tandem are considered virtually equal for runway weight bearing considerations, as are single-tandem and dual-wheel.

Omission of weight bearing capacity indicates information unknown. Footnote remarks are used to indicate a runway with a weight bearing greater than the longest runway.

## LIGHTING

**B: Rotating Beacon.** Green and white, split-beam and other types.

**L: Field Lighting.** An asterisk (*) may precede an element to indicate that it operates on prior request only (by phone call).

4—Low Intensity Runway
5—Medium Intensity Runway
6—High Intensity Runway
7—Instrument Approach (neon)
7A—Medium Intensity Approach Lights (MALS)
8—High Intensity Instrument Approach (ALS)
10—Visual Approach Slope Indicator (VASI)
11—Runway end identifier lights (threshold strobe) (REIL)
12—Short approach light systems (SALS)
13—Runway alignment lights (RAIL)
14—Runway centerline
15—Touchdown zone

Because the obstructions on virtually all lighted fields are lighted, obstruction lights have not been included in the codification.

## SERVICING

S2: Minor airframe repairs.
S3: Minor airframe and minor powerplant repairs.
S4: Major airframe and minor powerplant repairs.
S5: Major airframe and major powerplant repairs.

## FUEL

*(Fuel data includes each grade available.)*

| Code | Grade |
|---|---|
| F12 | 80/87 |
| F15 | 91/96 |
| F18 | 100/130 |
| F22 | 115/145 |
| F30 | Kerosene, freeze point −40°F |
| F34 | Kerosene, freeze point −58°F |
| F40 | Wide-cut gasoline, freeze point −60°F |
| F45 | Wide-cut gasoline without icing inhibitor, freeze point −60°F |

## OXYGEN

| | |
|---|---|
| Ox1 | High Pressure |
| Ox2 | Low Pressure |
| Ox3 | High Pressure—Replacement Bottles |
| Ox4 | Low Pressure—Replacement Bottles |

FIGURE 46

## OTHER

**1**—NOTAM Service is provided. Applicable only to airports with established instrument approach procedures, or high volume VFR activity.

**AOE**—Airport of Entry—A customs Airport of Entry where permission from U.S. Customs is not required, however, at least one hour advance notice of arrival must be furnished.

**AVASI**—Abbreviated Visual Approach Slope Indicator—2 boxes.

**FSS**—The name of the associated FSS is shown in all instances. When the FSS is located on the named airport, "on fld" is shown following the FSS name. When the FSS can be called through the local telephone exchange, (Foreign Exchange) at the cost of a local call, it is indicated by "(LC)" (local call) with the phone number immediately following the name of the FSS, i.e., "FSS: WICHITA (LC481-5867)." When an Interphone line exists between the field and the FSS, it is indicated by "(DL)" (direct line) immediately following the name of the FSS, i.e., "FSS: OTTO (DL)."

**IFR**—Airport with approved FAA Standard Instrument Approach Procedure.

**LRA**—Landing Rights Airport—Application for permission to land must be submitted in advance to U.S. Customs. At least one hour advance notice of arrival must also be furnished.

**REIL**—Runway end identifier lights (threshold strobe).

**RVV**—Runway Visibility Values, applicable runway provided.

**RVR**—Runway Visual Range, applicable runway provided.

**TPA**—Traffic Pattern Altitude—This information is provided for only those airports without a 24-hour operating control tower or FSS.

**TRI-VAS**—Tri-Color Visual Approach Slope Aid.

**VASI**—Visual Approach Slope Indicator, applicable runway provided.

**TCH**—Threshold Crossing Height.

**RRP**—Runway Reference Point.

## AIRPORT REMARKS

**Aircraft Categories**—*Category I*—Light-weight, single-engine, personal-type propeller driven aircraft. (Does not include higher performance single-engine aircraft such as the T-28.)

*Category II*—Light-weight, twin engine, propeller driven aircraft weighing 12,500 pounds or less such as the Aero Commander, Twin Beechcraft, DeHavilland Dove, Twin Cessna. (Does not include such aircraft as a Lodestar, Learstar, DC-3).

*Category III*—All other aircraft such as the higher performance single-engine, heavy twin-engine, four engine and turbojet aircraft.

"**FEE**" indicates landing charges for private or non-revenue producing aircraft. In addition, fees may be charged for planes that remain over a couple of hours and buy no services, or at major airline terminals for all aircraft.

"**Rgt tfc 13–31**" indicates right turns should be made on landings and takeoffs on runways 13 and 31.

Remarks data are confined to operational items affecting the status and usability of the airport, traffic patterns and departure procedures.

**Obstructions.**—Because of space limitations only the more dangerous obstructions are indicated. Natural obstructions, such as trees, clearly discernible for contact operations, are frequently omitted. On the other hand, all pole lines within at least 15:1 glide angle are indicated.

## FLIGHT SERVICE STATIONS

Flight Service Station (FSSs) and Combined Station/Tower (CS/Ts) are listed alphabetically by state in the Airport/Facility Directory. At certain locations the preflight briefing and flight plan processing responsibilities of the CS/T have been reassigned to an adjacent FSS. At these locations the adjacent FSS will be listed as the 'Associated FSS,' otherwise, the CS/T will be listed. Limited Remote Communications Outlet (LRCO) and Remote Communications Outlet (RCO), where available at the facility, are shown following the three letter identifier. If located at other than a facility site they are listed alphabetically.

FSSs and CS/Ts provide information on airport conditions, radio aids and other facilities, and process flight plans. Airport Advisory Service is provided at the pilot's request on 123.6 by FSSs located at non-tower airports or when the tower is not in operation. (See Part 1, ADVISORIES AT NON TOWER AIRPORTS.)

Aviation weather briefing service is provided by FSSs and CS/Ts; however, CS/T personnel are not certified weather briefers and therefore provide only factual data from weather reports and forecasts. Flight and weather briefing services are also available by calling the telephone numbers listed in the chapter entitled 'FSS-CS/T Information and Weather Service Office Telephone Numbers,' located in Part 2."

**Limited Remote Communications Outlet (LRCO)**—Unmanned satellite air/ground communications facility, which may be associated with a VOR. These outlets effectively extend service range of the FSS and provide greater communication reliability.

**Remote Communications Outlet (RCO)**—An unmanned satellite air to ground communications stations remotely controlled and providing UHF and VHF communications capability to extend the service range of an FSS.

**Civil communications frequencies used in the FSS air/ground system are now operated simplex on 122.0, 122.2, 122.3, 122.4, 122.6, 122.7, 123.6; emergency 121.5; plus receive-only on 122.05, 122.1, 122.15 and 123.6.**

**a. 122.0 is assigned to selected FSSs as a weather channel for both general aviation and air carrier.**

**b. 122.2 is assigned to all FSSs as a common en route simplex service.**

**c. 123.6 is assigned as the airport advisory channel at non-tower FSS locations, however, it is still in commission at some FSSs collocated with towers to provide part-time Airport Advisory Service.**

**d. 122.1 is the primary receive-only frequency at VORs. 122.05, 122.15 and 123.6 are assigned at selected VORs meeting certain criteria.**

**e. Some FSSs are assigned 50KHz channels for simplex operation in the 122–123 MHz band (e.g. 122.35).**

**Pilots using the FSS A/G system should refer to this directory or appropriate charts to determine frequencies available at the FSS or remoted facility through which they wish to communicate.**

Part time FSS hours of operation are shown in remarks under facility name.

## COMMUNICATIONS

Clearance is required prior to taxiing on a runway, taking off, or landing at a tower controlled airport.

When operating at an airport where the control tower is operated by the U.S. Government, two-way radio communication is required unless otherwise authorized by the tower. (When the tower is operated by someone other than the U.S. Government, two-way radio com-

FIGURE 47

munication is required if the aircraft has the necessary equipment.

Frequencies transmit and receive unless specified as: T—Transmit only, R—Receive only, X—On request. **Primary frequencies are listed first in each frequency grouping, i.e., VHF, LF.** Emergency frequency 121.5 is available at all TOWER, APPROACH CONTROL and RADAR facilities, unless indicated as not available in remarks.

## COMMUNICATIONS REMARKS

Remarks data are confined to operational items affecting the status and usability of navigational aids, such as: ILS component restrictions, part time hours of operation, frequency sectorization, VOT frequencies.

## VOICE CALL

The voice call for contact with the air traffic control tower is listed at each airport assigned such a facility.

## SERVICES AVAILABLE

**TOWER**

Pre-Taxi Clearance Procedure
Clearance Delivery (CLRNC DEL).
Approach Control (App Con) Radar and Non-Radar.
Departure Control (Dep Con) Radar and Non-Radar.
VFR Advisory Service (VFR Adv) Service provided by Non Radar Approach Control.
Radar Advisory Service for VFR Acft (Stage I).
Radar Advisory and Sequencing Service for VFR Acft (Stage II).
Radar Sequencing and Separation Service for participating VFR Aircraft, (Stage III-Terminal Radar Service Area (TRSA)).
Radar Sequencing and Separation Service for all aircraft in a Terminal Control Area (TCA).
Ground Control (GND CON).
VHF Direction Finding (VHF/DF).

**RADIO NAVIGATION AIDS**

Included in this section is a tabulation listed by facility name of all Air Navigation Radio Aids in the National Airspace System and those upon which the FAA has approved an instrument approach. *Private or military Navigation Radio Aids not in the National Airspace System are not tabulated.*

**AUTOMATIC TERMINAL INFORMATION SERVICE (ATIS)**

ATIS is continuous broadcast of recorded non-control information in selected areas of high activity. See Part 1.

**FLIGHT SERVICE STATION (FSS)**

Airport Advisory Service (AAS).
En Route Weather Advisory Service (Flight Watch).
Island, Mountain and Lake Reporting Service.
Remote Weather Radar Display (WR).
VHF Direction Finding (DF).

**UNICOM**

A private aeronautical advisory communications facility operated for purposes other than air traffic control, transmits and receives on one of the following frequencies:

U-1—122.8 MHz for Landing Areas (except heliports) without an ATC Tower or FSS;
U-2—123.0 MHz for Landing Areas (except heliports with an ATC Tower or FSS;
U-3—123.05 MHz for heliports with or without ATC Tower or FSS;
U-4—122.85 MHz for landing areas not open to the public;
U-5—122.95 MHz for landing areas not open to the public.

**NOTE.—UNICOM used for communications must be licensed by the Federal Communications Commission.**

## RADIO CLASS DESIGNATIONS

**Identification of VOR/VORTAC/TACAN Stations by Class (Operational Limitations):**

**Normal Usable Altitudes and Radius Distances**

| Class | Altitudes | Distance (miles) |
|---|---|---|
| T | 12,000′ and below | 25 |
| L | Below 18,000′ | 40 |
| H | Below 18,000′ | 40 |
| H | 14,500′ — 17,999′ | 100* |
| H | 18,000′ — FL 450 | 130 |
| H | Above FL 450 | 100 |

*Applicable only within the contiguous 48 States.

(H)=High (L)=Low (T)=Terminal

NOTE: An H facility is capable of providing L and T service volume and an L facility additionally provides T service volume.

The term VOR is, operationally, a general term covering the VHF omnidirectional bearing type of facility without regard to the fact that the power, the frequency-protected service volume, the equipment configuration, and operational requirements may vary between facilities at different locations.

AB ——— Automatic Weather Broadcast (also shown with ■ following frequency).
B ——— Scheduled Broadcast Station (broadcasts weather at 15 minutes after the hour.
DME ——— UHF standard (TACAN compatible) distance measuring equipment.
H ——— Non-directional radio beacon (homing), power 50 watts to less than 2,000 watts.
HH ——— Non-directional radio beacon (homing), power 2,000 watts or more.
H-SAB ——— Non-directional radio beacons providing automatic transcribed weather service.
ILS ——— Instrument Landing System (voice, where available, on localizer channel).
LDA ——— Localizer Directional Aid.
LMM ——— Compass locator station when installed at middle marker site.
LOM ——— Compass locator station when installed at outer marker site.
MH ——— Non-directional radio beacon (homing) power less than 50 watts.
S ——— Simultaneous range, homing signal and/or voice.
SABH ——— Non-directional radio beacon not authorized for IFR or ATC. Provides automatic weather broadcasts.
SDF ——— Simplified Direction Facility.
TACAN ——— UHF navigational facility—omnidirectional course and distance information.
VOR ——— VHF navigational facility—omnidirectional, course only.
VOR/DME ——— Collocated VOR navigational facility and UHF standard distance measuring equipment.
VORTAC ——— Collocated VOR and TACAN navigational facilities.
W ——— Without voice on radio facility frequency.
Z ——— VHF station location marker at a LF radio facility.

FIGURE 48

AIRMAN'S INFORMATION MANUAL (AIM)
Excerpt

# AIRPORT/FACILITY DIRECTORY

## SAMPLE

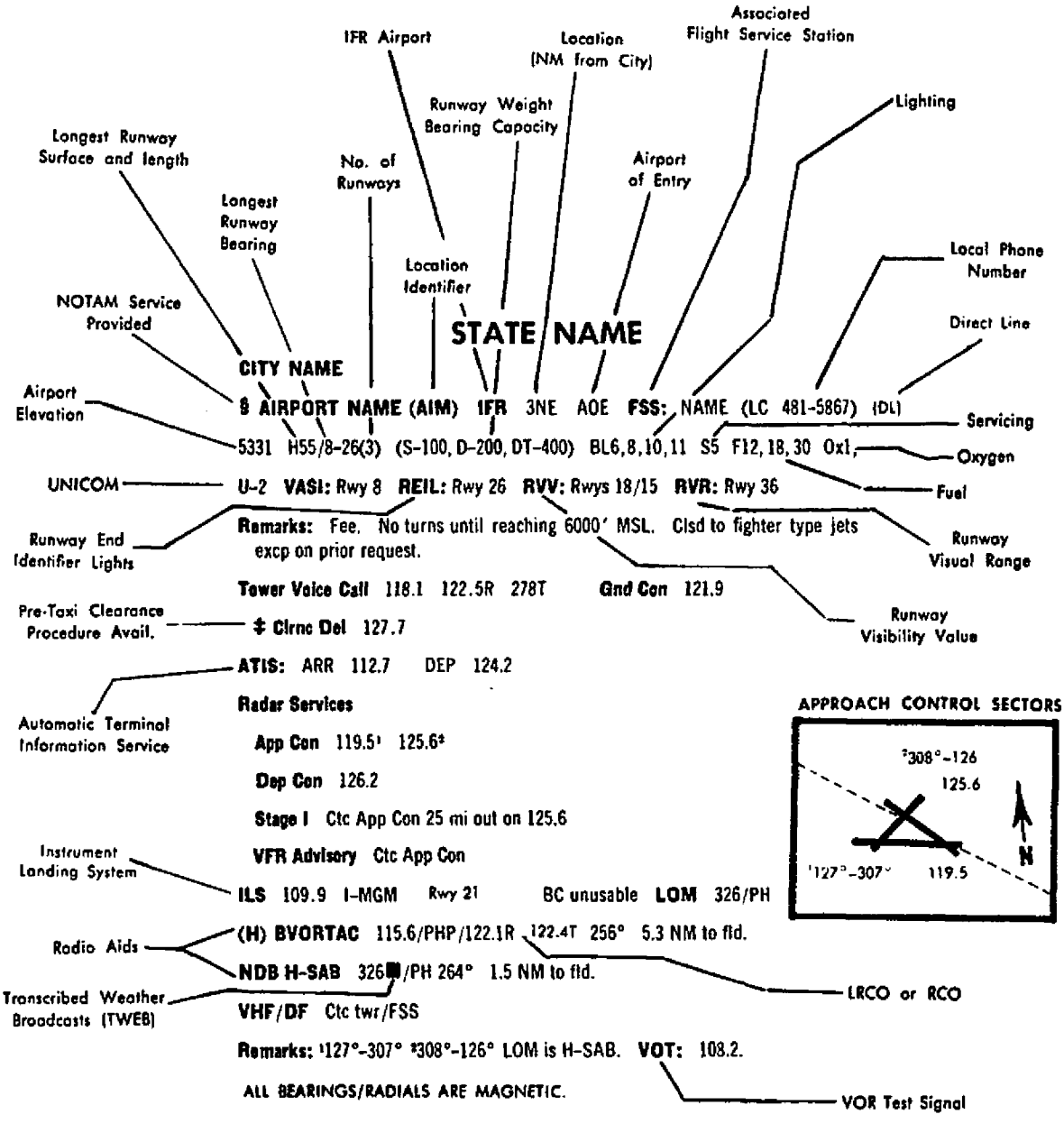



FIGURE 49

AIM Excerpt

# AIRPORT/FACILITY DIRECTORY

## ALABAMA—Continued

**MUSCLE SHOALS FSS** 121.5 122.1R 122.2 122.4T 123.6 **DF**

**§ MUSCLE SHOALS** *IFR* **(MSL)** 1E **FSS:** MUSCLE SHOALS on fld 550 H60/11-29(2) (S-38, D-53, DT-75) BL5,6 S5 F12,18,34 Ox2 U2
**Remarks:** Rwy 18-36 (S-53, D-78, DT-135). Attended daylight hrs, ngts phone 766-2203, ngt service charge. During a calm wind condition the preferred rwy is 29.
**Radar Services:**
**Huntsville App Con** 120.35 118.75
**Huntsville Dep Con** 120.35 118.75
**ILH** 109.7 I-MSL Rwy 29
**Muscle Shoals (L) BVORTAC** 116.5/MSL 289° 5.7NM rwy 29
**VHF/DF** Ctc FSS.
**Remarks:** GS not cmsnd.

**ROEBUCK NDB MHW** 201/ROE **FSS:** BIRMINGHAM

**SARATOGA NDB MHW** 296/ARF **FSS:** ANNISTON
**Remarks:** Non-federal facility.

**TALLADEGA (L) BVORTAC** 108.8/TDG/122.05R **FSS:** ANNISTON

**§ TROY MUNI (TOI)** *IFR* 5NW **FSS:** DOTHAN (DL)
399 H50/7-25(3) (S-50, D-80, DT-140) BL5 S5 F12,18 U-1
**Remarks:** Attended Mon-Fri 0600-1700 except holidays, other times ctc FBO. Extensive helicopter operations approach end rwy 32 0700-2100 lcl. Unmrkd dsplcd thr rwy 14R.
**Troy Tower** 124.3 134.95
**Radar Services:**
**Cairns App Con** 125.8 133.45
**ILS** 108.9 I-TOI Rwy 7 BC unusable **LOM:** 365/TO
**NDB MHW** 066° 4.6NM to rwy 7 (see Youngblood).
**Remarks:** Twr opers 0600-1800 Mon-Fri except holidays. ILS unmonitored when twr not in opern, GS unusable below 588' MSL. Rwy 7 LOM is Youngblood NDB.

**TUSCALOOSA FSS** 123.6

**§ TUSCALOOSA MUNI (TCL)** *IFR* 3NW **FSS:** TUSCALOOSA on Fld 169 H65/4-22(2) (S-90, D-120, DT-190) BL5,6 S5 F12,18,34 Ox2
**Remarks:** Rwy 11 clsd for tkof 1800-1000. 500' stopway each end rwy 11-29.
**Tuscaloosa Tower** 126.3 **Gnd Con** 121.8
**Radar Services:**
**Birmingham App Con** 124.5
**ILS** 109.1 I-TCL Rwy 4 **LOM:** 362/TC
**Tuscaloosa (L) BVORTAC** 117.8/TCL 238° 4.0NM to rwy 4.
**Remarks:** Twr operates 1000-1800, FSS provides AAS other hrs on 126.3.

**TUSKEGEE (L) BVORTAC** 117.3/TGE/122.1R **FSS:** MONTGOMERY

**WHITESBURG NDB MHW** 407/ITS **FSS:** MUSCLE SHOALS

**WILMER NDB BH** 248/MO **FSS:** MOBILE

**YOUNGBLOOD NDB MHW** 365/TO **FSS:** DOTHAN
**Remarks:** NDB unmonitored SS-0700 weekdays and weekends.

## ALASKA

A separate publication titled ALASKA SUPPLEMENT is issued every 28 days for Alaska.

## ARIZONA

**BUCKEYE (L) BVORTAC** 110.6/BXK/122.1R **FSS:** PHOENIX

**CASA GRANDE (H) BVORTAC** 114.8/CZG/122.1R **FSS:** PHOENIX

**COCHISE (H) BVORTAC** 115.8/CIE/122.1R **FSS:** DOUGLAS

**DOUGLAS FSS** 121.5 122.1R 122.2 122.6 123.6
**Remarks:** No wea bcst avbl 2200-0500 lcl time.

**DOUGLAS (L) BVORTAC** 108.8/DUG **FSS:** DOUGLAS

**FLAGSTAFF (L) BVOR** 108.2/FLG/126.65R **FSS:** PRESCOTT

## ARIZONA—Continued

**FORT HUACHUCA/SIERRA VISTA**
**§ LIBBY AAF/SIERRA VISTA MUNI (FHU)** *IFR* 3N **FSS:** DOUGLAS
4664 H53/11-29(2) BL5 F12,18
**Remarks:** Attended daylight. Rgt tfc rwys 20, 29.
**Libby Tower** 118.9 122.5R **Gnd Con** 121.7
**Fort Huachuca (T) VOR** 111.6/FHU on fld
**Fort Huachuca NDB H** 410/FHU on fld
**Remarks:** Twr opers 0600-2200 Mon-Fri, 0700-1700 Sat, Sun and holidays.

**GILA BEND (H) BVORTAC** 116.6/GBN/121.5 122.1R 122.6 **FSS:** PHOENIX

**GLOBE LRCO** 122.3 **FSS:** PHOENIX

**GOODYEAR**
**§ PHOENIX-LITCHFIELD MUNI (GYR)** 1SW **FSS:** PHOENIX (LC 261-4295)
968 H85/3-21(1) (S-60, D-80, DT-140) BL5 S5 F12,18,22,30 U2
**Remarks:** Rwy 21 threshold displaced 2000'. Rgt tfc rwy 21 for acft approaching from West at 2000' or below, otherwise left tfc pattern. TRI-VAS rwy 21.
**Litchfield Tower** 120.1 **Gnd Con** 121.7
**Radar Services:**
**Phoenix App Con** 120.7
**Remarks:** Twr opers 0600-2300. Two-way rdo required. Freq 121.5 not avbl.

**§ GRAND CANYON NATIONAL PARK (GCN)** *IFR* 7S **FSS:** PRESCOTT
6605 H90/3-21(1) (S-40, D-50, DT-80) BL5 S3 F12,18,30 U1
**Remarks:** TRI-VASI: Rwys 3, 21.
**Grand Canyon Tower** 119.0 **Gnd Con** 121.9
**Grand Canyon (L) BVOR** 109.0/GCN/122.1R 090° 0.3NM to fld
**Remarks:** Twr opers 0800-1600. Twr clsd Oct-June.

**IMPERIAL LRCO** 122.6 **FSS:** IMPERIAL

**KINGMAN (L) BVOR** 108.8/IGM/122.1R **FSS:** PRESCOTT

**NOGALES RCO** 122.4 **FSS:** TUCSON

**PAPAGO NDB H-SAB** 326■/PQO **FSS:** PHOENIX

**PEACH SPRINGS (H) BVORTAC** 112.0/PGS/122.15R **FSS:** PRESCOTT

**PHOENIX FSS** 121.5 122.1R 122.2 122.6 122.05 **DF**
**Remarks:** No wea bcst avbl 2200-0600 lcl time.

**PHOENIX**
**DEER VALLEY MUNICIPAL (P09)** 17N **FSS:** PHOENIX
1475 H51/7-25(1) (S-30, D-45, DT-60) BL4 S5 F12,18 U-2
**Remarks:** 5150 x 60 extension E end clsd, but avbl on prior request. Glider operns in vicinity of arpt Sat & Sun 1100-Sunset.
**Deer Valley Tower** 118.4 **Gnd Con** 121.8
**Remarks:** Twr opers 0700-1900 lcl Mon-Fri, dawn-dusk Sat and Sun. Non-federal facility.

**PHOENIX**
**§ SKY HARBOR INTL (PHX)** *IFR* 3E LRA **FSS:** PHOENIX on Fld 1128 H103/8R-26L(2) (S-100, D-200, DT-350) BL5,6,7A,11,13 S5 F12,18,30,34 Ox1,2,3,4 U2 **RETL:** Rwy 8L, 26R **RVV:** Rwy 8R
**Remarks:** Rgt tfc rnwys 8R, 26R. Rnwy 26L threshold displaced 706'. Unless advised by ATC all turbine acft and acft 12,500 lbs and over remain at or above 3,000' MSL until established on final. Fly base leg at least 5 mi from arpt.
**Phoenix Tower** 118.7 (Rwy 8L-26R) 120.9 (Rwy 8R-26L) **Gnd Con** 121.9
**‡ Clnc Del** 118.1
**ATIS:** 125.6
**Radar Services:**
**Phoenix App Con** 119.2 (010-109°), 124.1 (110-269°), 120.7 (270-009°), 115.6T
**Phoenix Dep Con** 119.2 (010-109°), 124.1 (110-269°), 120.7 (270-009°), 115.6T

FIGURE 50

AIM Excerpt

# AIRPORT/FACILITY DIRECTORY

## ARIZONA—*Continued*

**PHOENIX—(Continued)**

Stage I Ctc App Con beyond 10 miles
ILS 108.3 I-PHX Rwy 8R
Phoenix (H) BVORTAC 115.6/PHX 256° 5.3 NM to fld.
Remarks: No wea bcst avbl 2200–0600. VOT: 109.0.

**PRESCOTT FSS** 121.5 122.15R 122.2 122.4 123.6 **DF**
Remarks: No wea bcst avbl 2200–0500 lcl time.

**PRESCOTT (H) BVORTAC** 114.1/PRC **FSS: PRESCOTT**

**RYAN NDB H-SAB** 338■/RYN **FSS: TUCSON**

**ST. JOHNS (H) BVORTAC** 112.3/SJN/122.1R **FSS: GALLUP**

**SAN SIMON (H) BVORTAC** 115.4/SSO/122.1R **FSS: DOUGLAS**

**TUBA CITY (H) BVORTAC** 113.5/TBC/122.05R **FSS: PRESCOTT**

**TUCSON LRCO** 122.4 **FSS: TUCSON**

**TUCSON FSS** 121.5 122.1R 122.2 122.7 123.65 **DF**
Remarks: No wea bcst avbl 2200–0500.

**§ TUCSON INTL (TUS)** *IFR* 7S AOE **FSS: TUCSON** on Fld
2630 H120/11L-29R(3) (S-160, D-205, DT-305) BL5,10 S5 F12,18,22,30,40 Ox1,2,3,4 U2 **VASI:** Rwy 29R
Remarks: Rwy 11L threshold displaced 1100'. 1000' asph overrun each end rwy 11L-29R. Lndg fee. J-bar rwy 11L-29R. VASI rwy 29R upper TCH 78', lower TCH 42'; upper RRP 1690', lower RRP 1090'.
Tucson Tower: 118.3 **Gnd Con** 121.9
Radar Services:
App Con 118.5 (121-299°) 125.1 (300-120°) 134.1 117.1T
Dep Con 118.5 (121-299°) 125.1 (300-120°)
Stage II Ctc App Con 25 NM out on 125.9 (300-120°) 30 NM out on 124.0 (121-299°)
ILS 108.5 I-TUS Rwy 11L
VHF/DF Ctc FSS.
(H) BVORTAC 117.1/TUS 254° 6.1 NM to fld.
Remarks: VHF/DF unusable beyond 40 NM below 13,500' MSL 345-070° below 12,500' MSL 070-090°.

**VERDE LRCO** 122.7 **FSS: PRESCOTT**

**WINSLOW (H) BVORTAC** 112.6/INW/122.15R 122.6
**FSS: PRESCOTT**

**YUMA FSS** 121.5 122.1R 122.2 122.3
Remarks: No sked wea bcst 2200–0500 lcl time.

**§ YUMA MCAS/INTL (YUM)** *IFR* 4S AOE **FSS: YUMA** on Fld
213 H133/3L-21R(4) (S-103, D-200, DT-400) BL6 S5 F12,18,30 Ox1, 2
Remarks: Attended daylight. Rwy 3R-21L GWT (S-162, D-200, DT-400). 1000 overrun each end rwy 3L-21R. A-gear rwys 3L-21R and 3R-21L. 2300–0600 civil rwy will remain lgtd and addnl lgtg avbl thru FSS in emerg. TPA-jets 1700' MSL, props 1200' MSL, helicopters 700' MSL. Rgt tfc rwy 3L, 3R, 8, 26, 17.
Marine Yuma Tower 119.3 126.2 **Gnd Con** 121.9
‡ Clrnc Del 121.9
App Con 120.0
ILS 108.3 I-YUM Rwy 21R
VHF/DF Ctc twr.
(H) BVORTAC 116.8/YUM 167° 6.0NM to fld.
Remarks: Twr opers 0600–2300 except avbl for emgcy, FSS provides AAS other hrs on 119.3. Rwy 21R ILS unmonitored 2300–0600.

## ARKANSAS

**ARKADELPHIA NDB MHW** 275/ADF **FSS: PINE BLUFF**
Remarks: Non-federal facility.

**BATESVILLE NDB MHW** 317/BVX **FSS: JONESBORO**
Remarks: Non-federal facility.

**BLYTHEVILLE (L) VOR** 111.8/BYH **FSS: DYERSBURG**
**NDB HW** 311/BYH

## ARKANSAS—*Continued*

**BRUINS NDB MHW** 215/BSA **FSS: MEMPHIS**

**CAMDEN NDB MHW** 335/CDH **FSS: EL DORADO**
Remarks: Non-federal facility.

**CHEROKEE VILLAGE NDB MHW** 344/CVK **FSS: JONESBORO**
Remarks: Non-federal facility.

**DeQUEEN NDB MHW** 281/DEQ **FSS: TEXARKANA**

**CROSSETT NDB MHW** 396/CRT **FSS: EL DORADO**
Remarks: Non-federal facility.

**DRAKE (T) BVOR** 108.8/DAK **FSS: FAYETTEVILLE**

**ELDORADO FSS** 121.5 122.1R 122.2 123.6 **DF**

**EL DORADO (L) BVORTAC** 108.2/ELD **FSS: EL DORADO**

**FAYETTEVILLE FSS** 121.5 122.2 122.3 **DF**

**FAYETTEVILLE**

**§ DRAKE FLD (FYV)** *IFR* 4S **FSS: FAYETTEVILLE** on Fld
1251 H60/16-34(1) (S-40, D-60, DT-102) BL5 S5 F12,18,30 U-1
Remarks: Attended dalgt hrs.
Drake Tower 118.5 **Gnd Con** 121.8
LOC 111.9 I-FYV Rwy 16
Fayetteville (H) BVORTAC 116.4/FYV/122.1R
Remarks: FSS provides AAS on 118.5 when twr clsd. Twr opers 0800–2000.

**FLIPPIN (L) BVOR** 115.1/FLP/121.5 122.1R 122.6 122.2 **FSS: HARRISON**

**FORREST CITY NDB MHW** 332/FCY **FSS: MEMPHIS**
Remarks: Monitored 0700–2200 lcl Mon-Sat.

**FORT SMITH CS/T** 121.5 122.1R 122.6 122.2

**§ FORT SMITH MUNI (FSM)** *IFR* 4SE **FSS: FAYETTEVILLE (LC 782-0343)**
468 H80/7-25(2) (S-75, D-170, DT-300) BL5,6,8,10 S5 F12,18,22,30 U2 **RVV:** Rnwy 25 **VASI:** Rwy 7
Remarks: Attended 0600–2200. Fuel avbl on req after 2200, and fee. A-gear rwy 7-25. Arresting Cable rwwy 25 1000' from threshold.. VASI rwy 7 TCH 46' RRP 1000'.
Fort Smith Tower 118.3 **Gnd Con** 121.9
App Con 125.4 110.4T
ILS 109.5 I-FSM Rwy 25 **LOM:** 223/FS
Fort Smith (L) BVORTAC 110.4/FSM 226° 5.2NM to fld.
Fort Smith NDB HW 223/FS 254° 6.9NM to fld.
Remarks: Rwy 25 LOM is Fort Smith NDB.

**HARRISON FSS** 121.5 122.1R 122.2 123.6

**HARRISON (L) BVOR** 112.5/HRO **FSS: HARRISON**

**HEBER SPRINGS NDB MHW** 296/HBZ **FSS: HARRISON**
Remarks: Non-federal facility.

**HICKS NDB MHW** 299/HKA **FSS: DYERSBURG**
Remarks: Non-federal facility.

**HOT SPRINGS**

**§ MEMORIAL FLD (HOT)** *IFR* 3SW **FSS: PINE BLUFF (LC NA 4-4481)**
535 H61/5-23(2) (S-35, D-49, DT-78) BL5,6,7A,13 S5 F12,18,30
Remarks: Attended 0700–2100. MALSR unmonitored when twr is clsd. P-line SW. Pole NE.
Hot Springs Tower[1] 120.3 122.5R **Gnd Con** 121.7
Hot Springs App Con[1] 118.85 122.5R 110.0T
VFR Advisory Ctc App Con on 118.85
ILS 111.5 I-HOT Rwy 5 **LOM:** 385/HO
Hot Springs (L) VOR 110.0/HOT on fld.
Hot Springs NDB MHW 385/HO 048° 5.1NM to fld.
Remarks: Twr opers 0700–2300, other hrs ctc Little Rock App Con 110.0T and 120.3R. Rwy 5 ILS unmonitored when twr not operg. Rwy 5 LOM is Hot Springs NDB.

**JONESBORO FSS** 121.5 122.1R 122.2 122.6 123.6
Remarks: Opers 0600-2200, other hrs ctc Memphis FSS.

**JONESBORO (T) BVOR** 108.6/JBR **FSS: JONESBORO**
Remarks: From 2200–0600 automatic course monitor only.

FIGURE 51

## ARIZONA

**AJO MUNI (P01)** 6N 32°27'00'' 112°52'00'' **FSS: PHOENIX**
1458 H63/12-30 (1) BL4 F12
**REMARKS:** ARPT UNATTENDED. HVY JET TFC VCNTY ARPT. FUEL AVBL EMERG, CALL SHERIFF 387-7621. LIGHTS ON CENTER 3950'.

**ANGEL FLD See FORT GRANT**

**ANTELOPE RANCH See ROLL**

**BAGDAD** 2NE 34°35'45'' 113°10'10'' **FSS: PRESCOTT**
4136 H36/5-23 (1) (S-4) BL4
**REMARKS:** ARPT UNATTENDED. UNUSUAL AIR CURRENTS VICINITY ARPT,ESPECIALLY EAST APCH. RWY LGTS ACTIVATED BY KEYING 122.8 3 TIMES OR BY PRIOR REQ OR CIRCLING TOWN.

**BISBEE MUNI (P04)** 6SE 31°21'50'' 109°52'57'' **FSS: DOUGLAS**
4789 39/2-20 (3) L4 S5 F12
**REMARKS:** RWY LGTS TURNED ON AUTOLY FOR 12 MIN BY VOICE RELAY ON 122.8.

**§ CLIFTON-MORENCI, GREENLEE COUNTY (CFT)** 9SE **FSS: DOUGLAS**
32°57'10'' 109°12'35''
3811 H49/7-25 (1) (S-21) *BL5
**REMARKS:** ARPT UNATTENDED. FOR RWY LGTS & ROTG BCN PHONE 864-3888 OR 864-4149.

**COCHISE COUNTY See WILLCOX**

**COLORADO CITY MUNI** 4SW 36°56'58'' 113°00'50'' **FSS: CEDAR CITY**
4840 34/13-31 (2)
**REMARKS:** ARPT UNATTENDED.

**COOLIDGE MUNI** 2SW 32°58'00'' 111°32'45'' **FSS: PHOENIX**
1402 H21/8-26 (1) (S-4) F12 **(LC 723-3392)**
**REMARKS:** ARPT ATTENDED IRREGULARLY. FUEL IN EMERG ONLY.

**COOLIDGE FLORENCE MUNI (P08)** 6SE 32°56'00'' **FSS: PHOENIX**
111°25'30''
1587 H55/5-23 (4) (S-80,D-115,DT-210) S3 F12, 18 **(LC 723-3392)**
**REMARKS:** RGT TFC RWY 5, 8, 11, 35. PARACHUTE JUMPING SAT & SUN. TPA 1000' AGL. ALL TRAFFIC PATTERNS VARY DURING AF TRAINING. INTENSIVE JET TRAINING RWY 5-23 DAYLGT HRS MON-FRI. CTC AF MOBILE ATCT ON 122.8 BEFORE ENTERING TRAFFIC PATTERN.

**DOLAN SPRINGS, LAKE MOHAVE RANCHOS** 1W 35°34'06'' **FSS: NEEDLES**
114°17'55''
3200 37/1-19 (1)
**REMARKS:** ARPT UNATTENDED. P-LINE IN RWY 1 APCH.

**DOUGLAS MUNI (DGL)** 2E 31°20'30'' 109°30'15'' **FSS: DOUGLAS**
4181 53/18-36 (3) BL5 S5 F12, 18 OX2,4 **(LC 364-8458)**
**REMARKS:** ANTENNA IN RWY 8 APCH. RGT TFC RWY 8, 36, 12. ADDNL 3000 X 90 ASPH STRIP ON S SIDE RWY 8-26 CLSD. ONLY MID 2000' RWY 18-36 LGTD. OX-1 & OX-4 AVBL FM TOWN.

**§ DOUGLAS BISBEE, BISBEE DOUGLAS INTERNATIONAL (DUG)** **FSS: DOUGLAS ON FLD**
9NW 31°28'02'' 109°36'03'' IFR AOE
4158 H75/12-30 (4) (S-12) BL5 S5 F12, 18, 22, 34
**REMARKS:** RWY 8-26 WT BRG CPTY S-85,D-95,DT-155. ARPT ATTENDED 0600-2000. MAX ALLOWABLE GROSS WGT RWYS 03-21 & 12-30 IS 12500 LBS. RWY LGTS & ROTG BCN ACTIVATED ON 121.7.

**DOWNTOWN TUCSON See TUCSON**

**DVR See TACNA**

**EDS FIELD See PICACHO**

**ELOY MUNI** 4NW 32°48'25'' 111°35'10'' **FSS: PHOENIX**
1513 H39/2-20 (1) (S-12.5) BL5 F12, 18

**ESTRELLA SAILPORT See MARICOPA**

**FALCON FLD See MESA**

**FARM AERO See PHOENIX**

**§ FLAGSTAFF, PULLIAM (FLG)** 5S 35°08'16'' 111°40'18'' **FSS: PRESCOTT**
IFR
7012 H70/3-21 (1) (S-65,D-85,DT-130) BL5 S5 F12, 18, 30 **(LC 774-0475)**
U-1
**REMARKS:** ARPT ATTENDED 0700-1900 ON CALL AFTER 1900.

**FLY IN PICNIC GROUNDS See QUARTZSITE**

**FLYING E GUEST RANCH See WICKENBURG**

**FOREPAUGH See WICKENBURG**

## ARIZONA—CONTINUED

**HOLBROOK MUNI (P14)** 3NE 34°56'20'' 110°08'20'' **FSS: PRESCOTT**
5245 H58/3-21 (1) (S-12) BL5 S3 F12, 18

**HUNT, GREEN VALLEY** 2S 34°35'00'' 109°37'23'' **FSS: PRESCOTT**
5600 56/N-S (1)
**REMARKS:** ARPT UNATTENDED.

**§ PHOENIX SKY HARBOR INTL (PHX)** 3E 33°26'07'' **FSS: PHOENIX ON FLD**
112°00'43'' IFR LRA
1128 H103/8R-26L (2) (S-100,D-200,DT-350) BL5, 13, 7A, 11
S5 F12, 18, 30, 34 OX1,2,3,4 U-2
**REIL:** RWY 8L, 26R **RVV:** RWY 8R
**REMARKS:** (†) RWY 26L THRESHOLD DISPLACED 706'. RGT TFC RWY 26R, 8R. FLY BASE LEG AT LEAST 5 MI FM ARPT. UNLESS ADZD BY ATC ALL TURBINE ACFT & ACFT 12,500 LBS & OVER REMAIN AT OR ABOVE 3000' MSL UNTIL ESTABD ON FINAL.

**POLACCA** 4SW 35°48'00'' 110°25'00'' **FSS: PRESCOTT**
5573 H38/4-22 (1)
**REMARKS:** ARPT UNATTENDED. RGT TFC RWY 4, 22, 15, 33.

**§ PRESCOTT MUNI (PRC)** 8N 34°39'05'' 112°25'15'' IFR **FSS: PRESCOTT ON FLD**
5042 H76/3-21 (2) (S-50,D-63,DT-100) BL5 S5 F12, 18
U-2
**VHF/DF:** CTC FSS
**REMARKS:** ARPT ATTENDED 0600-1900 ON CALL OTHER HRS. RWY 3 THRESHOLD DISPLACED 797'

**PULLIAM See FLAGSTAFF**

**TUCSON, DOWNTOWN TUCSON** ADJ SE 32°11'10'' **FSS: TUCSON**
110°56'55''
2490 43/16-34 (2) F12, 18 **(LC 792-6359)**
**REMARKS:** ARPT ATTENDED DAWN DUSK. P-LINE IN RWY 11 APCH. P-LINE IN RWY 29 APCH. P-LINE IN RWY 16 APCH.

**§ TUCSON, FREEWAY (P12)** 4NW 32°16'40'' 111°00'30'' **FSS: TUCSON**
2290 H45/12-30 (1) (S-6) BL4 S5 F12, 18 U-1 **(LC 792-6359)**
**REMARKS:** RWY 30 THRESHOLD DISPLACED 500'. P-LINE IN RWY 30 APCH. MAINTAIN 50' OVER ROMERO RD ON FINAL TO RWY 30.

**TUCSON, RYAN FIELD** 12SW 32°08'29'' 111°10'00'' **FSS: TUCSON**
2413 H40/6R-24L (1) (S-9) BL4 S5 F12, 18 U-1 **(LC 792-6359)**
**REMARKS:** ARPT ATTENDED 0800-1800. RGT TFC RWY 6R, 16. GLIDER OPERNS WITHIN 10 MILE RADIUS WEEKENDS. 2525 X 25 ASPH STRIP SUPERIMPOSED ON DIRT STRIP 6L-24R BEGINNING 625' FM SW END. RWY 6L-24R RESTRICTED TO GLIDERS ONLY.

**§ TUCSON INTL (TUS)** 7S 32°07'05'' 110°56'32'' IFR **FSS: TUCSON ON FLD**
AOE
2630 H120/11L-29R (3) (S-160,D-285,DT-385) BL5, 10 S5
F12, 18, 22, 30, 40 OX1,2,3,4 U-2
**VASI:** RWY 29R
**VHF/DF:** CTC FSS
**REMARKS:** (†) RWY 11L THRESHOLD DISPLACED 1100'. ARRESTING DEVICE RWY 21, 11L, 29R. VASI RWY 29R UPPER TCH 78', LOWER TCH 42'/ UPPER RRP 1690', LOWER RRP 1090' 1000' ASPH OVRN EACH END RWY 11L-29R.

**WINDOW ROCK (P34)** 1S 35°39'20'' 109°03'45'' **FSS: GALLUP**
6755 H70/2-20 (1) (S-30,D-45,DT-75) L5 F18
**REMARKS:** ARPT ATTENDED 0800-1700.

**§ WINSLOW MUNI (INW)** 1W 35°01'20'' 110°43'20'' IFR **FSS: PRESCOTT**
4938 H71/11-29 (2) (S-60,D-70,DT-110) BL5 S3 F12, 18 **(DL)**
U-1
**REMARKS:** ARPT ATTENDED 0700-1800 ON CALL AFTER HRS. RWY 29 THRESHOLD DISPLACED 400'.

**§ YUMA MCAS/YUMA INTERNATIONAL (YUM)** 4S 32°39'24'' **FSS: YUMA ON FLD**
114°36'18'' IFR AOE
213 H133/3L-21R (4) (S-100,D-200,DT-400) BL6 S5 F12,
18, 30 OX1,2
**VHF/DF:** CTC TWR
**REMARKS:** (†) RWY 3R-21L WT BRG CPTY S-162,D-200,DT-400. ARPT ATTENDED DAYLIGHT. ARRESTING DEVICE RWY 3L, 21R, 3R, 21L. RGT TFC RWY 3L, 3R, 8, 26, 17. 1000' OVERRUN EACH END RWY 03L-21R. FSS PROVIDES ARPT ADV SVC WHEN TWR CLSD. TPA-JETS 1700' MSL/PROPS 1200' MSL/COPTERS 700' MSL. 2300-0600 APROP CIVIL RWY LGTD, OTHER RWYS LGTD ON REQ THRU FSS IN EMERG.

FIGURE 52

Excerpt

# AIRMAN'S INFORMATION MANUAL—PART 3A

## NOTICES TO AIRMEN

**This part is issued every 14 days. It contains appropriate notices from the daily NOTAM Summary, and other items considered essential to flight safety.**

**This section contains Notices to Airmen that are expected to remain in effect for at least seven days. Temporary notices without published duration dates are normally carried twice unless resubmitted.**

**NOTE: Data preceded by a checkmark (✓) are considered permanent and will be published one time only in this section. Data should be noted on charts and records.**

**NOTE: Notices are arranged in alphabetical order by State (and within the State by City or locality).**

**NEW OR REVISED DATA: New or revised data are indicated by underlining the first line of the affected item. The new information is not necessarily limited to the underlined portion, which is used only to attract attention to the new insert.**

### ALABAMA

AUBURN, OPELIKA ARPT: Tmpry ATCT and FSS will oper on Nov 10. Freqs 123.1 lcl ctl, 121.8, 122.5R gnd ctl, 121.5 emgcy. Hours 1000–1800 lcl.

TALLADEGA MUNI ARPT: Rwy 3–21 clsd to acft 40,000 lbs GWT or over. (3–73)

TUSCALOOSA: FSS remains operational, telephone number—(205) 758–3628.

TUSKEGEE—MOTON FIELD ARPT: Const in progress. Arpt clsd til aprxly Dec 1973. (3–73)

### ALASKA

SPECIAL NOTICE: Pilots flying aircraft equipped with SCR–718 altimeters will assure that the altimeter is turned off within 200 NM of Clear, Alaska and Thule, Greenland.

**For complete information on Alaska consult the Alaska Supplement.**

### ARIZONA

BISBEE MUNI ARPT: Rwy lgts 2–20 inop. (8–73)

GRAND CANYON: Control zone hrs 0800–2000 lcl time.

GRAND CANYON NATIONAL PARK ARPT: ATCT deactivated until aprxly 1 June 74.

GRAND CANYON NATIONAL PARK: All pilots are requested to avoid flying below the canyon rim and to maintain a distance 1500′ above and horizontally from all scenic overlooks, parks, trails and Grand Canyon Village.

PRESCOTT MUNI ARPT: Obstrn 30′ AGL lctd ¼ NM SSW of TDZ rwy 3 unlgtd. First 1450′ rwy 11 clsd.

### ARKANSAS

EL DORADO, GOODWIN FLD: Threshold rwy 22 displaced 413′. (6–73)

FORDYCE MUNI ARPT: Rwy 04 thr dspicd 100′. (8–73)

HELENA/WEST HELENA - THOMPSON - ROBBINS ARPT: Rwy 17–35 clsd UFN. (9–73)

### CALIFORNIA

SPECIAL NOTICE: Do not mistake dirt strip on large island, Lake Berryessa, lctd lat 38–34 long 122–13 for airport. Strip is unauthorized and unsafe.

ANO NUEVO ISLAND: Avoid low flying in the vicinity and over island. Biological research of wild life in progress.

BISHOP RDO: VOR ident "BIH" OTS. (11–73)

BLYTHE ARPT: Intensive airline jet acft training in progress 24 hrs daily. Inbound acft report 20 miles out on 123.6 and guard 123.6 for arpt advisory service, UFN. Use other freqs for other purposes. Unicom is not for arpt advisory use.

CHINO ARPT: Constr on arpt til aprxly Jan 1974.

LOS ANGELES INTL ARPT: ILS/OM "I–LAX" serving rwy 25L shutdown til aprxly Dec 20. (8–73)

PRIEST RDO: VOR/DME—DME portion will be dcmsnd eff 6 Dec 73. (11–73)

REDDING, SKY RANCH ARPT: 4′ drop off SE end rwy 12–30 not marked or lgtd. (10–73)

SALINAS MUNI ARPT: Const on fld. Rwy 13–31 clsd til aprxly Feb 74. Check NOTAMS for current info. (9–73)

SAN CLEMENTE FLIGHT RESTRICTION: FAR Section 91.95 prohibits acft operns below 4000′ MSL within a one mile radius of the San Mateo Point Loran Station/Oceanside VORTAC 300 radial 12.5 NM.

SAN FRANCISCO INTL ARPT: Rwy 10L–28R clsd lndg Mon-Sat 0600–1830 lcl til aprxly Jan 74. Blast fence 8 ft high lctd 770 ft east of dspicd thr of rwy 28R til aprxly Apr 74. East 600′ rwy 10L–28R clsd til aprxly April, 1974. (11–73)

SAN JOSE MUNI ARPT: In the interest of noise abatement, all turbojet acft are requested not to takeoff or land between 2400–0600 lcl unless justifiable. Cessna Citation or acft of equally low noise level excepted. The use of reverse thrust should be minimized at pilot's discretion at all times.

SAN JOSE MUNI ARPT: DME lctd glide slope bldg operg on test on channel 46 for 2-segment apch rwy 30L.

SANTA ROSA, SONOMA CO. ARPT: Twr 40′ AGL W side TDZ rwy 32 unlgtd UFN.

FIGURE 53

AIM Excerpt

# RULES PERTAINING TO AIRCRAFT ACCIDENTS, INCIDENTS, OVERDUE AIRCRAFT, AND SAFETY INVESTIGATIONS

(National Transportation Safety Board, Procedural Regulation, Part 480 (in part)).

**1. IMMEDIATE NOTIFICATION**

The operator of an aircraft shall immediately, and by the most expeditious means available, notify the nearest National Transportation Safety Board, Bureau of Aviation Safety Field Office when:

(a) An aircraft accident or any of the following listed incidents occur:

(1) Flight control system malfunction or failure;

(2) Inability of any required flight crewmember to perform his normal flight duties as a result of injury or illness;

(3 Turbine engine rotor failures excluding compressor blades and turbine buckets;

(4) In-flight fire;

(5) Aircraft collide in flight.

(b) An aircraft is overdue and is believed to have been involved in an accident

(c) The following information is required if available:

(1) Location;

(2) Date;

(3) Time;

(4) Aircraft make, model, and registration number and nationality.

(5) Names of operator and crew;

(6) Number of persons involved;

(7) Injuries of each person;

(8) Weather conditions.

**2. MANNER OF NOTIFICATION**

The most expeditious method of notification to the National Transportation Safety Board by the operator will be determined by the circumstances existing at that time. The National Transportation Safety Board has advised that any of the following would be considered examples of the type of notification that would be acceptable:

(a) Direct telephone notification.

(b) Telegraphic notification.

(c) Notification to the Federal Aviation Administration who would in turn notify the NTSB by direct communication; i.e., dispatch or telephone.

**3. REPORTS**

a. The operator shall file a report on NTSB Form 6120.1 or 6120.2, available from the National Transportation Safety Board Field Offices, or the National Transportation Safety Board, Washington, D.C.:

(1) Within ten (10) days after an occurrence for which notification is required in 1 (a) and (b) above;

(2) When, after seven (7) days, an overdue aircraft is still missing;

(3) Upon request of an authorized representative of the National Transportation Safety Board;

b. Each crew member, if physically able at the time the report is submitted, shall attach thereto a statement setting forth the facts, conditions and circumstances relating to the accident or occurrence as they appear to him to the best of his knowledge and belief. If the crew member is incapacitated, he shall submit the statement as soon as he is physically able.

**4. WHERE TO FILE THE REPORTS**

a. The operator of an aircraft shall file with the Field Office of the National Transportation Safety Board nearest the accident or incident any report required by this section.

b. The National Transportation Safety Board field offices are listed under U.S. Government in the telephone directories in the following cities: Anchorage, Alaska; Chicago, Ill.; Denver, Colo.; Fort Worth, Texas; Kansas City, Mo.; Los Angeles, Calif.; Miami, Fla.; New York, N.Y.; Oakland, Calif.; Seattle, Wash.; Washington, D.C.

FIGURE 54

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration

# 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 |

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. They have been discontinued since the subject areas which they cover are now adequately treated in one or more of the following FAA publications:

Pilot's Handbook of Aero. Knowledge, AC 61-23A
Aviation Weather - AC 00-6
Airman's Information Manual (annual subscription)
Other pertinent FAA Advisory Circulars

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

The Advisory Circular Checklist and certain free Advisory Circulars may be obtained from:

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



U. S. GOVERNMENT PRINTING OFFICE : 1975 O - 572-289

# GROUND INSTRUCTOR WRITTEN TEST GUIDE BASIC–ADVANCED

REVISED
1974

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Flight Standards Service

## PREFACE

This test guide was prepared by the Federal Aviation Administration as Advisory Circular AC 143–1D to assist applicants who are preparing for the Ground Instructor Written Test. It supersedes the *Ground Instructor Written Test Guide*, AC 143–1C, issued in 1972.

This guide outlines the scope of the basic aeronautical knowledge requirements for a ground instructor; acquaints the applicant with source material that may be used to acquire this basic knowledge; presents sample test items with answers and explanations, and illustrations representative of those used in the current Ground Instructor Written Test.

Comments regarding this publication should be directed to the U.S. Department of Transportation, Federal Aviation Administration, Flight Standards Technical Division, P.O. Box 25082, Oklahoma City, Oklahoma 73125.

# CONTENTS


| | Page |
|---|---|
| Preface | iii |
| Introduction | 1 |
| Nature of the Written Tests | 1 |
| Type of Test Questions | 1 |
| Taking the Test | 2 |
| Recommended Study Materials | 3 |
| How to Obtain Sales Publications | 5 |
| Study Outline—Fundamentals of Instructing | 7 |
| Study Outline—Aeronautical Knowledge | 9 |
| Sample Test | 17 |
| Answers and Explanations | 23 |
| Additional Questions for Study | 25 |
| Appendix | 27 |