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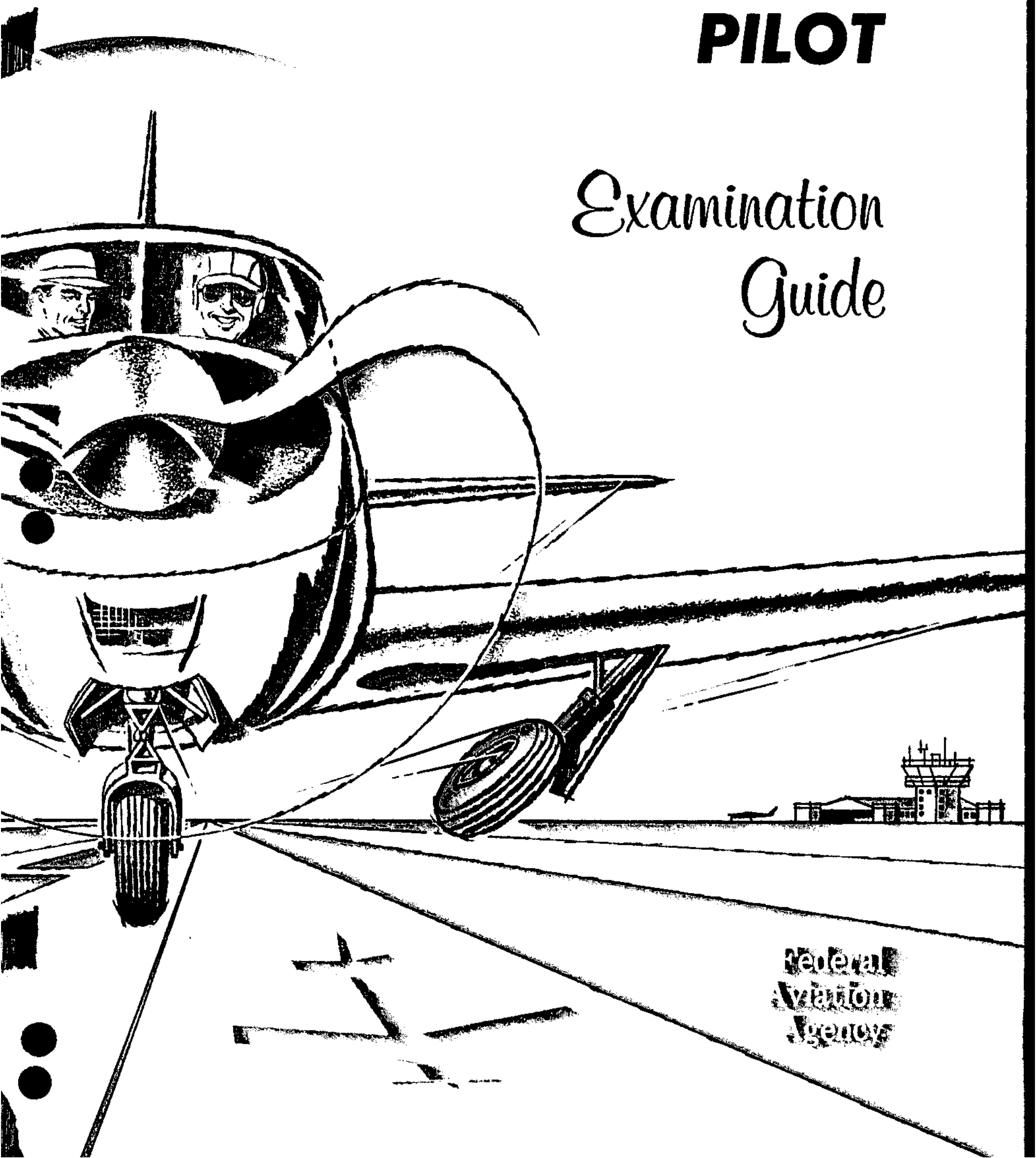
AC 61-28

COMMERCIAL PILOT

Examination Guide



Federal
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COMMERCIAL PILOT EXAMINATION GUIDE

Revised 1966

FEDERAL AVIATION AGENCY

Flight Standards Service

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PREFACE

The Operations Airman Examination Section of Flight Standards Service, Federal Aviation Agency, has issued this Commercial Pilot Examination Guide, AC 61-28, to assist applicants who are preparing for the Commercial Pilot Written Examination. It was prepared by the same Federal Aviation Agency Specialists who developed the Commercial Pilot Written Examinations currently in use. Its purpose is to guide prospective applicants toward a clear understanding of the requirements, the reference material, the form of the examination, and the examining procedures.

This guide supersedes the Commercial Pilot Examination Guide dated 1962.

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COMMERCIAL PILOT EXAMINATION GUIDE

INTRODUCTION

This guide is not offered as a quick and easy way to obtain the necessary knowledge for passing the written examination; there is NO quick and easy way to obtain the background of experience, knowledge, and skill that the present-day professional pilot must acquire. Rather, the intent of this guide is to define the scope and narrow the field of study, insofar as possible, to the knowledge requisite to the Commercial Pilot Certificate.

BASIS FOR THE EXAMINATION

No longer is the commercial pilot concerned primarily with "hopping passengers around the cow pasture" on sunny Sunday afternoons. He now conducts extended personal or business flights, or engages in the various phases of air commerce, and his area of operation is virtually boundless. Consequently, he often encounters situations involving rapidly changing weather conditions and unfamiliar terrain which demand knowledge of the elements as well as precise navigation. The airports and airspace he now uses have become congested with all types of flight operations, making stringent control imperative for the smooth, efficient flow of air traffic.

Technological advances and refinements have made the modern airplane versatile, reliable, and efficient. Many of today's smaller general aviation airplanes—the modern light single-engine and twin-engine airplanes—have a performance capability which, a short time ago, was found only in the larger and more powerful air carrier and military aircraft.

With its increased performance, improved instrumentation, and the addition of reliable radio navigation equipment such as VOR and ADF, it is natural that the airplane's primary commercial use is for safe, speedy, and efficient transportation. For these reasons the Commercial Pilot Written Examination is slanted to the transportation function. The basis of the examination is an operationally realistic cross-country flight.

The test items in the examination are those which relate to a successfully planned and executed flight. The pilot employs all pertinent flight information in planning his trip and applies his knowledge of air traffic rules, weather, navigation, radio, operation of aircraft and engines, etc., insofar as it contributes to safe, efficient flight. Recognizing this functional approach, the examination is designed to integrate technical information of several subjects into the test items of a single section.

TYPE OF TEST ITEMS

The examination contains 80 test items of the "objective, multiple-choice" type, and each can be answered by the selection of a single response from among the four presented. This type of examination has several advantages, two of which are (1) rapid scoring, making it possible for the applicant to receive his grade as soon as possible, and (2) objective scoring, eliminating any element of individual judgment by the examiner in determining the grade.

TAKING THE EXAMINATION

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

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

1. There are *no* "trick items." Each statement means exactly what it says. Do not look for hidden meanings nor read into the test item something that is not intended. Unless specifically stated otherwise, test items do not concern exceptions to the rule; they are based on the general rule.
2. Always read the complete test item, including the optional responses, *before* you make your choice. In many cases, the responses listed below the test item are your only clue as to the point of knowledge being

tested. Be sure that you understand what they mean. Then, from the list of alternative responses, decide which one you *think* is correct. Be sure that the one you select is the best among those listed.

3. Only *one* of the responses given is completely correct. The others may be the result of incorrect computations, misconceptions of rules and principles, or erroneous or incomplete analysis of the problem. Be sure that you understand and consider all factors.
4. Each test item is independent of other test items; that is, the correct response to one item is not based on the correct response to a previous item, although occasionally the same factors may be used.
5. If you find that you have considerable difficulty with a particular test item, do not spend too much time on it. Go on to the next item. When you reach the end of the test, go back to any items which you have passed over previously. This will enable you to use the available time to maximum advantage in demonstrating your knowledge and understanding of the subject.
6. In working problems which require computations or the use of the computer, your result may not agree exactly with any of the responses listed. This could be due to slight differences in individual computers and small errors that you might make in measuring distances, true courses, etc. However, sufficient spread is provided between correct and incorrect responses so that you will be able to make a positive selection, provided you have used correct technique and reasonable care in your computations. Therefore, choose the response that is *nearest* to your result. (NOTE: When the test is constructed, the correct responses are "double-checked" by several types of computers commonly used throughout the country.)
7. When reporting for the examination, you should be prepared to present to the Inspector administering the examination your eligibility to take it, as well as documentary evidence of your identity. Normally, *the Inspector will not permit you to begin the examination unless there is sufficient time to complete it.* Four hours and 30 minutes is the normal time allowed for completing the Commercial Pilot (Airplane) Written Examination.

ELIGIBILITY FOR TAKING THE EXAMINATION

Although certain requirements for the issuance of the Commercial Pilot Certificate are prescribed in FAR Part 61, there are, at the time of this writing, no prerequisites for taking the written examination initially. Requirements for *retaking* the examination after failing are prescribed in Section 61.27, FAR Part 61.

STUDY OUTLINE FOR THE COMMERCIAL PILOT WRITTEN EXAMINATION

This study outline is the framework of basic aeronautical knowledge that the prospective commercial pilot must know and be able to apply to pertinent situations. Every test item in the FAA examination can be directly related to one or more of the topics contained in this outline. Frequently, topics may overlap when the situation demands the application of several knowledge areas to arrive at the complete solution of a problem. This subject matter is predicated on operationally realistic airman activity and encompasses the requirements specified in Federal Aviation Regulations. Many topics in this outline are referenced to pertinent sources of information.

A. FEDERAL AVIATION REGULATIONS

Have a knowledge of:

1. Pilot privileges and limitations (FAR Part 61).
2. Recency of experience requirements (FAR Part 61).
3. Pilot certificates (FAR Part 61).
4. Pilot medical certificates (FAR Part 61).
5. Pilot responsibilities and preflight actions (FAR Part 91; Exam-O-Gram 4).
6. Aircraft maintenance and inspection requirements (FAR Part 91; Exam-O-Gram 26).
7. Aircraft certificates and documents (FAR Part 91; Exam-O-Gram 26).
8. General operating rules (FAR Part 91; Exam-O-Grams 4, 6).
9. General flight rules (FAR Part 91; Exam-O-Grams 2, 4).
10. Visual flight rules (FAR Part 91; Exam-O-Grams 1, 7).
11. Operating rules at airports (FAR Part 91; AIM*).
12. Airport traffic signals and markings (FAR Part 91; AIM*).
13. Accident reporting rules (CAB Part 320; AIM*).

B. FLIGHT INFORMATION PUBLICATIONS AND CHARTS.

Have a knowledge of:

1. *Airman's Information Manual* (AIM).
2. Aeronautical chart symbols (aeronautical chart; Exam-O-Grams 23, 24, 25).
3. Military climb corridors, restricted and prohibited areas (Exam-O-Gram 25).
4. Use of airport advisory service (AIM; Exam-O-Grams 14, 22, 24).
5. Radio facility data and symbols (AIM; Exam-O-Grams 14, 22, 24).
6. Controlled airspace boundaries (aeronautical chart; FAR Part 1, 71; Exam-O-Gram 26).
7. Significance of runway designations (AIM).
8. Airport night lighting.

Be able to:

1. Obtain radio facility information (AIM; Exam-O-Grams 14, 22, 24).
2. Obtain airport facility information (Airport Directories, AIM; aeronautical chart).
3. Select appropriate aeronautical charts (aeronautical chart; Exam-O-Grams 4, 25).
4. Determine terrain and obstruction clearance (aeronautical chart; Exam-O-Gram 23).
5. Relate FAR flight rules to airport symbols or data.
6. Relate FAR flight rules to chart elevations.
7. Relate FAR flight rules to controlled airspace symbols.
8. Relate FAR flight rules to restricted or prohibited areas.

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* AIM (*Airman's Information Manual*)

C. WEATHER FUNDAMENTALS, FORECASTS, AND REPORTS

Have a knowledge of:

1. Measurement of atmospheric pressure.
2. Cause of atmospheric circulation.
3. Effect of mountains and other obstructions on wind.
4. Relative humidity (Exam-O-Gram 17).
5. Methods by which air reaches the saturation point.
6. Effect of temperature on air density.
7. Effect of temperature on flight (Exam-O-Gram 11).
8. Cloud types and associated weather.
9. Fog, frost, clouds, and precipitation.
10. Thunderstorms and turbulence.
11. Freezing levels and icing conditions (Exam-O-Gram 21).
12. Characteristics of a cold front.
13. Characteristics of a warm front.
14. Characteristics of an occluded front.
15. Symbols used in teletype reports and forecasts (Exam-O-Gram 26).
16. Radio weather broadcasts (Exam-O-Grams 5, 17, 26).
17. Significance of temperature/dewpoint reports (Exam-O-Gram 21).
18. Significance of cloud and ceiling reports (Exam-O-Grams 17, 20, 21).
19. Significance of surface wind reports (Exam-O-Grams 17, 21, 26).
20. Significance of atmospheric pressure reports (Exam-O-Gram 21).

Be able to:

1. Recognize basic weather conditions and trends on surface weather maps.
2. Interpret and relate Area Forecasts to the route of flight.
3. Interpret and relate Terminal Forecasts to the route of flight.
4. Interpret and relate In-flight Advisories to the route of flight.
5. Interpret and relate Aviation Weather Reports to the route of flight.
6. Interpret and relate Pilot Reports (PIREPS) to the route of flight.
7. Interpret and relate Winds Aloft Forecasts to the route of flight.
8. Relate surface wind reports to available runways (Exam-O-Grams 21, 26).
9. Relate weather conditions or information to FAR flight rules.
10. Obtain weather information for planning and while enroute (Exam-O-Gram 5, 34).

D. PILOTAGE, DEAD RECKONING, AND RADIO NAVIGATION

Have a knowledge of:

1. Methods used in pilotage.
2. Chart projections used for air navigation.
3. Time zones and 24–hour clock system.
4. Effects of wind on navigation (Exam-O-Gram 27).
5. Significance of magnetic variation and compass deviation (Exam-O-Gram 12).
6. Significance of true airspeed, indicated airspeed, and groundspeed (Exam-O-Grams 26, 27).
7. Significance of track, course, heading, bearing, and radial (Exam-O-Grams 15, 16, 27).
8. Principles of LF ranges, omni ranges, and radio beacons.
9. Operation of aural range receivers, omni receivers, and ADF receivers.
10. Use of navigation computers—slide rule side and wind vector side.
11. Flight plans (Exam-O-Grams 4, 6, 30, 31).

Be able to:

1. Measure distances on the chart.
2. Measure courses on the chart.
3. Select appropriate landmarks and checkpoints on the chart.
4. Select cruising altitudes based on weather conditions (Exam-O-Gram 2).
5. Select cruising altitudes based on the direction of flight (Exam-O-Grams 2, 17, 22).
6. Determine winds by interpolation of Winds Aloft Forecasts.
7. Determine headings using Winds Aloft by wind triangle or computer.
8. Determine compass heading, using compass correction card.
9. Determine groundspeed, using Winds Aloft by wind triangle or computer.
10. Determine groundspeed and ETA's by inflight check.
11. Determine time, distance, or speed, using Winds Aloft by wind triangle or computer.
12. Determine fuel consumption or rate of consumption from performance charts and computer.

13. Determine true airspeed from altitude, temperature, and IAS, using computer.
14. Determine rate of climb or descent, using computer.
15. Determine true altitude, pressure altitude, density altitude, using computer.
16. Solve "off course" problems.
17. Relate LF aural signals to position.
18. Relate omni indications to position (Exam-O-Grams 15, 16).
19. Relate ADF indications to position.
20. Determine time/distance to station, using VOR or ADF.

E. RADIO COMMUNICATIONS

Have a knowledge of:

1. Radio procedures and phraseology (Exam-O-Grams 14, 24).
2. Standard transmitting and receiving frequencies (Exam-O-Grams 14, 24).
3. Characteristics of standard broadcast (AM), low frequency (LF), and very high frequency (VHF) stations (Exam-O-Gram 14).
4. Availability of in-flight assistance (Exam-O-Grams 19, 26, 30).
5. Air defense emergencies — SCATER (AIM).
6. Direction finding procedures (AIM, Exam-O-Gram 19).

Be able to:

1. Interpret and apply wind information as received in radio transmissions (Exam-O-Gram 26).
2. Determine when communications are required (Exam-O-Grams 1, 24).
3. Make position reports.
4. Interpret airport traffic instructions and plan approaches and departures (FAR Part 91).
5. Interpret enroute traffic instructions (AIM).
6. Obtain emergency assistance (Exam-O-Gram 19).

F. FLIGHT INSTRUMENTS AND RELATED FACTORS

Have a knowledge of:

1. Characteristics of the magnetic compass (Exam-O-Gram 12).
2. Airspeed limitation instrument markings (Exam-O-Grams 8, 26).
3. Significance of altimeter settings (Exam-O-Gram 9).
4. Significance of pressure and density altitude (Exam-O-Gram 11).
5. Effect of temperature on altimeters (Exam-O-Gram 9).
6. Relationship of turn indicators to speed and bank.

Be able to:

1. Apply altimeter settings and compensate for errors.
2. Interpret altitude indications (Exam-O-Gram 9).
3. Interpret pitch attitude instruments.
4. Interpret bank attitude instruments.
5. Interpret power setting instruments.
6. Use airspeed correction table (Exam-O-Gram 26).
7. Determine pressure altitude by altimeter or pressure reports.
8. Determine density altitude by computer.

G. AIRPLANE AND ENGINE OPERATION

Have a knowledge of:

1. Theory of airfoils.
2. Forces acting on the airplane.
3. Functions of the flight controls and related axes.
4. Use of control surface trim tabs.
5. Effect of wind on airplane speeds (Exam-O-Gram 27).
6. Effect of crosswinds on ground control (Exam-O-Gram 27).
7. Effect of altitude on airplane speeds (Exam-O-Gram 26).
8. Effect of attitude on stalling speeds (Exam-O-Gram 28).
9. Effect of frost or ice on airfoils (Exam-O-Gram 28).
10. Theory of reciprocating engines.
11. Theory of carburetion.
12. Theory of propellers.
13. Basic airplane fuel systems.
14. Basic airplane lubricating systems.
15. Engine instruments and controls.
16. Procedures for adjusting RPM and manifold pressure.
17. Effect of altitude on engine performance.
18. Effect of improper use of the mixture control.
19. Effect and cause of detonation.
20. Effect of the use of improper fuel grade.

21. Effect of and conditions conductive to carburetor icing.
22. Methods of detecting and eliminating carburetor icing.
23. Methods of preventing and eliminating fuel contamination (Exam-O-Gram 10).
24. In-flight emergency procedures.
25. Significance of best climb speeds (Exam-O-Gram 17).
26. Maneuvering speed and its use (Exam-O-Gram 8).
27. Methods of coping with wake turbulence such as wingtip vortices (Exam-O-Gram 3).
28. Procedures for landing in turbulent air (AIM; Exam-O-Gram 3).
29. Preflight and postflight safety practices.

H. AIRPLANE PERFORMANCE CHARACTERISTICS

Have a knowledge of:

1. Static and dynamic stability.
2. Airplane Flight Manuals.
3. Relationship between airspeed, bank, and rate of turn.
4. Significance of load factors (Exam-O-Grams 13, 28).
5. Effect of humidity on airplane and engine performance (Exam-O-Grams 11, 17).

Be able to:

1. Compute gross weight and allowable load (Exam-O-Gram 13).
2. Compute CG location through the use of loading graphs.
3. Use maximum safe crosswind chart.
4. Use Koch chart for takeoff and climb data (Exam-O-Gram 11).
5. Use takeoff performance charts—tabular and graphic. (Exam-O-Gram 33)
6. Use climb performance charts—tabular and graphic. (Exam-O-Gram 33)
7. Use cruise performance charts—tabular and graphic. (Exam-O-Gram 33)
8. Use fuel consumption charts—tabular and graphic. (Exam-O-Gram 33)
9. Use stalling speed charts. Exam-O-Gram 33)
10. Use landing distance charts—tables and graphs. (Exam-O-Gram 33)

SAMPLE EXAMINATION

The following test items are included for one purpose—to familiarize you with the *type* of items you may expect to find on the FAA examinations. You should keep in mind that these sample items do not include all the topics on which you may be tested in the FAA examination. The examination itself is, at best, a sampling of your aeronautical knowledge. It is for this reason that you should concentrate on the section entitled STUDY OUTLINE FOR THE COMMERCIAL PILOT WRITTEN EXAMINATION. A knowledge of all the topics mentioned in this outline—*not* just the mastery of the sample test items—should be used as the criterion for determining that you are properly prepared to take the FAA written examination and meet the knowledge requirements for the Commercial Pilot Certificate.

The correct responses to the sample test items, with explanations, are given at the end of the examination. The appendix of this booklet contains the supplementary materials which will be required from time to time during the sample examination. These materials include weather information, aircraft description and performance data, and the flight planning data (excerpted information from the *Airman's Information Manual*). World Aeronautical Chart 361 is also provided for your use.

This examination is based on a flight from Goodland, Kansas, to Pueblo, Colorado, and then to Alamosa, Colorado. An intermediate landing will be made at Pueblo. Although the examination sets up a hypothetical situation, the weather data is authentic. The airplane you are assumed to be flying on the first portion of the flight is a BRIGADIER which is a late model four-place, single-engine airplane. It is equipped with retractable landing gear and a constant-speed propeller. On the second portion of the flight you will be flying a COMMODORE 410C which is similar to the BRIGADIER. Each airplane is typical of several models currently being produced by the various manufacturers. Airplane data for each airplane is given in the supplementary information provided in the appendix.

NOTE: The reader should bear in mind that these sample test items are based on Federal Aviation Regulations in effect on January 1, 1966.

Assume that you are a pilot with a Commercial Pilot Certificate employed by a manufacturing company. This company uses several business aircraft. You are to fly three sales representatives from Goodland to Pueblo Memorial Airport in the company's BRIGADIER, and then fly them from Pueblo to Alamosa Airport in a COMMODORE. The entire flight is to be conducted under Visual Flight Rules (VFR). The exact route you will fly to these points is dependent on the weather, terrain, and available navigational aids and will be described later, during your preflight planning.

Goodland Airport, Goodland, Kansas	39°22′; 101°42′
Pueblo Memorial Airport, Pueblo, Colorado	38°17′; 104°30′
Alamosa Airport, Alamosa, Colorado	37°26′; 105°52′

* * * * *

Prior to making any flight, the pilot should ascertain that both he and his airplane meet the requirements of Federal Aviation Regulations (FAR).

* * * * *

1. Assume that you have a Commercial Pilot Certificate and that a second-class medical certificate was issued to you on June 1, 1965. With regard to carrying passengers for hire, your medical certificate is valid until the end of—

1—June 1, 1966.
2—June 1, 1967.
3—May 31, 1966.
4—June 30, 1966.

2. According to FAR Part 91, an airplane shall not be operated unless it has had an annual (formerly periodic) inspection within the preceding 12 calendar months. When an airplane has received this inspection, it is indicated by—

1—the issuance of a new Airworthiness Certificate.
2—the issuance of a new Aircraft Registration Certificate.
3—an entry in the maintenance records.
4—completion of an alteration and repair form.

3. Assume that your flight is being conducted under FAR Part 135, "Air Taxi Operators and Commercial Operators of Small Aircraft." In order to carry passengers, in accordance with Part 61, you must have made, in an aircraft of the same category, class, and type, at least—

1—3 takeoffs and landings to a full stop within the preceding 60 days.
2—3 takeoffs and landings to a full stop within the preceding 90 days.
3—5 takeoffs and landings to a full stop within the preceding 60 days.
4—5 takeoffs and landings to a full stop within the preceding 90 days.

4. Much of the success of a cross-country flight is directly dependent on careful flight planning. Preflight action should include a careful study of available current weather reports and forecasts, taking into consideration fuel requirements and an alternate course of action if the flight cannot be completed as planned. Such preflight action is—

1—good operating practice and is required by FAR.
2—required by FAR only if passengers are carried for hire.
3—required by FAR only if the flight is to traverse controlled airspace.
4—good operating practice but is not required by FAR.

5. Noting the frontal weather presented on the surface weather map in fig. 2 of this guide, you should observe that the stations along the cold front have reported—

1—a lesser amount of cloud cover than those along the stationary front.
2—more precipitation than those along the stationary front.
3—lower visibilities than those along the stationary front.
4—less temperature/dewpoint spread than those along the stationary front.

6. Assume that during your preflight planning the forecasts shown in fig. 4 of this guide are available to you. Based on the latest terminal forecast for the following stations, you note that the lowest ceiling between Noon and 4 PM local time should be at—

1—Goodland (GLD).
2—Colorado Springs (COS).
3—Garden City (GCK).
4—Alamosa (ALS).

7. Based on the 1300 MST and the 1400 MST Aviation Weather Reports (teletype sequence) for Pueblo in figs. 6, 7, and 8 of this guide, you note that at 1400 MST the height of the ceiling was—

1—unchanged.
2—unknown.
3—7,000 feet.
4—8,000 feet.

8. If the weather should be reported as a ceiling of 1,000 feet and the visibility as less than 1 mile as you approach the vicinity of Pueblo (see WAC 361), you—

1—should proceed to another airport within the control zone.
2—would not be permitted to fly VFR within the control zone.
3—should remain outside the control zone and request a "special VFR clearance."
4—must take no special actions because the ceiling is not below VFR minimums.

9. On the flight from Pueblo to Alamosa (see WAC 361), you plan to fly through the LaVeta Mountain Pass between Walsenburg (48 miles SSW of Pueblo) and Alamosa. On the basis of the 1400 MST Aviation Weather Report at Alamosa, fig. 7, and assuming the highest terrain in the pass to be 9,000 feet MSL, you could expect to—

1—be able to fly VFR through the pass at 12,500 feet MSL.

2—find the clouds preventing VFR flight through the pass.
3—be able to maintain 2,000 feet above the terrain but unable to maintain 500 feet below the clouds.
4—be unable to maintain 2,000 feet above the terrain and 500 feet below the clouds.

* * * * *

Having throughly checked the weather and terrain along your proposed flight, you now decide on the exact route and draw the course on the chart as follows:

From	*To*	*Route*
Goodland Municipal, Kansas	Pueblo Memorial, Colorado	Direct
Pueblo Memorial, Colorado	Alamosa Municipal, Colorado	Via Walsenburg (Town), Colorado

* * * * *

10. After determining the altitudes available with consideration given to cloud and terrain separation, you next select the flight level at which you would find the most favorable winds. Using the Winds Aloft Forecasts for Goodland, fig. 9, you determine that the wind at 8,500 feet is from a—

1—true direction of 234° at 11 knots.
2—magnetic direction of 222° at 13 knots.
3—true direction of 234° at 15 mph.
4—true direction of 225° at 16 mph.

11. Certain factors must be considered when selecting a VFR cruising altitude that conforms to Regulations. After determining your true courses, which of the following need NOT be considered in selecting your cruising altitude?

1—The elevation of the terrain over which you will fly.
2—The terrain clearance which you plan to maintain.
3—Whether or not the flight is conducted on Federal Airways.
4—The magnetic variation in the area over which you will fly.

12. You decide to cruise at 8,500 feet MSL on the first leg of your flight, and from the Brigadier Cruise Horsepower Charts in fig. 39, you decide to use a power setting of 2100 RPM and 20.9" Hg, producing 132 BHP. Using the Cruising Operation and the Fuel Consumption vs. Horsepower Charts in figs. 37 and 38, you find that at a density altitude of 8,500 feet your True Airspeed and rate of fuel consumption will be approximately—

1—179 mph and 9.4 gph.
2—180 mph and 10.4 gph.
3—173 mph and 9.4 gph.
4—173 mph and 10.4 gph.

13. Assume that your True Airspeed will be 176 mph and the wind is forecast to be from a true direction of 222° at 13 knots at your selected cruising altitude. What will be your magnetic heading and groundspeed on the flight from Goodland to Pueblo? (Use WAC 361.)

1—255° MH and 188 mph GS.
2—255° MH and 164 mph GS.
3—229° MH and 190 mph GS.
4—229° MH and 162 mph GS.

14. In order to make good a True Airspeed of 176 mph at your cruising altitude of 8,500 feet, where the outside air temperature is reported as +15°C, your indicated airspeed should be approximately—

1—150 mph.
2—159 mph.
3—167 mph.
4—195 mph.

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

15. From your knowledge of the *Airman's Information Manual* (AIM) (see excerpts, figs. 43 through 60) you should know that the current frequency on which to receive the navigation radio aids, such as the Alamosa VORTAC, is found by reference to the—

1—aeronautical chart only.
2—Restrictions to Air Navigation Radio Aids Section of AIM.
3—Airport/Facility Section of AIM.
4—FSS and Weather Bureau Telephone Numbers Section of AIM.

16. You note, on available publications, (see appendix) the radio frequencies on which you will receive FSS's during your flight. A standard VHF frequency on which to transmit to most FSS's is—

1—122.8 mc.

2—122.5 mc.
3—122.2 mc.
4—122.1 mc.

17. From available publications, (see appendix), you determine the frequencies on which to conduct two-way radio communications with the applicable control towers. To communicate with Pueblo Memorial Tower, you should—

1—transmit on 122.5 mc or 119.1 mc and receive on 122.5 mc.

2—transmit on 122.5 mc or 119.1 mc and receive on 119.1 mc.

3—transmit on 119.1 mc and receive on 122.5 mc.

4—transmit on 116.7 mc and receive on 119.1 mc.

18. Assume each of the four persons aboard the airplane weighs 180 lbs. and that the airplane will have a full fuel load. From the information in the Airplane Flight Manual in fig. 34, you determine that to remain within the maximum allowable gross weight, the baggage should not exceed—

1—40 lbs.

2—96 lbs.

3—113 lbs.

4—270 lbs.

NOTE: Based on 6 lbs. per gallon of fuel and 7.5 lbs. per gallon of oil.

* * * * *

After filing a flight plan, you conduct a thorough preflight inspection of the airplane and prepare for takeoff.

* * * * *

19. Assume that while you taxi to take off, Goodland FSS reports an altimeter setting of 29.88, and that after setting this figure in your altimeter setting dial your altimeter indicates 3,726 feet. In this case you should—

1—leave the altimeter setting on 29.88 regardless of the indicated altitude since this and your cruising altitudes are pressure altitudes.

2—readjust the altimeter setting dial to the standard sea level pressure of 29.92 so that your cruising altitude will be measured above sea level.

3—readjust the altimeter to 3,653 feet for takeoff but set future altimeter settings on the dial just as they are reported enroute.

4—note the difference in the altimeter setting dial after readjusting the altimeter to 3,653 feet and apply this difference to all future altimeter settings.

20. While allowing the engine to warm up prior to your "before takeoff check," you remember that detonation may result in severe damage to the engine and occurs when the fuel mixture explodes instead of burning evenly and progressively. *One* factor that is likely to cause detonation is—

1—high density altitudes.
2—excessively rich fuel-air mixtures.
3—the abrupt opening of the throttle.
4—the use of higher-than-recommended fuel octanes.

21. The stalling speed of your airplane is 65 mph indicated airspeed in a wings-level attitude. After takeoff you are climbing directly into a 30 mph headwind at an indicated airspeed of 95 mph. If a turn is made so that the wind is from directly behind the airplane, the—

1—airplane would stall.
2—groundspeed would increase by 60 mph.
3—indicated airspeed would read 125 mph.
4—true airspeed would increase to 125 mph.

22. In using the magnetic compass to establish and maintain your heading, you should know that, due to the normal characteristics of a compass in the Northern Hemisphere, it will usually indicate a turn toward the—

1—west as you enter a medium banked left turn from a south heading.

2—east as you enter a medium banked left turn from a north heading.

3—south when you accelerate on an east heading.

4—north when you decelerate on a west heading.

23. Upon leveling off at your cruising altitude, you note that you are on course and abeam the town of Ruleton at 1442 MST. If you make good a groundspeed of 165 mph, you should be abeam

the Maurer Ranch airstrip (approximately half the distance to Pueblo) (see WAC 361) at—

1—1509 MST.
2—1514 MST.
3—1519 MST.
4—1529 MST.

24. While maintaining a magnetic course of 225°, you decide to take a bearing on Hugo VOR. As you rotate your omnibearing selector, you note that the LEFT/RIGHT Needle centers when the selector is on 080° and the TO/FROM Indicator reads FROM. If you *do not change* the bearing selector, the TO/FROM Indicator will change to TO after you have crossed the—

1—080 radial.
2—135 radial.
3—140 radial.
4—170 radial.

25. Refer to fig. 13. Assume that airplane "8" has an omni indication as shown in instrument "A" with the course selector set on 125°. If you reversed course as depicted by airplane "9" but *did not change* the course selector, your omni indications would appear as shown in illustration—

1—A.
2—C.
3—D.
4—F.

26. Assume that you have been holding a constant heading, and at 1503 MST you discover that you are over Trading Post airstrip (east of Maurer Ranch). To make an "off-course" correction so as to proceed *from this point directly* to Pueblo Memorial Airport (see WAC 361), you should change your heading to the right—

1—7 degrees.
2—9 degrees.
3—16 degrees.
4—22 degrees.

27. Assume that after changing your heading for the direct flight from Trading Post airstrip to Pueblo Memorial, your groundspeed will be the same as was made good from Goodland to Trading Post. Remembering that your time over Ruleton was 1442 and the time over Trading Post was 1503, you determine your groundspeed and ETA over Pueblo Memorial to be—

1—109 mph and an ETA of 1556 MST.
2—135 mph and an ETA of 1615 MST.
3—152 mph and an ETA of 1556 MST.
4—176 mph and an ETA of 1536 MST.

28. As you monitor Hugo VOR for weather reports, you hear the transmission begin with "THIS IS LA JUNTA AREA RADIO; AVIATION WEATHER . . ." From this you should realize that you are—

1—tuned to the wrong frequency for Hugo Radio.
2—receiving a continuous taped recording of weather reports.
3—getting interference from the VOR at La Junta.
4—receiving a normal scheduled weather broadcast.

29. You plan to start descending when 20 miles out from Pueblo while on a direct course from Trading Post airstrip (see WAC 361).. Your airplane is equipped with a 360° fixed-card ADF indicator and you have the ADF receiver tuned to Hanover LF radio beacon. If you maintain a magnetic heading of 250°, you will be 20 miles from Pueblo Memorial when the ADF needle points to approximately—

1—052°.
2—315°.
3—068°.
4—302°.

NOTE: Hanover LF radio beacon is 22 miles north of Pueblo.

30. If you crossed directly over the Pueblo VORTAC (see WAC 361) at 7,500 feet MSL, you should realize that insofar as *vertical* limits are concerned, you would be—

1—above the airport traffic area and above the control zone.
2—within the airport traffic area but above the control zone.
3—above the airport traffic area but within the control zone.
4—within the airport traffic area and within the control zone.

31. In response to your request for landing instructions, you receive the following transmission from Pueblo Tower:

". . . CLEARED TO ENTER LEFT TRAFFIC, RUNWAY TWO FIVE, WIND TWO ZERO ZERO AT ONE FIVE, ALTIMETER TWO NINER EIGHT EIGHT, REPORT DOWNWIND, OVER."

Based on these instructions, you should plan to land on the runway having a magnetic direction of—

1—250°, your downwind leg should be south of the airport, and your magnetic heading on base leg should be less than 340°.
2—250°, your downwind leg should be north of the airport, and your magnetic heading on base leg should be less than 160°.
3—025°, your downwind leg should be south of the airport, and your magnetic heading on base leg should be more than 340°.
4—025°, your downwind leg should be north of the airport, and your magnetic heading on base leg should be less than 160°.

32. Assume that your altimeter has been set to 29.79 and that you fly the traffic pattern at an indicated altitude of 5,700 feet without resetting the altimeter in accordance with the above tower instructions. Other aircraft with properly adjusted altimeters that are also flying the traffic pattern at 5,700 feet indicated altitude will be approximately—

1—90 feet lower than you.
2—90 feet higher than you.
3—900 feet higher than you.
4—900 feet lower than you.

33. As you maneuver the airplane in the traffic pattern, you are aware that a stall this close to the ground is dangerous. You should realize that an airplane can be stalled—

1—only when the nose is high and the airspeed is low.
2—only when the nose is too high in relation to the horizon.
3—only when the airspeed decreases to the established stalling speed.
4—at any airspeed and any flight attitude.

34. While flying in the traffic pattern you pay particular attention to the airspeed indicator. The colored markings on this instrument, as shown in fig. 17, are very significant. Which of the following speeds are identified by color on the indicator?

1—Maximum gear operating speed.
2—Maneuvering speed.
3—Maximum flaps extended speed.
4—Power-on stalling speed.

* * * * *

Upon completion of this flight, you file an arrival notice with the control tower and make preparations for the flight in the COMMODORE 410C to Alamosa. After rechecking the weather along your route of flight, you proceed to compute the loading and performance data.

* * * * *

35. Most performance charts are based on pressure altitude. The pilot can determine pressure altitude by adjusting the altimeter to the—

1—current altimeter setting provided by the weather station and the indicated altitude will be the pressure altitude.
2—standard sea level pressure of 29.92 and the indicated altitude will be the pressure altitude.
3—station pressure reduced to sea level and the indicated altitude will be the pressure altitude.
4—field elevation and add the number of feet indicated by the smallest hand.

36. Using appropriate information from the Airplane Flight Manual, fig. 25, and the Weight and Balance Charts, fig. 26, determine whether the airplane, if loaded as follows, meets weight and balance requirements.

4 occupants	170 lbs. each
Full fuel tanks	6 lbs. per gal.
Full oil tank	7.5 lbs. per gal.
Oil moment	−.4
Empty airplane moment	+69.2
Baggage	120 lbs.

On the basis of this information, the total moment is—

1—135.5, and the airplane would be within CG limits.
2—135.5, but the airplane would not be within CG limits.

3—131.3, and the airplane would be within CG limits.
4—131.3, but the airplane would not be within CG limits.

37. Assume that the pressure altitude of Pueblo is currently 5,000 feet, wind is calm, and that the airplane is loaded to maximum allowable gross weight. Using the Takeoff Data Chart in fig. 27, determine the *increase* in takeoff distance to clear a 50-foot obstacle when the temperature is 96°F, over a similar condition with the temperature 41°F.

1—205 feet.
2—368 feet.
3—405 feet.
4—791 feet.

38. As you refer to the Cruise Performance Chart in fig. 33, you are undecided as to whether to use a cruise power setting of 2100 RPM and 20" Hg or 2450 RPM and 20" Hg while cruising at 10,500 feet. You determine from the 10,000-foot chart that if 2450 RPM and 20" Hg is used, you will—

1—reduce the available flight time by 1 hour and 30 minutes.
2—not arrive at your destination any sooner.
3—use the same total amount of fuel.
4—need to increase the manifold pressure to increase your range.

39. Assume that locally the visibility is reduce to 2 miles in blowing dust as you prepare for takeoff, and that in reply to your request for a special VFR clearance, the tower transmits the following instructions:

". . . . CLEARED OUT OF CONTROL ZONE ONE ZERO MILES SOUTH OF AIRPORT, MAINTAIN SPECIAL VFR CONDITIONS AT OR BELOW FIVE THOUSAND FIVE HUNDRED MSL WHILE IN CONTROL ZONE, REPORT DEPARTING CONTROL ZONE."

This clearance is authorization, while within the control zone, to—

1—fly into clouds or with a flight visibility of 1 mile or less below 5,500 feet MSL.
2—disregard minimum safe altitudes while enroute to the horizontal limits of the control zone.
3—fly at altitudes closer than 500 feet below clouds while maintaining visual reference with the ground.
4—operate in accordance with all of the foregoing procedures.

40. The COMMODORE 410C has an unsupercharged engine rated at 260 HP at sea level with 2625 RPM and 29" Hg. With the constant-speed propeller set to full low pitch, the mixture full forward, and using full throttle for takeoff at Pueblo, you should expect, because of the elevation, to have—

1—less than 29" Hg manifold pressure.
2—less than 2625 RPM.
3—an excessively lean fuel/air mixture.
4—more than 2625 RPM.

41. While in level cruising flight, you notice that although the position of the throttle and propeller controls are unchanged, you are gradually losing manifold pressure and airspeed. Suspecting carburetor ice, you apply carburetor heat. If carburetor ice does exist, in a float-type carburetor, you will note—

1—an immediate increase in manifold pressure as carburetor heat is applied.
2—a progressive increase in RPM as the carburetor heat melts the ice.
3—a further loss of manifold pressure followed by a gradual increase while carburetor heat is being applied.
4—a decrease in RPM until the application of carburetor heat is discontinued.

42. Reports of weather conditions at flight altitude, particularly between stations, seen by the pilot instead of the ground observer, are available in weather stations and frequently broadcast by radio. This type of information is termed—

1—In-flight Weather Advisories.
2—AMOS reports.
3—SIGMETS.
4—PIREPS.

43. During flight you observe various cloud formations. A high, lens-shaped cloud termed "Standing Lenticular" and reported in aviation weather sequence reports by a contraction ACSL, is usually associated with a "mountain wave" type

weather phenomena. Associated with a cloud of this type, you should expect to find—

1—fog and poor visibility.

2—heavy precipitation.

3—calm wind conditions.

4—severe turbulence.

44. As you start across the mountains, you adjust your altimeter to the latest Pueblo altimeter setting. Although good practice dictates that you maintain at least 2,000 feet clearance, if you were to fly at an indicated altitude of 11,000 feet in order to clear a peak having an elevation of 10,000 feet, you could have—

1—less than 1,000 feet clearance if the air temperature is lower than standard for that altitude.

2—less than 1,000 feet clearance if the air temperature is higher than standard for that altitude.

3—1,000 feet clearance regardless of air temperature because altimeters are affected by pressure and not temperature.

4—more than 1,000 feet clearance if the air temperature is less than standard for that altitude.

45. In order to maintain a safe distance above mountain peaks and other obstructions, you must know the altitude of the aircraft and the elevation of these obstacles. Correct interpretation of altimeter indications is imperative. From the illustrations in figs. 14 and 15, select the highest and the lowest indications.

1—A–7 the highest; A–1 the lowest.

2—A–7 the highest; A–8 the lowest.

3—A–11 the highest; A–2 the lowest.

4—A–12 the highest; A–13 the lowest.

* * * * *

After crossing the mountains, you start descending in preparation for landing. As you approach the traffic pattern you close your flight plan through Alamosa radio.

* * * * *

46. Assume that the white arc on your airspeed indicator extends from 57 mph clockwise to 110 mph. During a 60° bank prior to lowering the landing gear and flaps in the traffic pattern, according to the COMMODORE Stall Speed Chart in fig. 29, the power-off stalling speed would be—

1—57 mph CAS (TIAS).

2—65 mph CAS (TIAS).

3—85 mph CAS (TIAS).

4—92 mph CAS (TIAS).

47. On normal final approaches to near-sea-level fields, you have been maintaining an indicated airspeed of 70 mph to provide a safety margin above the stalling speed of the airplane. The *indicated speed* at which the airplane will stall while landing at Alamosa, where the field elevation is 7,535 feet MSL, will be—

1—the same as at sea level but the true airspeed will be higher.

2—higher than at sea level but the true airspeed will be the same.

3—the same as at sea level and the true airspeed will be the same.

4—higher than at sea level and the true airspeed will be higher.

48. A knowledge of the effect of airspeed and degree of bank on turning flight is of particular importance while maneuvering in the traffic pattern. Referring to the airplanes in fig. 21, determine which of the following statements is completely accurate. (Assume that all three airplanes are making coordinated turns.)

1—Airplane C will have the largest radius of turn but the rate of turn will be the same for all three airplanes.

2—Airplane A will have the greatest rate of turn but the radius of turn will be the same for all three airplanes.

3—Airplane A will have the lowest rate of turn and the smallest radius of turn.

4—Airplane C will have the lowest rate of turn and the largest radius of turn.

49. After landing and parking the airplane, you request that your fuel tanks be refilled. With regard to fuel octane rating, which of the following statements is TRUE?

1—Use of a lower than specified octane results in reduced power output and is usually more harmful to the engine than higher octane.

2—Use of a lower than specified octane may result in reduced power output but is usually less harmful to the engine than higher octane.

3—Use of a higher than specified octane usually improves engine performance and is not harmful to the engine.

4—Use of a higher than specified octane improves engine performance but is usually harmful to the engine.

50. If you should be involved in an accident which results in substantial damage to the airplane only, the nearest Civil Aeronautics Board, Bureau of Safety Field Office must be notified—

1—within 48 hours.
2—within 7 days.
3—within 10 days.
4—immediately.

EXPLANATIONS OF THE SAMPLE TEST ITEMS

NOTE: We wish to emphasize that a creditable performance on this sample examination should not be interpreted to mean that you have achieved the knowledge requirements for the issuance of a Commercial Pilot Certificate. This examination is merely to acquaint you with the *types* of test items in the official examination and to assist you in *preparing* for that examination.

1—(4) FAR 61.43 prescribes that for operations requiring a Commercial Pilot Certificate, a Second Class Medical Certificate expires at the end of the *last day* of the 12th month *after* the month in which it was issued. The 12th month after June 1965 is June 1966. The last day of June 1966 is the 30th of June. Therefore, the medical certificate expires at the end of June 30, 1966, as correctly stated only in response number 4.

2—(3) Response number 1 is incorrect because Airworthiness Certificates are normally issued when the aircraft is certificated as being airworthy at the time of original manufacture, and after substantial alteration or repair has been made and the airworthiness renewed. It is *not* issued after each annual or periodic inspection. Number 2 is wrong in that Registration Certificates are reissued *only* when ownership of the aircraft has been transferred. Number 3 is correct since FAR Part 91 requires that entries be made in the maintenance records each time maintenance work, including inspections, is performed. Number 4 is incorrect since the alteration and repair form describe only the alteration and repair that was performed on the aircraft or component, and does not refer to an inspection of the whole airplane.

3—(2) FAR Part 61 states that a pilot operating under Part 135 may not pilot an aircraft under the provisions of Part 135 if the aircraft carries any person other than members of the crew, unless within the preceding 90 days he has made at least *three* takeoffs and landings to a full stop, in an aircraft of the same category, class, and type. Since you are assumed to be operating under Part 135, numbers 1, 3, and 4 do not correctly reflect compliance with this requirement.

4—(1) Response number 1 is correct because this action *is* good operating practice and FAR Part 91 *does require* that each pilot in command, before beginning a flight away from the vicinity of the airport, shall familiarize himself with available weather reports and forecasts, fuel requirements, alternative actions if the planned flight cannot be completed, and any known traffic delays of which he has been advised by ATC. Hence, response numbers 2, 3, and 4 are incorrect since this requirement of FAR is *not limited* to flights carrying passengers for hire, *nor* to those flights traversing controlled airspace.

5—(1) The degree of blackening within the station circles on the map in fig. 2 indicates the amount of cloud coverage at the station. Since the station circles along the cold front are only partially blackened, the cloud coverage is less than along the stationary front, where circles are almost completely blackened. Thus, response number 1 is correct. Response number 2 is incorrect since the lack of precipitation along the cold front is indicated by the absence of precipitation symbols; while along the stationary front, the presence of appropriate symbols adjacent to the stations, as well as the shaded area along the stationary front, indicate precipitation in that area. Number 3 is also incorrect, since the omission of visibility values at stations along the cold front indicates unrestricted visibility; while low visibility values are shown to the left of the station symbols along the stationary front. It becomes apparent that number 4 is also incorrect by comparing the temperature/dewpoint spreads at the stations along each of the fronts—the spreads being greater along the cold front.

6—(4) The Amended Forecast for the period 1145 CST—2300 CST (at the bottom of fig. 4) is the *latest* forecast for Goodland. After 1200C, scattered clouds at 2,500 feet and a ceiling of 15,000 feet with broken clouds are predicted until 1600C. The *latest* forecast for Colorado Springs (earlier forecast at top of fig. 4) calls for a ceiling with broken clouds at *8,000 feet*, and, occasionally, ceilings at *7,000 feet* after 1200M. The Amended Forecast is also the *latest* for Garden City and, between 1200C and 1600C, it calls for 1,500-foot scattered and 15,000-foot scattered, which by definition is *not* considered a ceiling. The *latest* and only forecast for Alamosa calls for a ceiling at *6,000 feet with broken clouds* after 1200M. Therefore, only response number 4 is correct because, according to the *latest* forecast for each of these stations, Alamosa will have the lowest ceiling after Noon. (This test item emphasizes the importance of using the most *recent* forecasts in planning a flight.)

7—(2) A ceiling is defined as the lowest layer of broken clouds, overcast, or obscuration, that is not reported as thin or partial. According to the appropriate report, in fig. 7, the clouds at Pueblo were *not* reported as thin; therefore, the broken clouds at 8,000 feet constituted the ceiling at 1300 MST. However, at 1400 MST the clouds at 8,000 feet and at 16,000 feet went to a scattered condition and no longer were considered a ceiling. Consequently, the ceiling *did* change to the high broken (cirriform) layer, making responses 1, 3, and 4 incorrect. Response number 2 is correct because the broken layer of high clouds in the 1400 MST report is the ceiling, and the letter "U" indicates that the height is unknown. (The figure "70" following the broken clouds symbol is not 7,000 feet as implied in response number 3, but in fact indicates that the visibility is 70 miles.)

8—(2) Normally, to operate within a control zone under VFR, the ceiling must be at least 1,000 feet and the visibility 3 miles. If either of these conditions does not exist, a special VFR clearance must be obtained prior to operating within the zone. In this instance, the ceiling is *not* less than basic VFR minimums; however, the visibility *is*. FAR 91.107 also stipulates that when a person has received appropriate ATC clearance, the flight and ground visibility must be at least 1 mile. Therefore, since the visibility in this case is less than 1 mile, you are not permitted to enter the control zone VFR, as correctly stated in response number 2. For this reason, response numbers 3 and 4 are incorrect. Number 1 is also incorrect because weather minimums for a control zone apply to all airports within that zone, thereby making it illegal to proceed VFR to any of these airports.

9—(1) Ceilings are reported as the height of the broken or overcast clouds above the surface at the reporting stations. Alamosa, having an elevation of 7,535 feet MSL, is reporting, in the pertinent report in fig. 7, a ceiling of 7,000 feet; thus, the base of the clouds is at 14,535 feet MSL. To provide a 2,000-foot clearance above the 9,000-foot terrain in the pass and a 500-foot separation below the clouds, a flight altitude between 11,000 feet MSL and 14,035 feet MSL is required. Since 12,500 feet MSL assures this required distance below the clouds and above the terrain, and is adequate for VFR flight, response number 1 is correct. Response number 2 is incorrect because VFR flight at this altitude *is possible*. Responses 3 and 4 are also incorrect since this altitude of 12,500 feet *does provide* 2,000 feet clearance above the terrain, as well as 500 feet below the clouds.

10—(4) Remember, the Winds Aloft Forecasts give the direction from which the wind is blowing as measured from TRUE north, and the speed is given in KNOTS. Since in fig. 9, the wind is not given for 8,500 feet, we must interpolate using the winds data given on either side of this altitude. It is noted that the wind is from 210° at 18 knots at 7,000 feet, and from 240° at 10 knots at 10,000 feet. Therefore, for each 1,000 feet between these altitudes the wind direction increases 10° and the wind speed decreases approximately 2–3 knots. Therefore, at 8,500 feet the wind is from 225° at 14 knots (or coverted to mph—16 mph) as correctly given in response number 4. (Even at magnetic values or speed conversions, numbers 1, 2, and 3 are incorrect.)

11—(3) The Regulation on VFR cruising altitudes is applicable only at or above 3,000 feet above the surface. Since you must know the height at which you plan to fly above the terrain, you must also know the terrain elevation. Thus, response numbers 1 and 2 are incorrect. Number 3 is correct because the Regulation on cruising altitudes applies anywhere and is *not limited* to flights within Federal Airways. The proper altitude is governed by the magnetic course being flown; to determine this, magnetic variation must be applied to the true course. Therefore, number 4 is also incorrect.

12—(1) The Cruising Horsepower Setting Charts in fig. 39 show the amount of brake horsepower (BHP) that is obtained from a given RPM and manifold pressure with various outside air temperatures at certain altitudes. Determining that your horsepower will be 132 BHP, we next refer to the Cruising Operation Chart in fig. 38 and follow the line representing 132 horsepower up to the 8,500-foot altitude line. From this point of intersection follow the vertical line on this graph down to the True Airspeed line. This indicates that your TAS will be 179 mph. Then, on the Fuel Consumption vs Horsepower Chart, fig. 37, find the 132 BHP line and follow it vertically to the curved line marked "ABOVE 2500 FT" (since your cruising altitude will be above that altitude). From this intersection move horizontally to the Fuel Consumption line. We find that our rate of fuel consumption will be 9.4 gph. Therefore, response number 1 is the only correct answer.

13—(4) At the meridian nearest the mid-point of your flight, (see WAC 361) measure the True Course (244°) between the two points. After converting the wind speed from 13 knots to 15 mph (since your airspeed is in mph), apply the wind direction and wind speed to the True Course and True Airspeed (by graphically plotting a wind triangle problem or by use of the wind face of a computer). After doing so, we determine that the True Heading is 242° and the groundspeed is 162 mph. On the WAC we find a Magnetic Variation of 13° in the area of our flight. Subtracting this variation of 13° (since it is easterly) from the True Heading, gives us a Magnetic Heading of 229°.

Given		*Find*	
TC	244°	TH	(242°)
TAS	176 mph	Mag Var	(13°E)
Wind Speed	15 mph (13 knots)	MH	(229°)
Wind Direction	222° True	GS	(162 mph)

Although slight variances may exist in different computers, if you use correct procedures, your results should more nearly agree with correct response number 4 than with the incorrect responses 1, 2, and 3.

14—(1) The explanation presented herein is pertinent to the type of computers having a typical True Airspeed Computations scale and may differ slightly from methods used in various other computers. However, the fundamental solutions are similar. On the Airspeed Computations scale set the outside air temperature, +15°, opposite the cruising altitude of 8,500 feet. Directly below 176 mph TAS on the True Airspeed scale, read the indicated airspeed of 150 mph on the Indicated Airspeed scale. The incorrect figures in responses 2, 3, and 4 may result if you do not make certain that the problem is set up on the Airspeed Computations scale of this computer; or if −15° is used instead of +15°; or if you read the indicated airspeed on the True Airspeed scale instead of on the Indicated Airspeed scale.

15—(3) Although the aeronautical chart may list the proper frequency of the radio aid, it must be kept current with data from the latest Sectional Chart Bulletin in AIM (fig. 50). Furthermore, it is not the *only* source of this information. Thus response number 1 is not correct. Number 2 is incorrect since only the *restrictions* in the use of nav-aids are described in the section titled "Restrictions to Enroute Navigation Aids" (fig. 51). The Airport/Facility Section (fig. 59) *does* list the frequencies of enroute, as well as terminal, nav-aids, making response number 3 correct. Frequencies of nav-aids are no longer found in the section titled "FSS and Weather Bureau Telephone Numbers" (fig.60). Furthermore, no FSS is located at Alamosa, although there is a VORTAC there. Therefore, response 4 is also incorrect.

16—(4) Frequencies on which to *communicate* with FSS's are given in the section of AIM titled "FSS and Weather Bureau Telephone Numbers." As stated in fig. 60, 122.1 mc is the standard frequency on which FSS's will *receive* your transmission. Therefore, number 4 is correct. Number 1 is incorrect because 122.8 mc is a frequency for UNICOMS. Number 3 is incorrect since the standard frequency on which FSS's *transmit* airport advisory service messages is 122.2 mc. Number 2 is incorrect because 122.5 mc is the standard frequency on which to transmit to most *control towers.*

17—(2) By reference to the Airport/Facility Directory of AIM, (fig. 59), we determine that, for Pueblo, responses 1 and 3 are incorrect because the letter R following 122.5 means this tower *only receives* on this frequency. Hence, *you will not receive* the tower transmissions on 122.5 mc. Since the information given indicates that this tower receives on 122.5, and transmits *and* receives on 119.1, response number 2 is correct. The letter T following 116.7 mc indicates that the tower *only transmits* on this frequency; therefore, you cannot transmit to them on 116.7 mc, making response number 4 incorrect.

18—(2) The correct method of computation for this problem is as follows:

1,833 lbs. empty weight (including 1 gal. of unusable fuel)
+ 17 lbs. of oil (2.25 gal. at 7.5 lbs. per gal.)
+720 lbs. for occupants (4 persons at 180 lbs. each)
+234 lbs. of fuel (39 gal. *usable* fuel at 6 lbs. per gal.)
2,804 lbs. loaded weight

2,900 lbs. (maximum gross weight)
−2,804 lbs. (loaded weight)
96 lbs. baggage

19—(4) Response number 1 is incorrect in that this action will *not give* you, and you do *not want*, pressure altitude for cruising altitudes. Furthermore, it would cause you to be 73 feet lower than indicated by the altimeter. Number 2 is incorrect because this procedure would result in the altimeter indicating height above a pressure level of 29.92 (pressure altitude) and would indicate height above sea level *only* if the pressure at sea level happened to be 29.92″ Hg. Number 3 is not completely correct because setting the reported altimeter settings in the dial without correcting for the error would cause the altimeter to indicate altitudes uncorrected for the calibration error. Number 4 is correct because applying the error to all future altimeter settings will result in the altimeter indicating height above sea level.

20—(3) Detonation is always closely associated with abnormally high cylinder temperatures and pressures. Response number 1 is incorrect because high density altitudes will cause the fuel/air mixture to become *richer* with a cooler engine temperature. Number 2 is incorrect since a rich mixture burns faster than a lean mixture, and therefore produces less heat and pressure. Number 3 is correct because abrupt opening of the throttle from a slow speed will result in sharp increases of pressure within the cylinder, causing an almost instantaneous burning of the mixture which is characteristic of detonation. Number 4 is incorrect because the octane rating reflects the ability of the fuel to withstand compression without detonation. Therefore, the higher the octane rating, the less likelihood of detonation.

21—(2) Remember, airspeed is the speed at which an aircraft is traveling *through* the air mass. Since the direction it travels through the air has no effect on its speed through the air, the true airspeed and indicated airspeed will not be affected by a change in direction of travel. Thus, responses 3 and 4 are incorrect. Response number 1 is also incorrect because if the stalling speed is 65 mph and the airplane, as implied above, is still traveling 95 mph *through* the air, the airplane will not stall. Number 2 is correct because when headed into the wind, the airplane's speed over the ground is retarded to 65 mph, but when headed downwind, the wind increases the groundspeed to 125 mph, a gain of 60 mph.

22—(2) The lines of force in the earth's magnetic field are parallel to the earth's surface at the equator but point increasingly downward when moving closer to the magnetic poles. In addition to aligning itself with the magnetic field and magnetic poles, the compass card has a tendency to dip downward because of the downward pull of the magnetic field. In straight-and-level flight the compass card is balanced to compensate for this tendency to dip downward. While in a banked attitude, however, the vertical component of the earth's magnetic field causes the north-seeking end of the compass card to dip to the low side of the bank and thus to rotate. In a bank from a north heading, this rotation, from the pilot's viewpoint, is opposite to the direction of the bank, and from a south heading is in the same direction as the bank. In a left bank from a south heading, the card will rotate toward east, hence response number 1 is incorrect. A left bank from a north heading will rotate the card toward east as correctly stated in response number 2. During acceleration and deceleration on east and west headings, the card tilts fore and aft, and again is caused to rotate. The direction of this rotation during acceleration or deceleration on east and west headings can be easily remembered by associating the letters of the word ANDS; i.e., Acceleration (to the) North; Deceleration (to the) South. Therefore, responses 3 and 4 are incorrect.

23—(1) On course, the distance from abeam Ruleton to abeam Maurer Ranch is measured as 73 miles. At a groundspeed of 165 mph, this should take approximately 27 minutes. Adding this elapsed time to the time of passing Ruleton, we compute the ETA to be 1509 MST (1442 +27=1509). Therefore, only response number 1 is correct. Basing your computations on the distance from Goodland to Maurer Ranch, instead of from Ruleton, or misreading the computer, or making other commonly made miscalculations, may result in the incorrect figures given in responses 2, 3, and 4.

24—(4) When the L/R needle is centered, the TO-FROM indicator of the omni receiver shows whether the course appearing in the course selector would, if followed, take the airplane toward the station or away from the station. It has no relation to the course or heading being flown and, depending only on the station's location relative to the airplane's location, continues to indicate TO or FROM. Upon passing the point where a course of 080° would take the airplane *toward* the station instead of *from* the station, the TO-FROM indicator would change to "TO." This point is either directly over the station or when crossing the radial which is perpendicular to the course set in the course selector (not the course being flown). The TO-FROM indicator, therefore, would change to "TO" after the 170° radial is crossed (080°+90°=170°), as shown only in correct response number 4.

25—(1) Regardless of the airplane's heading, an omni instrument L/R needle shows the airplane's position relative to the course set in the course selector. Airplane 8 is to the right of the 125° course TO the station. Airplane 9, although headed away from the station, is still positioned to the right of the 125° course TO the station. In both cases, this is shown by instrument A as correctly stated in response number 1. *Instrument C in* response number 2 is incorrect because it shows the airplane to be left of this 125° course TO the station. Instruments D and F in numbers 3 and 4 are incorrect because in the positions of airplanes 8 and 9 it is impossible to have an indication of 125° FROM the station.

26—(3) Using the off-course formula method for our solution, we first find, by measuring perpendicular to the planned course line, that Trading Post is 11 miles off our course. The distance traveled from Goodland is 72 miles. On the computer set up the ratio

$$\frac{\text{distance off}}{\text{distance flown}} = \frac{\text{correct to parallel}}{60}$$

in the following manner. Under 11 (miles off course) on the outer (miles) scale, set 72 (distance traveled) on the inner (minutes) scale. Then above 60 on the minutes scale, read 7 degrees to parallel course or stop drift. To determine the *additional* correction to return to course at the destination, use the same ratio but substitute remaining distance for distance flown. Under 11 set 96 (remaining distance from Trading Post to Pueblo); then above 60 read 9 degrees *additional* correction for returning to course at destination. The total correction is then 16 degrees (7+9=16) as shown in response number 3. Response number 1 is incorrect because 7 degrees is only the correction to *parallel* the course. Number 2 is also incorrect since 9 degrees is the *additional* correction necessary to return to the course in the remaining distance of 96 miles.

27—(4) You passed Ruleton at 1442 MST and were over Trading Post at 1503 MST—a distance of 62 miles in 21 minutes. Thus your groundspeed was 176 mph, as in response number 4. If this speed is maintained, it will take 33 minutes to travel the 96 miles from Trading Post to Pueblo Airport. Computing the ETA over Pueblo by adding the 33 minutes to the time over Trading Post (1503+33=1536), we find that only response number 4 is correct.

28—(4) Response number 1 is incorrect because this transmission does not necessarily indicate an incorrect frequency for Hugo VOR. You would hear the same transmission on Hugo VOR and Lamar VOR since each has the same controlling FSS as indicated on the chart. Response number 2 is incorrect because continuous taped weather recordings are used in some *LF radio beacons*. Number 3 is wrong because there is no VOR at La Junta although it does have an FSS. Number 4 is correct since the La Junta FSS remotely controls Hugo, as well as Lamar VOR, and uses this introduction for scheduled weather broadcasts transmitted simultaneously over each of these controlled VOR frequencies.

29—(1) Measure the TRUE bearing from the 20-mile point to the beacon; then subtract the local easterly variation to determine the MAGNETIC bearing. Since the airplane heading is 250° from Magnetic North, by subtracting the heading we obtain the relative bearing to be indicated on the ADF.

315°	True bearing from 20-mile point to station
− 13°	East variation for that area
302°	Magnetic bearing from 20-mile point to station
−250°	Magnetic heading
052°	Relative bearing

30—(3) An airport traffic area extends from the surface up to, but not including, 2,000 feet above the surface of the airport. The elevation of Pueblo Memorial is 4,725 feet MSL; thus, the airport traffic area ends at 6,725 feet MSL. A control zone extends from the surface upward, with *no* vertical limits. Therefore, at 7,500 feet MSL you are above the airport traffic area but within the control zone, as correctly stated only in response number 3.

31—(1) The runway number 25 corresponds to the magnetic direction (250°) of a takeoff or landing on that runway. In runway designations, the last digit is always omitted. Response numbers 3 and 4 are incorrect because a runway with a direction of 025° would be designated as runway 03 instead of 25. Response number 1 is correct and number 2 incorrect since a left-hand pattern to this westerly runway would require a downwind leg south of the airport. In addition, a left-hand base leg, 90° to the runway and corrected for a left crosswind, requires a magnetic heading of slightly less than 340°.

32—(1) A difference of .1" Hg in pressure is equal to approximately 100 feet of altitude and altimeters are calibrated accordingly. Your altimeter setting of 29.79 is .09 lower than the proper setting of 29.88, resulting in your being 90 feet higher than the other airplanes as stated in correct response number 1. Hence, response numbers 2, 3, and 4 are incorrect.

33—(4) A stall is always the result of exceeding the critical angle of attack. This can occur not only at low airspeeds or nose high attitudes, but also when excessive or sudden back pressure is applied in a pull-up from a high-speed steep dive, steep turn, or any other attitude. High speed stalls of this type are sometimes well above the established stalling speed. Therefore, the conditions described in response numbers 1, 2, and 3 are *not* the *only* conditions in which a stall can occur. Response number 4 is the only correct answer.

34—(3) The limiting speeds listed in response numbers 1, 2, and 4 are not color coded on the airspeed indicator. Therefore, they are not correct answers. The maximum flaps extended speed in response 3 is indicated by the upper airspeed limit of the white arc, the whole of which shows the operating speed range for full flaps. Thus, number 3 is correct.

35—(2) Response 1 is incorrect since this procedure will give you the altitude above mean sea level (MSL), and is used in establishing cruising altitudes below 18,000 feet. Number 2 is correct in that pressure altitude is actually the height above a standard pressure level of 29.92. Number 3 is incorrect since this procedure in fact is what you are accomplishing in response 1. Number 4 is in error because the smallest hand on the altimeter indicates the 10,000-foot increments only.

36—(2) On the loading graph in fig. 26, follow the appropriate diagonal line to the point where it intersects the horizontal line representing the weight of each loaded item. From this point drop straight down the graph to determine the moment of each item. Add the weight of each item to the empty weight (unusable fuel is included in the airplane's empty weight) to determine the total weight, and add all the moments to find the loaded airplane moment.

	Weight	*Moment*
2 front seat occupants @ 170 lbs. each	340 lbs.	+12.2
2 rear seat occupants @ 170 lbs. each	340 lbs.	+24.0
63 gal. usable fuel @ 6 lbs. per gal.	378 lbs.	+18.0
3 gal. (12 qt) oil @ 7.5 lbs. per gal.	22.5 lbs.	−00.4
Baggage	120 lbs.	+12.5
Empty Airplane Weight	1,780 lbs.	+69.2
Total	2,980.5	+135.5

Thus, the total moment is 135.5 as stated in response number 2. Now enter the Center of Gravity Moment Envelope, fig. 26, at the total moment for the loaded aircraft until intersecting the horizontal line representing the weight of the loaded airplane. Since this point of intersection does not lie within the boxed area on the graph, the airplane as loaded is *not* within CG limits, as correctly stated in response number 2. Hence, numbers 1, 3, and 4 are incorrect.

37—(2) With a gross weight of 3,000 lbs., the distance required to clear a 50-foot obstacle on takeoff at 5,000 feet with zero wind and 41° F, according to the chart in fig. 27, is 1,675 feet. This distance will increase 10% for each 25° Fahrenheit that the temperature is above the standard 5,000-foot temperature, 41° F. Since the temperature is 96°, we have an increase of 55° (96−41=55). This means that we will have an increase of 22% in takeoff distance. Twenty-two percent of 1,675 feet is 368 feet. Therefore, only response number 2 is correct.

38—(1) From the 10,000-foot chart in fig. 33, we find that at 2100 RPM and 20″ Hg with 63.5 gal., the endurance is 6.7 hours, while at 2450 RPM and 20″ Hg, the endurance is 5.2 hours. A difference of 1.5 hours or one hour and 30 minutes, as correctly stated in response number 1. Number 2 is incorrect because at the higher power setting, the airspeed is faster, resulting in an earlier arrival at the destination. Number 3 is incorrect because although traveling faster at the higher power, to travel the same distance at the lower power the rate of fuel consumption is *less* than at the higher setting. Number 4 is incorrect because increasing manifold pressure would decrease rather than increase the range.

39—(3) Response number 1 is incorrect because special VFR minimums require that you remain "clear of clouds" and have a flight (and ground) visibility of at least 1 mile. The Federal Aviation Regulations, in this instance, do *not* permit deviation from minimum safe altitudes—therefore, response number 2 is incorrect. As correctly stated in response number 3, the Regulation requires that you remain clear of clouds but does not specify a minimum cloud separation. Since responses 1 and 2 are incorrect, number 4 cannot be correct.

40—(1) Although the engine controls are in normal position for takeoff, you should not expect the engine to develop normal power at Pueblo because of the lesser air density at the high elevation. As correctly stated in response number 1, you would obtain less than the normal 29″ Hg. Since the airplane is equipped with a constant-speed propeller, the RPM should not be affected unless there is a drastic reduction in manifold pressure. Thus, responses 2 and 4 are incorrect. Because of the less dense air at this elevation, the fuel/air mixture will be richer than normal, rather than too lean, making response number 3 incorrect.

41—(3) When ice exists in the carburetor venturi, it chokes off some of the air that enters the carburetor, resulting in a loss of manifold pressure. When heat is applied, an additional loss of manifold pressure results since heated air is less dense and some of the ram-effect is lost. As the ice is melted by the carburetor heat, air is again allowed to enter normally and the manifold pressure increases. Thus response number 1 is incorrect and number 3 is correct. Numbers 2 and 4 are incorrect because with a constant-speed propeller, the RPM will remain the same.

42—(4) Response number 1 is incorrect because In-flight Weather Advisories are actually *forecasts*, from a ground observer, of weather that is potentially hazardous to aircraft in flight. Number 2 is incorrect because AMOS reports are weather reports from an Automatic Meteorological Observation Station. Number 3 is incorrect since SIGMETS are a form of In-flight Weather Advisories. Number 4 is correct because PIREPS are PIlot REPorts of weather he has seen or experienced in flight.

43—(4) A standing lenticular cloud is formed by strong winds striking a mountain peak and rising. On the leeward side, the air flow breaks down into strong downdrafts and severe turbulence. This turbulence is found below the lenticular cloud, as correctly indicated in response number 4 and incorrectly stated in number 3. Due to the strong winds associated with a mountain wave, it is unlikely that fog would form in these areas, making response number 1 incorrect. Number 2 is also incorrect because, with the severe downdrafts on the leeward side, the air is heated as it descends, decreasing the likelihood of condensation or precipitation.

44—(1) Sensitive altimeters *are* affected by both pressure and temperature, so number 3 is incorrect. Even though adjusted to the proper pressure (altimeter setting), if the temperature is lower than the standard temperature for that altitude, the altimeter will read higher than the actual altitude. If the temperature is higher than standard, the altimeter will read *lower* than actual. Therefore, only response number 1 is correct.

45—(4) In reading altimeters, first read the smallest hand indicating the 10,000-foot increment, then read the next largest hand indicating the 1,000-foot increment, and then read the largest hand indicating the 100-foot increment. In figs. 14 and 15; A–7 indicates 9,500 feet; A–1 indicates 10,500 feet; A–8 indicates 10,000 feet; A–11 indicates 15,500 feet; A–2 indicates 11,000 feet; A–12 indicates 18,800 feet; A–13 indicates 4,500 feet. Therefore, A–12 is the highest and A–13 is the lowest as correctly stated in response number 4.

46—(4) The 57 mph stalling speed indicated by the lower airspeed limit of the white arc is for a wings-level, full-flaps condition only. During a 60° bank with power off and gear and flaps up, the Stall Speed Chart indicates that the stalling speed is 92 mph CAS. Therefore, number 4 is correct, while numbers 1, 2, and 3 are incorrect.

47—(1) The airspeed indicator measures the impact pressure of the air on the pitot tube. At any altitude, to obtain a given Indicated Airspeed, the impact pressure must be a certain value. Because of the reduced air density at high elevations, the airplane moves faster through the air, with an impact pressure, or Indicated Airspeed, equivalent to that obtained at sea level. With the reduced air density, the True Airspeed at which the airplane stalls at altitude is greater; but since, at a given Indicated Airspeed, the airplane is actually traveling faster, the *indicated* stalling speed will be the same as at sea level. This condition is correctly stated in response number 1 only. Numbers 2, 3, and 4 are therefore not true statements.

48—(4) Due to the higher speed causing greater centrifugal force, the faster airplane, although using a degree of bank identical to that of the slower airplane, will turn at a lesser number of degrees per second and requires both a larger radius and more space to turn than the slower airplane. Response number 1 is incorrect because although Airplane C will have the largest radius of turn, each airplane will have a different rate of turn. Number 2 is incorrect; although Airplane A will have the greatest radius of turn, the rates of turn for each airplane will be different. Number 3 is not true since Airplane A will have the *fastest* rate of turn, not the lowest, although its radius of turn will be the smallest. Number 4 is correct because Airplane C, having the higher speed and greater centrifugal force, will have the lowest rate of turn and the largest radius of turn.

49—(1) Fuel octane ratings indicate the antiknock value or the ability of the fuel to withstand compression and resist detonation. The likelihood of engine damage due to detonation is less with the use of the higher octane rating fuel. Conversely, as correctly stated in response number 1, if the octane of the fuel used is lower than specified for the engine, detonation may result and cause damage to the engine. Although the lower octane reduces power output, it is always more harmful than the higher octane fuel. Therefore, number 2 is incorrect. Numbers 3 and 4 are not true because use of fuel with a higher than specified rating does *not* usually improve performance and may cause engine damage by burning the valves.

50—(4) Civil Aeronautics Board Safety Investigation Regulation Part 320 specifically stipulates that an accident which results in substantial damage to the airplane must be reported *immediately*, by the most expeditious means. Therefore, only response number 4 is correct.

RECOMMENDED STUDY MATERIALS

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

1. *Airman's Information Manual (AIM)* ($15.00). An FAA publication developed as a pilot's operational manual presenting information necessary for the planning and conduct of a flight in the National Airspace System. (Excerpts of this manual are presented in figures 43 through 60 in the Appendix of this study guide.)

2. *Flight Training Handbook* ($0.70). This is a basic reference manual containing information of great importance to the commercial pilot. The subjects covered include theory of flight, principles of safe flying, inspection and care of aircraft, and performance and analysis of flight maneuvers.

3. *Aviation Weather* ($2.25). A detailed study of weather phenomena from the viewpoint of the pilot.

4. *Private Pilot's Handbook of Aeronautical Knowledge* ($2.50). This text of basic aeronautical knowledge was designed to meet the needs of the private pilot. However, the commercial pilot who is thoroughly familiar with the material discussed in this book has gone a long way toward mastering the subject areas required for commercial operation.

6. *Federal Aviation Regulations.*

Part 1 ($0.25).
Part 61 ($0.50).
Part 71 ($0.20).
Part 91 ($0.45).

The applicant is responsible for knowing applicable portions of Parts 61 and 91, which in turn will require a knowledge of some portions of Parts 1 and 71.

7. *Civil Aeronautics Board, Safety Investigation Regulations, Part 320* ($0.05). Prescribes the procedures and requirements pertaining to aircraft accidents and certain other incidents involving aircraft.

8. *VFR EXAM-O-GRAMS.* Analyses and explanations of selected topics of aeronautical knowledge presented in the form of questions and answers. These are issued by the FAA Airman Examination Section on an irregular basis and are distributed free of charge, in limited quantities, upon request. An example of the Exam-O-Grams is presented on page 31. A list of Exam-O-Grams which have been published as of the date of this examination guide is given on page 29.

HOW TO OBTAIN STUDY MATERIALS

VFR Exam-O-Grams (*IFR Exam-O-Grams* if desired) are non-directive in nature, and are issued solely as an information service to individuals interested in Airman Written Examinations. They are available *free of charge* (in limited quantities) by ordering from:

Flight Standards Technical Division
Operations Branch, AC–740
P.O. Box 1082
Oklahoma City, Oklahoma 73101

(Indicate in your request if you wish to be placed on the mailing list for future issues.)
All other* study materials listed may be obtained by remitting check or money order to:

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

There are many excellent commercially prepared textbooks, audio-visual training aids, and programmed instruction courses, which may be helpful in preparation for the examination.

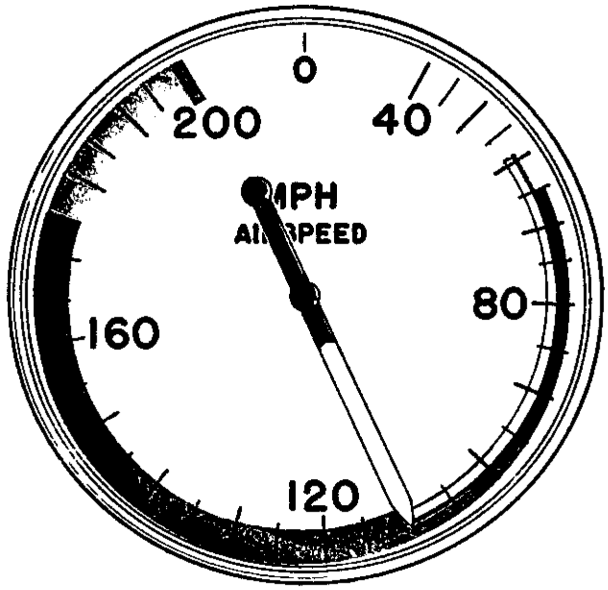
**Private Pilot's Handbook of Aeronautical Knowledge* is also available at many airports.

LIST OF VFR PILOT EXAM-O-GRAMS

No.	*Title*
1	Control Zone VFR Weather Minimums
2	VFR Cruising Altitudes
3	An Invisible Hazard to Light Aircraft
4	Preflight Planning for a VFR Cross-Country Flight (Series 1)
5	Preflight Planning for a VFR Cross-Country Flight (Series 2)
6	Preflight Planning for a VFR Cross-Country Flight (Series 3)
7	Getting Caught on Top of an Overcast
8	Airspeed Indicator Markings
9	Altimetry
10	Fuel Contamination
11	Density Altitude and Its Effect on Aircraft Performance
12	The Magnetic Compass
13	Weight and Balance
14	Radio Communications Frequencies
15	How to Use VOR (Series 1)
16	How to Use VOR (Series 2)
17	Common Misconceptions (Series 1)
18	Lost Procedures—Pilotage
19	Emergency or Lost Procedures (Radio)
20	Ceiling and Visibility
21	Flying Into Unfavorable Weather
22	Potential Mid-air Collisions
23	Interpreting Sectional Charts (Series 1)
24	Interpreting Sectional Charts (Series 2)
25	Interpreting Sectional Charts (Series 3)
26	Common Misconceptions (Series 2)
27	The Effect of Wind on an Airplane
28	Factors Affecting Stalling Speed
29	Potential Mid-air Collisions (Series 2)
30	Flight Plans (Series 1)
31	Flight Plans (Series 2)
32	Signposts in the Sky
33	Use of Performance Charts
34	How to Obtain Proper Weather Briefing
35	UNICOM Frequencies and Uses

APPENDIX

FEDERAL AVIATION AGENCY
VFR EXAM-O-GRAM NO. 8
AIRSPEED INDICATOR MARKINGS



The above airspeed indicator depicts the airspeed limitation markings of a late model civilian airplane. How many of the airspeed questions below can you answer by studying the airspeed indicator pictured above?

1. *What is the flap operating range?*
2. *What is the power-off stalling speed with the wing flaps and landing gear in the landing position?*
3. *What is the maximum flaps extended speed?*
4. *What is the normal operating range?*
5. *What is the power-off stalling speed "clean"*—(gear and flaps retracted)?
6. *What is the maximum structural cruising speed?*
7. *What is the caution range?*
8. *What is the never exceed speed?*

Airplanes manufactured after 1945 and certificated under the provisions of FAR 23 (12,500 lbs. or less) are required to have the standard system of airspeed indicator markings described in this Exam-O-Gram. In the interest of safety, it is important for you as a pilot to recognize and understand these airspeed limitation markings. And, too, this information will come in handy if you are planning to take a written examination for a pilot's certificate; current FAA written examinations contain questions on this subject. A short explanation of the airspeeds and airspeed ranges you need to know follows. The descriptions, through choice, are limited to simple layman language. (For the more technical engineering nomenclature, refer to *Federal Aviation Regulations Part 23.*)

Answers to Questions on Airspeeds

Starting with the slower speeds and working up we have:

	Airspeeds (See Illustration)
1. FLAP OPERATING RANGE (the white arc)	*59 to 110 mph*
2. POWER-OFF STALLING SPEED WITH THE WING FLAPS AND LANDING GEAR IN THE LANDING POSITION (the lower limit of the white arc)	59 mph
3. MAXIMUM FLAPS EXTENDED SPEED (the upper limit of the white arc). This is the highest airspeed at which you can put down full flaps. If flaps are operated at higher speeds, severe strain or structural failure may result	110 mph
4. THE NORMAL OPERATING RANGE (the green arc)	65 to 175 mph
5. POWER-OFF STALLING SPEED "CLEAN"—WING FLAPS AND LANDING GEAR RETRACTED (the lower limit of the green arc)	65 mph
6. MAXIMUM STRUCTURAL CRUISING SPEED (the upper limit of the green arc). This is the maximum speed for normal operation	175 mph
7. CAUTION RANGE (the yellow arc). You should avoid this area unless you are in smooth air	175 to 200 mph
8. NEVER EXCEED SPEED (the radial red line). This is the maximum speed at which the airplane can be operated in smooth air. No pilot should ever exceed this speed intentionally	200 mph

There are other airspeed limitations *not marked on the airspeed indicator* which you should know. They are generally found on placards in view of the pilot or in the Airplane Flight Manual. One of these speeds, a very important one, is the MANEUVERING SPEED. This is your "rough air" speed and the maximum speed for abrupt maneuvers. If during flight you should encounter severe turbulence, you should reduce your airspeed to maneuvering speed or less in order to reduce the stress upon the airplane structure.

KNOW YOUR AIRSPEED LIMITATIONS
THIS KNOWLEDGE MAY SAVE YOUR LIFE

LIST OF ILLUSTRATIONS

Figure Number

Weather Information

Figure Number

General Atmospheric Charts

Airman's Information Manual (Excerpts)

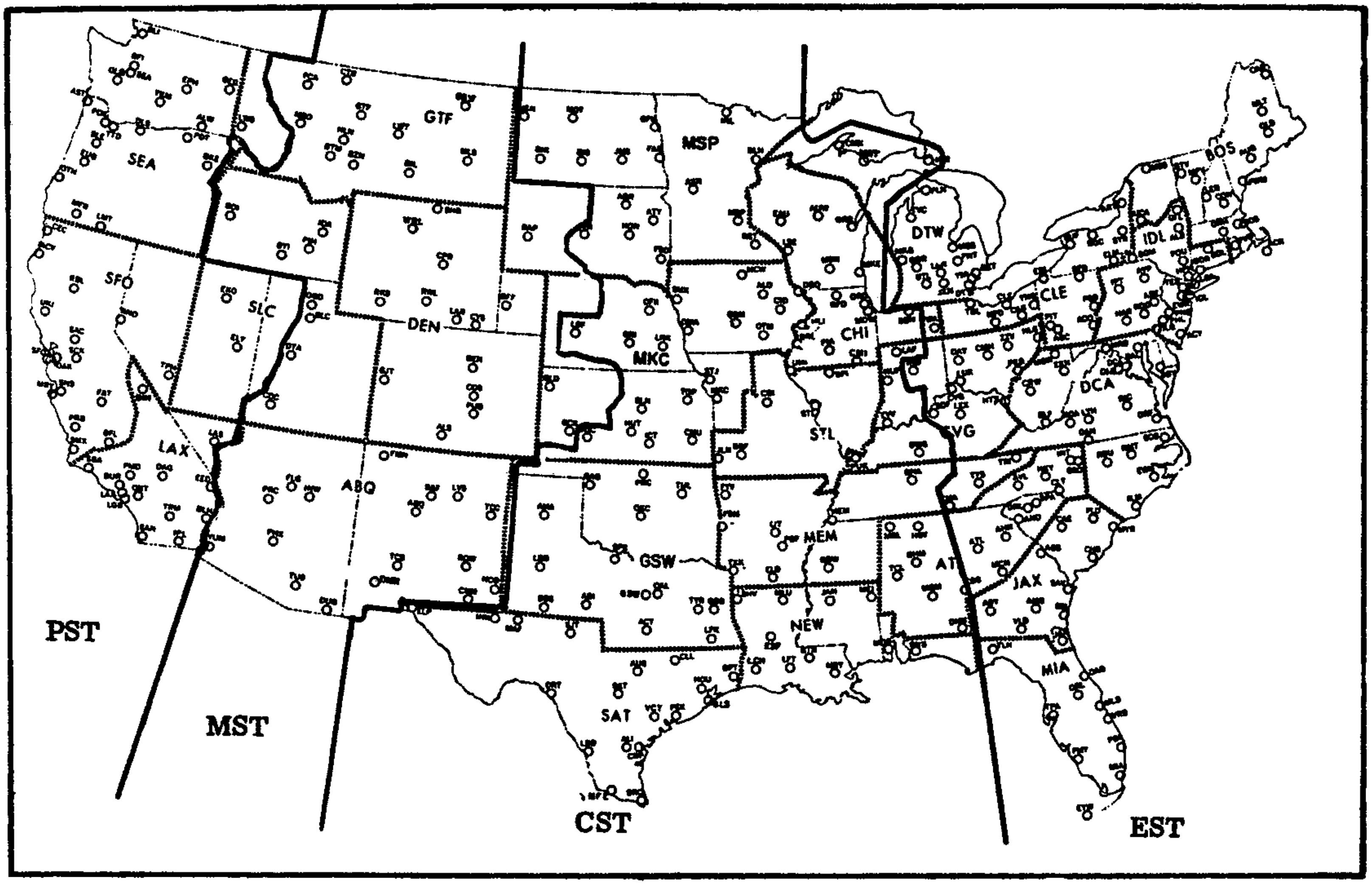
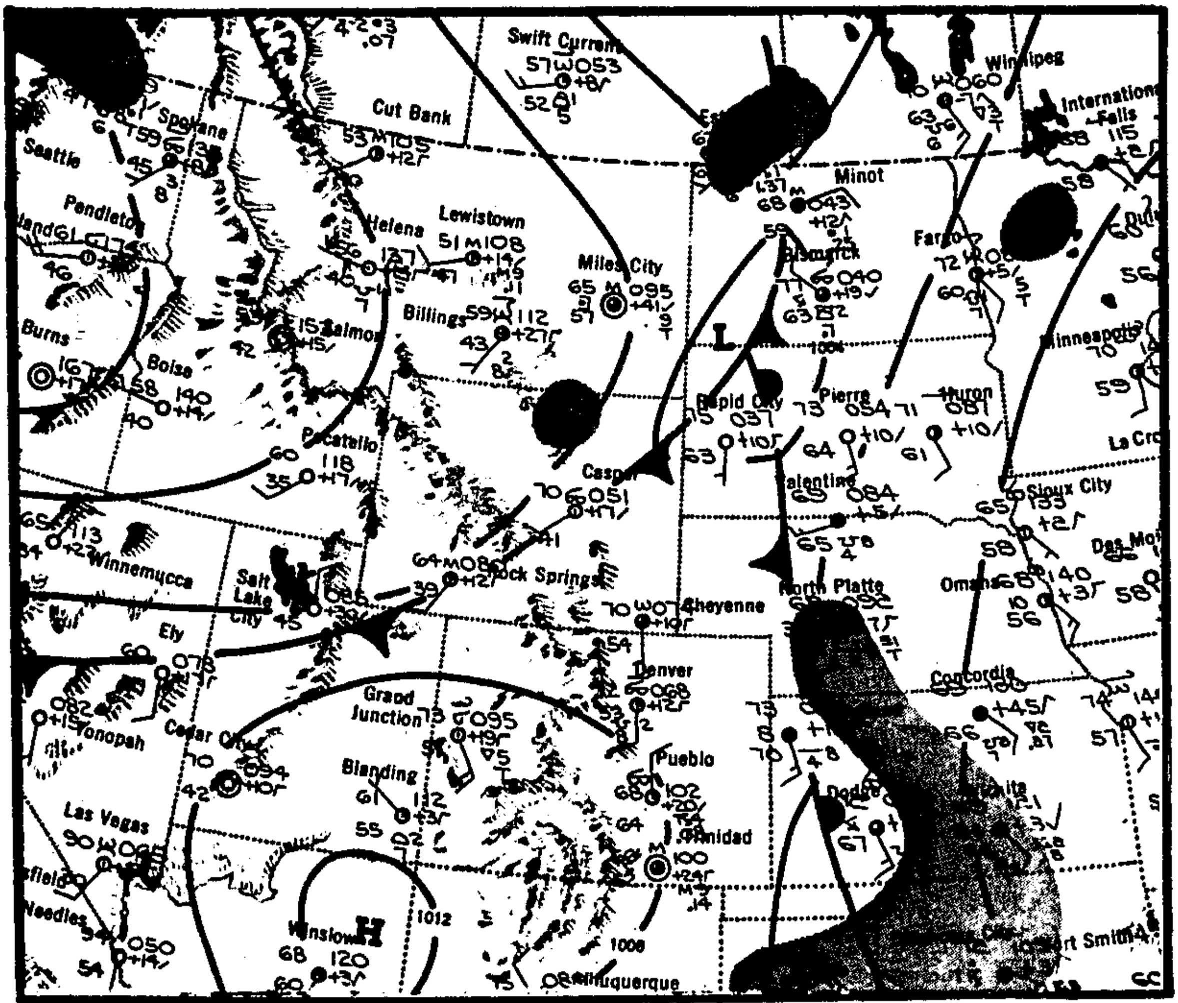


FIGURE 1—Map showing time zones and station locations.



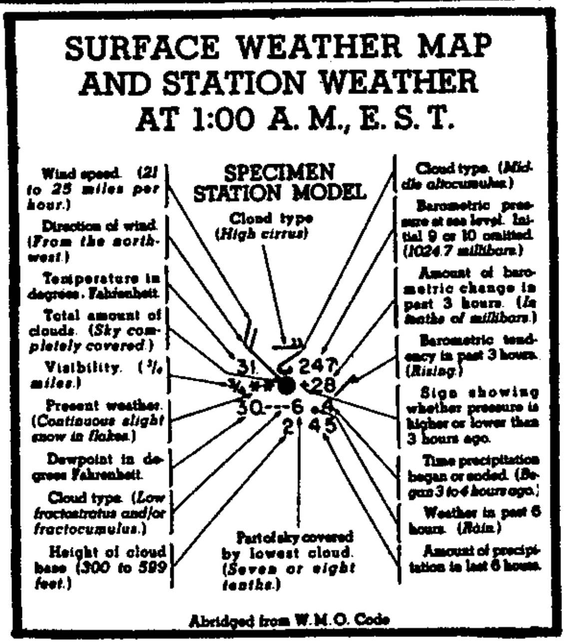


FIGURE 2—Segment of daily weather map.

AREA FORECASTS

FA MKC 111845
13C THU -01C FRI

NEB EXCP PNHDL KANS

CLDS AND WX. CNTRL AND ERN NEB NMRS LYRS CLDS WITH CIGS GENLY 8-15 HND EXCP HIER IN EXTRM E. VSBYS 2-5R-F OR L-F ERY AFTN AND BCMG MORE GENL OVR AREA DURG EVE EXCP IPVG IN NEB PNHDL TO 30-50 WITH A FEW TSTMS.

MOST OF KANS CNDS SIMILAR TO NEB EXCP HIER CNDS EXTRM E AND EXTRM W PTNS KANS. FEW TSTMS LATE AFTN OR EVE IN WRN THIRD AND MORE NMRS TSTMS LKLY S-CNTRL AND SERN KANS. CIGS LFTG TO ARND 10-15⊕ DURG AFTN LWRG AGAIN DURG EVE TO 5-8⊕ VSBYS TO 3-6R-F OR L-F. TOPS AC TO ARND 160-180. CB LCLY TO 300-400.

ICG. MDT IN CB. FRZG LVL 140-160.

TURBC. SVR IN TSTMS.

OTLK. 01C-13C FRI. CSDRBL STRATUS OVR MOST OF KANS AND ERN NEB WITH POOR VSBYS IN FOG AND RAIN OR DRZL.

****

FA DEN 111845
12M-24M THU

COLO WYO NEB PNHDL

CLDS AND WX. WK COLD FRONT E-W NEAR NRN BDR COLO MOVG SEWD TO SRN BDR COLO AND BCMG DFUS 24M.

ALG AND S OF FRONT SCTD TSTMS AND SHWRS DCRG AFT 20M AND ENDG BY MIDN. BASES CU AND CB 100-150⌀V⌀180-220⌀V⌀ASL LCLY OVC IN THE HVYR SHWRS AND TSTMS. SFC WND GUSTS TO 40KTS VCNTY TSTMS AND PSBL ISLTD SML HAIL. VSBYS LCLY 2 TO 5 MI IN HVYR TSTMS. TOPS CB TO +350ASL. HIR MTNS AND PKS OCNLY OBSCD IN THE SHWRS AND TSTMS.

N OF FRONT WYO NEB PNHDL CLR TO OCNL 120-160⌀180-200V⌀ASL WITH FEW TSTMS ERN WYO AND NEB PNHDL ENDG BY 20M WITH CLRG THRAFT.

ICG. LCL MDT ICG IN CB. FRZG LVL NW WYO 110 SLPG TO 165ASL SE COLO.

TURBC. LCL MDT TURBC OVR AND NEAR HIR MTNS WYO AND NRN COLO AND LCLY SVR FOR LGT ACFT. LCL MDT TO SVR TURBC VCNTY TSTMS. LCL MDT CAT LKLY NW WYO 300-400ASL.

OTLK 00M-12M FRI. MSTLY CLR. HI LVL CAT SHIFTG EWD OVR RMNDR WYO.

FIGURE 8—Area forecasts.

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                         TERMINAL FORECASTS

FT1 DEN 111645
17Z THU-05Z FRI            (1000 MST THU - 2200 MST THU)

DEN 80⦶C150⦶ 0210 . 1300M 80⦶C150⦶ 0515 OCNL C80⦶ PSBL BRF RW-
    OR TRW- 0525G35. 1900M 80⦶150⦶. 2100M 150⦶.

COS 80⦶C150⦶ . 1200M C80⦶150⦶ 3615 OCNL C70⦶ PSBL BRF RW- OR
    TRW- 3630G40.

GJT 70⦶150⦶ CB VCNTY. 1300M 70⦶C150⦶ OCNL C70⦶ PSBL BRF RW- OR
    TRW- 3525G35. 2000M 70⦶C150⦶.

PUB 80⦶150⦶ 3615 . 1300M 80⦶C150⦶ 0515 OCNL C70⦶RW- OR TRW
    3620G40. 2000M 80⦶C150⦶.

CYS 80⦶140⦶ 3215. 1300M 80⦶C150⦶ 3415 OCNL C80⦶ PSBL BRF RW-
    OR TRW-. 2000M 150⦶.

ALS 60⦶120⦶. 1200M C60⦶120⦶ 1315 PSBL BRF RW- OR TRW- 1320330.
    2000M 60⦶120⦶.
•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_

FT1 MKC 111645
17Z THU-05Z FRI           (1100 CST THU - 2300 CST THU)

GLD 80C100⦶ 1615 ⦶V⦶. 1600C C30⦶ 1815. 1800C 40⦶C80⦶ 2015
    TSTMS VCNTY.

GCK 25⦶300⦶ 1812. 1600C 45⦶120⦶300-⦶ 2015. SCTD TSTMS VCNTY BY
    1700C.

DDC 20⦶ 1615 ⦶V⦶. 1600C 45⦶C100⦶ 1615. SCTD TSTMS VCNTY AFT
    1700C.

AMA 80⦶C300⦶ 2015.1300C 80⦶C300⦶ 2015 PSBL C50⦶RW AFT 1900C.

GAG C75⦶300⦶ 2015G. 1500C C85⦶300⊕ 2015G OCNL TRW.

HUT C8⊕5F 1615 INTMT R-. 1500C C10⊕7 1617 OCNL RW-. 1900C C7⊕
    4R-F 1615.
•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_

AMENDED FT1 MKC 111730
1745Z THU-0500Z FRI        (1145 CST THU - 2300 CST THU)

GLD C5⦶120⊕ 1610. 1200C 25⦶C150⦶ 1815. 1600C 40⦶C80⦶ 2015 TSTMS
    VCNTY.
GCK C20⦶100⦶ 1815. 1200C 15⦶150⦶ 2015. 1600C 15⦶ 1815 TSTMS VCNTY.
DDC DO GCK.
GAG DO GCK.
```

FIGURE 4—Terminal forecasts.

STATION DESIGNATORS AND LOCATIONS

(In all instances, except Fraser, the coordinates represent the airport location.)

AKO	AKRON, COLORADO	40 10 N; 103 13 W
ALS	ALAMOSA, COLORADO	37 26 N; 105 52 W
AMA	AMARILLO, TEXAS	190 STAT. MI. SW OF DDC
COS	COLORADO SPRINGS, COLO.	38 48 N; 104 42 W
CYS	CHEYENNE, WYOMING	100 STAT. MI. N OF DEN
DDC	DODGE CITY, KANSAS	37 46 N; 99 59 W
DEN	DENVER, COLORADO	38 45 N; 104 53 W
DHT	DALHART, TEXAS	36 01 N; 103 33 W
FSR	FRASER, COLORADO (town)	39 51 N; 105 49 W
GAG	GAGE, OKLAHOMA	36 18 N; 99 46 W
GCK	GARDEN CITY, KANSAS	37 56 N; 100 44 W
GJT	GRAND JUNCTION, COLO.	190 STAT. MI. SW OF DEN
GLD	GOODLAND, KANSAS	39 22 N; 101 42 W
HLC	HILL CITY, KANSAS	39 23 N; 99 50W
HUT	HUTCHISON, KANSAS	110 STAT. MI. E OF DDC
LHX	LA JUNTA, COLORADO	38 03 N; 103 31 W
MCK	MC COOK, NEBRASKA	40 15 N; 100 38 W
MKC	KANSAS CITY, MISSOURI	300 STAT. MI. NE OF DDC
PUB	PUEBLO, COLORADO	38 17 N; 104 30 W
RSL	RUSSELL, KANSAS	80 STAT. MI. E OF HLC
RTN	RATON, CREWS FLD, N.M.	36 44 N; 104 30 W
SAF	SANTA FE, NEW MEXICO	205 STAT. MI. S OF PUB
SNY	SNYDER, NEBRASKA	150 STAT. MI. NE OF DEN
TAD	TRINIDAD, COLORADO	37 15 N; 104 20 W

FIGURE 5—Station designators and locations.

AVIATION WEATHER REPORTS
TELETYPE SEQUENCE

```
SA3Ø1118ØØ              (1100 MST)
DEN 8ØΦ14ØΦ/-Φ6Ø 074/89/46/Ø7Ø6/ØØ1/CB SW TCU NW-NE
FSR MISG
GLD E16ØΦ15+ Ø87/78/66/1415/992
HLC E5⊕4F 109/73/69/1612/99Ø 4ØØØØ 66
RSL S E18Φ/Φ15 1Ø4/8Ø/69/1814G20/987/ 6Ø3 66
COS 85Φ16ØΦ/Φ1ØØ Ø98/87/41/Ø7Ø8/Ø11/TCU DSNT S AND OVR MTS SWNW
PUB 8Φ16ØΦ/Φ70 Ø7Ø/9Ø/47/14Ø5/995/CB SW TCU NW FEW ACSL S-E
LHX /-Φ15+ Ø68/88/56/27Ø8/992/ 6Ø3 63 2474Ø
TAD 8ØΦ/Φ6Ø Ø86/87/58/Ø9Ø8/ØØ5 CB RWU W TCU S 1Ø5 6Ø 24554
GCK UΦ15+ Ø75/88/65/14Ø7/986/ 61Ø 66 24842
DDC E15Φ12ØΦ1Ø Ø97/81/68/1614/99Ø
RTN AMOS /88/5Ø/2ØØ3/Ø1Ø/ØØØ/ 6ØΦ16ØΦ/Φ5Ø HVY CU WNW-N
GAG 9ØΦ/-15 Ø91/92/68/2012G2Ø/988/ 4ØØØØ 76
ALS 7ØΦ/Φ6Ø Ø87/85/55/Ø7Ø8/ØØ5 CB NW
SA311118ØØ              (1200 CST)
SNY E7ØΦ12Ø⊕1Ø Ø95/79/62/32Ø8/996/RWU W ACC ALQDS/3Ø8 64 24863
AKO E1ØØΦ/Φ15+ Ø99/79/60/Ø9Ø9/999/ 3Ø8 63 24843
MCK E1Ø⊕4F 74/68/1412/988

•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_•_

SA3Ø1119ØØ              (1200 MST)
DEN 8ØΦ13ØΦ6Ø Ø78/87/47/Ø71Ø/ØØ1/CB RWU OCNL LTGIC WNW
FSR MISG
GLD E16ØΦ15+ Ø86/83/66/1612/992
HLC E7Φ6F 1Ø5/79/7Ø/1812/989
RSL S 1ØΦE2ØΦ/⊕15 1Ø5/78/65/1118G24/987
COS E85Φ16Ø⊕65 1Ø2/84/47/Ø5Ø7/Ø11/CB DSNT S AND OVR MTNS WN TCU
    ALQDS RWU W BINOVC
PUB 8ØΦ16ØΦ/Φ7Ø Ø66/9Ø/46/Ø5Ø3/993/TCU-CB ALQDS RWU SW FEW ACSL
LHX /-Φ15+ Ø64/92/56/36Ø5/991/CSL SW-NW BLDG CU SWN
TAD E8ØΦ/Φ6Ø Ø83/88/54/Ø9Ø8/ØØ4 CB RWU W TCU ALQDS
GCK O15+ Ø72/92/62/2Ø1Ø/985/FEW CI TCU CB SW
DDC 15Φ/Φ1Ø Ø93/82/7Ø/2Ø15/988
RTN AMOS /89/48/12Ø8/ØØ8/ØØØ/ 7ØΦ/Φ5Ø CB SW AND W-N RW- NW
GAG /-Φ15 Ø88/94/66/1815G2Ø/987/FEW CU
ALS E7ØΦ/Φ6Ø Ø88/86/57/Ø91Ø/ØØ7/ FEW CU
SA311119ØØ              (1300 CST)
SNY E7ØΦ12Ø⊕1Ø 1Ø3/76/59/36Ø6/998/RWU W-N-NE
AKO E12ØΦ/⊕15+ 1Ø1/81/63/Ø5Ø8/ØØØ/FEW CU
MCK E1Ø⊕6F 8Ø/70 1415/988/ LRG BINOVC
```

FIGURE 6—Aviation weather reports (teletype sequence).

```
                    AVIATION WEATHER REPORTS
                       TELETYPE SEQUENCE

SA3Ø112ØØØ                  (13ØØ MST)
DEN 8ØⓄ13ØⓄUⓄ4Ø Ø8Ø/83/51/Ø214/ØØ1/ CB SCTD RWU ALQDS MTNS OCNLY
    OBSCD SW-NW/ ØØØ 1963
GLD 17ØⓄ/Ⓞ15+ Ø71/89/62/16Ø8/989/ CB W/  898
HLC S E12⊕1Ø 1Ø5/8Ø/71/141Ø/989/ 6Ø2
RSL S B3⊕4F 1Ø4/69/67/142ØG27/987/ ØØØ
COS 85Ⓞ16ØⓄ/Ⓞ65 Ø92/87/49/29Ø7/ØØ8/TE39 MOVD E G33OCNL DSNT LTGCG
    E RWU N        CB TCU ALQDS/8Ø7 1972
PUB E8ØⓄ16ØⓄ/Ⓞ7Ø Ø51/94/48/2ØØ9/99Ø/ TCU-CB ALQDS RWU W
LHX 8ØⓄ/-Ⓞ15+ Ø47/97/53/23Ø6/987/714 TCU SE
TAD E7ØⓄ/⊕6ØTR- 1Ø9/72/63/Ø9Ø5/ØØ6 T OVHD-E MOVG E RWU N
GCK O15+ Ø6Ø/97Ø61/2ØØ8/982/ CU N TCU NW CB SW/ 712
RTN AMOS  /7-/51/3516/ØØ8/ØØØ/
GAG /-Ⓞ15 Ø78/96/69/182ØG25/985/FEW CU/ 71Ø
ALS S E7ØⓄ/⊕6Ø Ø9Ø/87/58/1Ø15/ØØ9
SA3112ØØØ                  (14ØØ CST)
SNY E7ØⓄ12Ø⊕12 Ø9Ø/78/55/Ø512/994/RWU VIRGA SW-NW-NE/ 8Ø5
AKO 8ØⓄE12ØⓄ/Ⓞ15+ Ø89/84/63/Ø512/997/CB S SW
MCK E15Ⓞ12ØⓄ1Ø 82/74/1415/E987

•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-•-

SA3Ø1121ØØ                  (14ØØ MST)
DEN 8ØⓄE13ØⓄ5Ø Ø8Ø/83/55/Ø212G23/ØØ1/ CB AND RWU E AND W TCU NE
FSR E9ØⓄ25 64/46 ØØØØ/ BINOVC E RWU NW
GLD /-Ⓞ15+ Ø66/89/61/1412/987/CB W AND N HRZN
HLC S E15Ⓞ3Ø⊕5F 124/75/7Ø/1118/988
RSL S B5⊕6F 1Ø5/71/67/1419G25/986
COS 85Ⓞ16ØⓄ/Ⓞ65 Ø87/87/51/Ø511/ØØ7/CB TCU ALQDS RWU DSNT NE
PUB 8ØⓄ16ØⓄUⓄ7Ø Ø48/94/47/181Ø/988 /CB ALQDS
LHX 8ØⓄ/-Ⓞ15+ Ø48/96/54/18Ø9
TAD S E8ØⓄ/Ⓞ6Ø Ø83/81/59/14Ø5/ØØ2 RB15 TE36  MOVD E RWU E
    TCU ALQDS LTGCG E
GCK O15+ Ø56/96/59/16Ø8/981/FEW CU CI TCU W-N
DDC 3ØⓄ/Ⓞ1Ø Ø7Ø/93/68/1415/983
RTN AMOS /82/55/3417/ØØ6/ØØØ/
GAG /-Ⓞ15 Ø79/96/7Ø/1620 325/985/FEW CU
ALS   E7ØⓄ/Ⓞ6Ø Ø9Ø/88/58/1Ø15/ØØ9
SA3111 21ØØ                 (15ØØ CST)
SNY E6Ø⊕1ØR-- Ø96/75/53/1414/995/RB25 HVY CU SE RWU S AND W-NW
AKO 8ØⓄE12ØⓄ/⊕15+ Ø9Ø/82/62/Ø513/997/CB ALQDS RWU SE
MCK S E22Ⓞ12Ø⊕12 84/7Ø/1415 /987
```

FIGURE 7—Aviation weather reports (teletype sequence).

```
                    AVIATION WEATHER REPORTS
                       TELETYPE SEQUENCE

SA 3Ø1121ØØ              (15ØØ MST)
DEN E8Ø⌽13Ø⊕4Ø Ø97/79/54/Ø912G18/ØØ3/CB AND RWU SW
GLD U⌽15+ Ø71/86/63/1113/988/CB SW
HLC E15⌽3ØØ⌽4F 1Ø4/74/68/1116/987
RSL E5⊕5F 1Ø1/7Ø/67/1616G23/985
COS S 85⌽/⌽65 Ø91/83/49/Ø715/ØØ6/CB-TCU ALQDS
PUB 8Ø⌽16Ø⌽7Ø Ø45/96/43/2ØØ8/988/ CB ALQDS
LHX 8Ø⌽E1ØØ⌽15+ Ø47/92/6Ø/1814/987/CB AQDS
TAD E8Ø⌽/⌽6Ø Ø74/85/54/Ø712/ØØØ TCU ALQDS RWU E
GCK /-⌽15+ Ø5Ø/97/57/18Ø9/979/ FEW CU TCU W
DDC 3Ø⌽/⌽1Ø Ø64/91/7Ø/1417/981 CU BLDG S
RTN AMOS /84/51/33Ø8/ØØ /ØØØ/
GAG 7Ø⌽/⌽15 Ø72/95/7Ø/1628G35/983
ALS E 7Ø⌽/⌽6Ø Ø9Ø/88/6Ø/1Ø15/Ø1Ø
SA 311121ØØ              (1600 CST)
SNY E6Ø⌽/⊕12 Ø95/77/59/27Ø7/995/RE4Ø
AKO 5Ø⌽E1ØØ⌽1ØRW-- 11Ø/79/63/1415G3Ø/ØØ1/CB RWU NE-E    DRKE-S
    RB55
MCK E22⊕12Ø⌽/⌽12 79/71/1615G20/E988
```

FIGURE 8—Aviation weather reports (teletype sequence).

WINDS ALOFT FORECASTS

FD1 WBC 111150Z
12Z-24Z THU

LVL	3000	5000 FT	7000	10000FT	15000FT	20000FT	25000FT
DEN			2825	2725+12	2535-2	2550-13	2455-23
CYS				3020+10	2530+5	2440-2	2445-7
PUB			2725	2625+14	2425+5	2430-2	2330-5

FD1 WBC 1111600
04Z-16Z THU

LVL	3000	5000 FT	7000	10000FT	15000FT	20000FT	25000FT
MKC	1620	1718+16	1816	1915+9	2407+2	2507-7	3310-19
DDC		2015+19	2020	2125+15	2125+12	2230+8	2230+5
GLD		1822	2118	2410+15	2515+10	2915+7	2930+2

FIGURE 9—Winds aloft forecasts.

```
IN-FLIGHT WEATHER ADVISORIES

URGENT
FL MKC 111440
0840C-1140C THU
AIRMET ALPHA 1. MOST OF SERN AND WRN KANS AND WRN NEB CIGS
GENLY BLO 1 THSD FT VSBYS LCLY LESS THAN 2 MIS IN RAIN AND
FOG. SLOLY IMPVG CNDS THRU AREA AFT MID MRNG.
111000...HP

URGENT
FL DEN 111645
0945M-1345M THU
AIRMET ALPHA 1. WYO COLO NEB PNHDL OCNL MDT TURBC WITH LCL
SVR TURBC LKLY OVR AND ALG E SLP HIR MTNS AND RDGS NRN COLO
AND WYO. PSBL STG DOWNDRAFTS IMDTLY E OF MTNS AND RDGS
ESPECIALLY IN WYO.
110935...JAS
```

FIGURE 10—In-flight weather advisories.

```
PILOT REPORT SUMMARY

DEN UA 111920
PUB-ALS OVR LVT PASS MDT DOWNDRAFTS E SLP PASS CLR PA23

30SE DEN MDT TURBC 85 C172

65W PUB LGT - MDT TURBC 130-150 BE50

75S PUB LINE TSTMS N-S OVR AND ALG E SLP MTNS FM LVS TO TAD
BASES 115 LTGCG 105 C47
```

FIGURE 11—Pilot report summary (PIREPS).

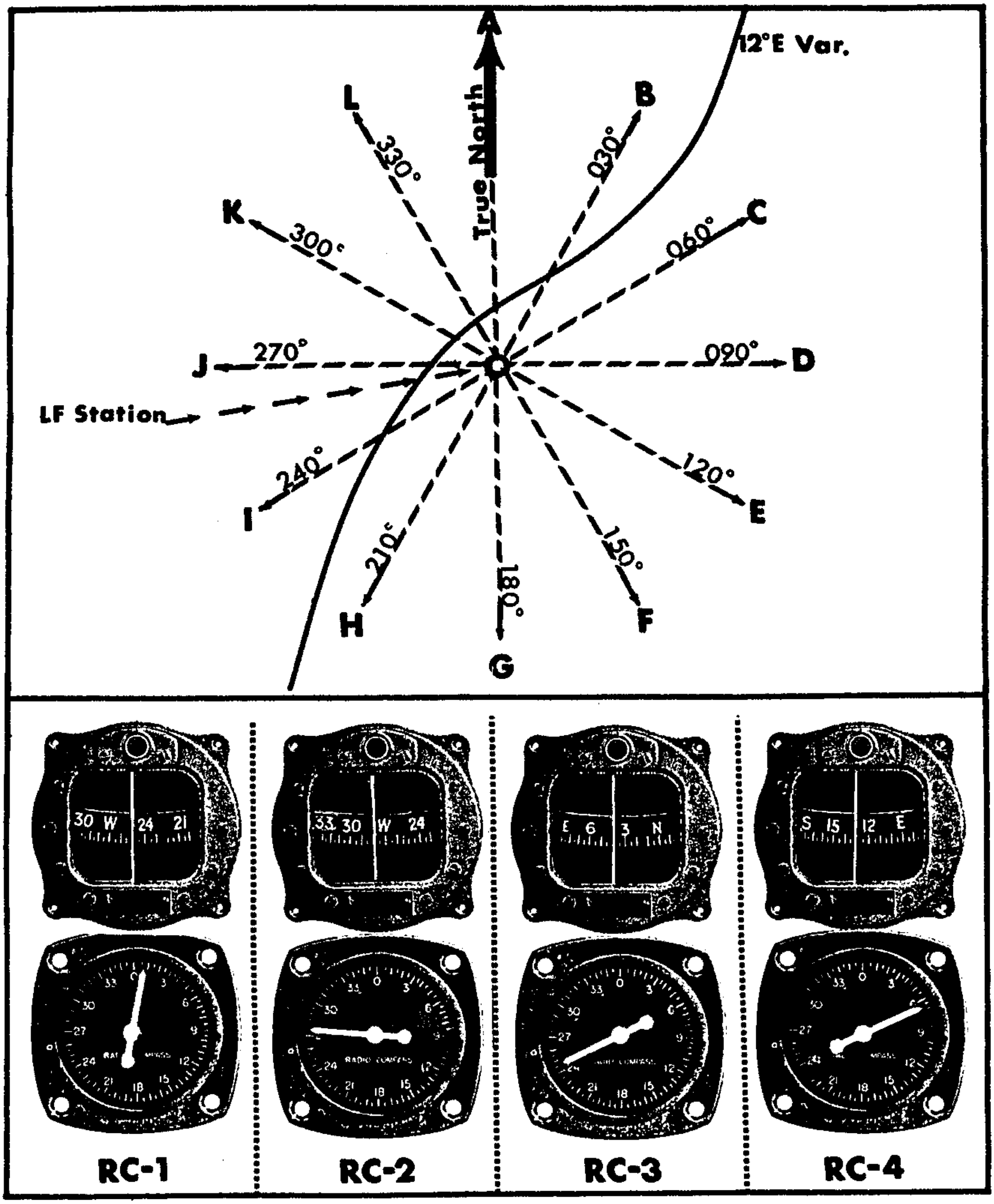


FIGURE 12—Plotting true line of position on chart (ADF).

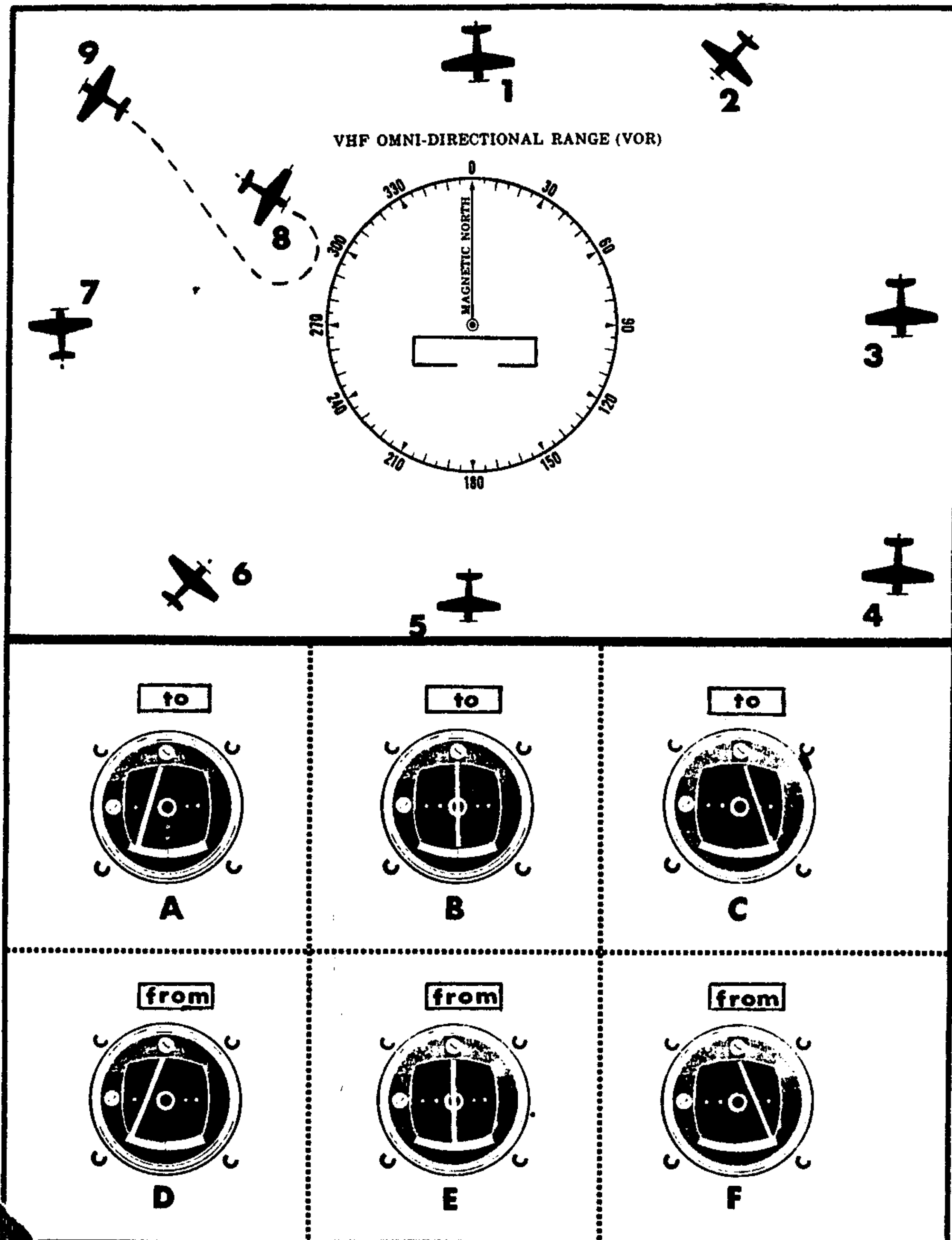


FIGURE 18—Plotting magnetic line of position on chart (OMNI).

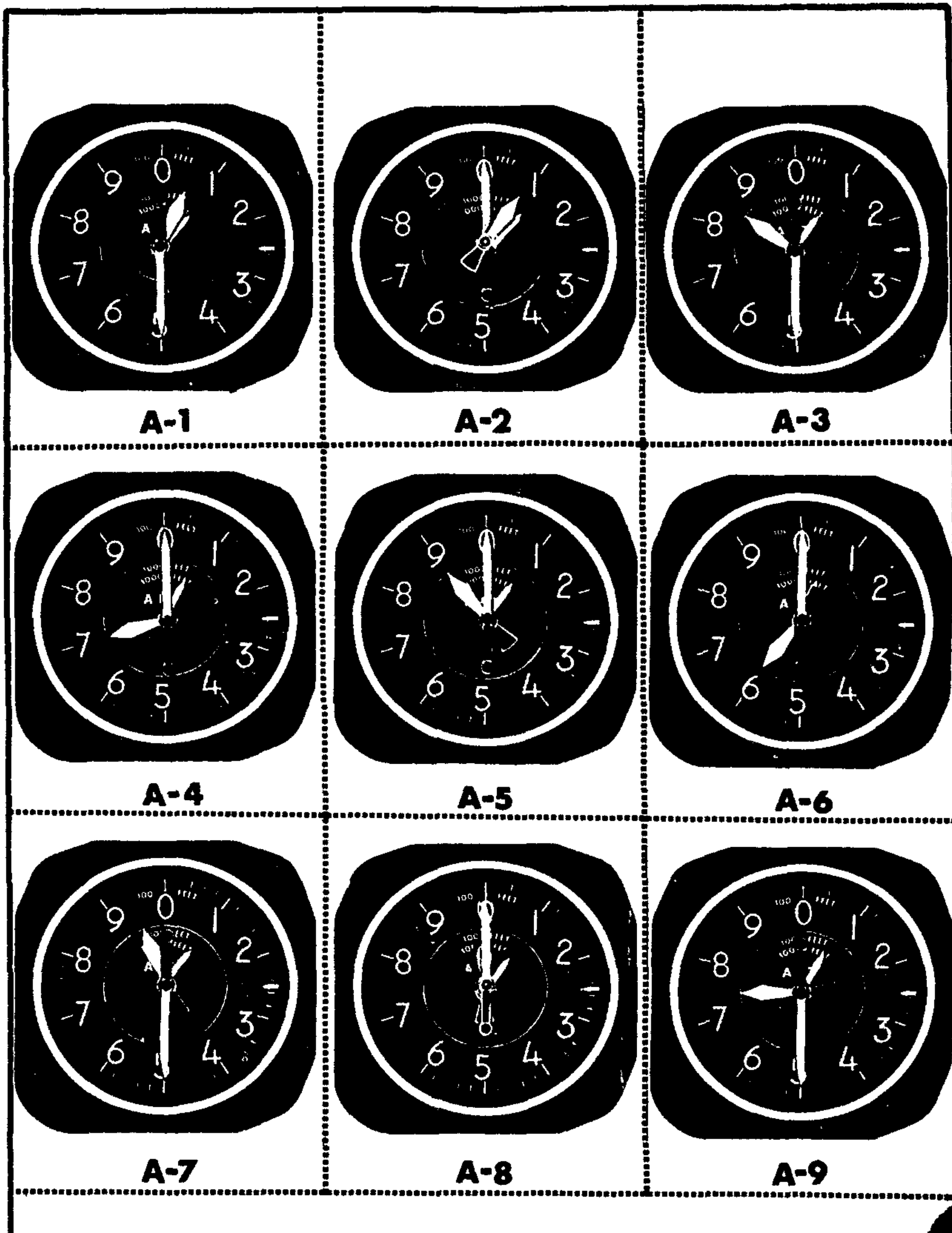

A-1 A-2 A-3 A-4 A-5 A-6 A-7 A-8 A-9

FIGURE 14—Altimeter illustrations.

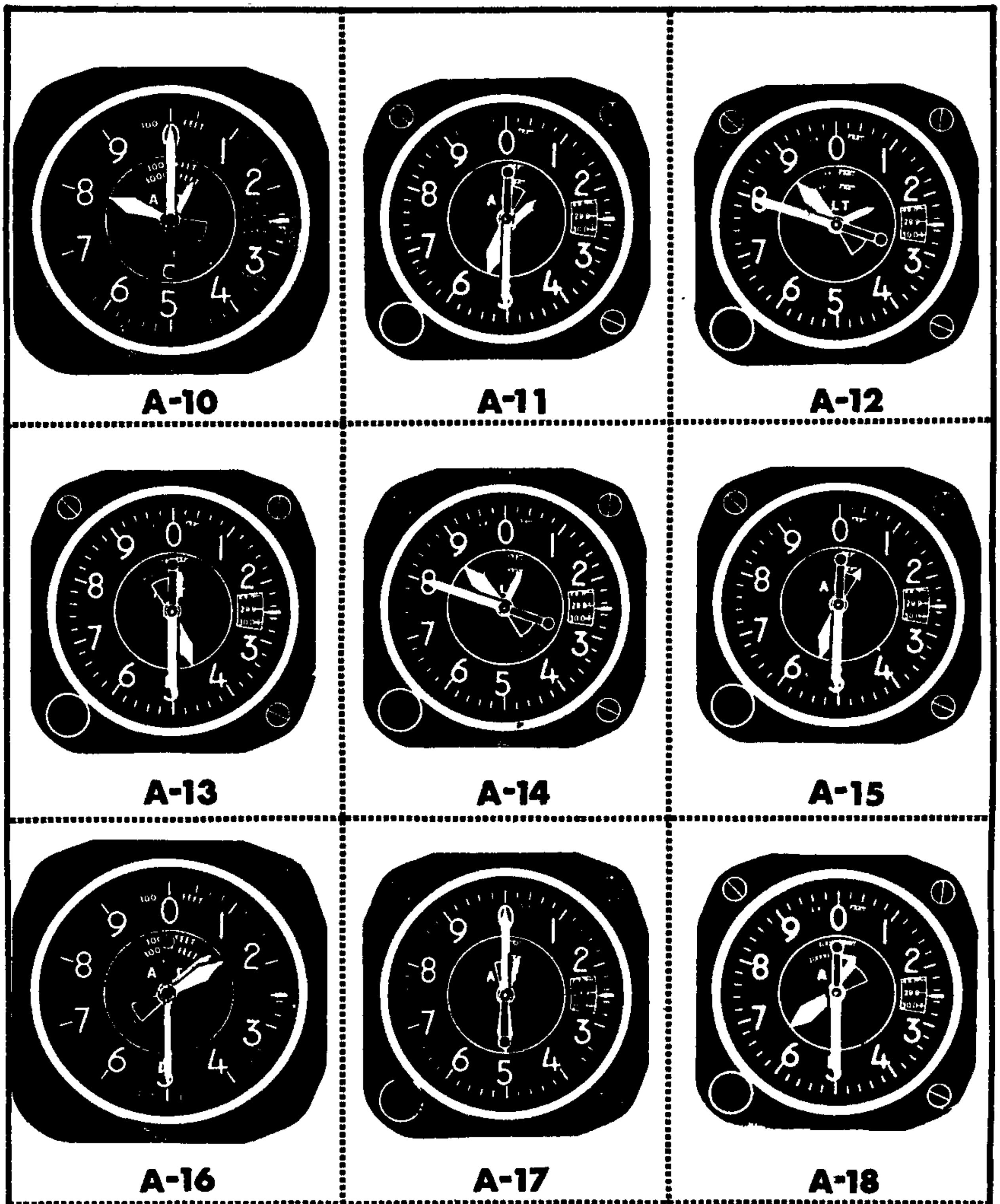
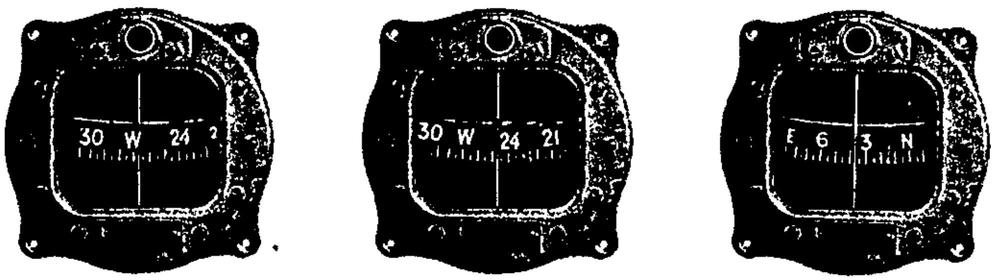


FIGURE 15—Altimeter illustrations.



CH-1 CH-2 CH-3

COMPASS CORRECTION CARD

FOR (MH)	N	030	060	E	120	150	S	210	240	W	300	330
STEER (CH)	001	029	063	090	118	148	178	212	245	274	303	334

FIGURE 16—Magnetic compass headings and compass correction card.

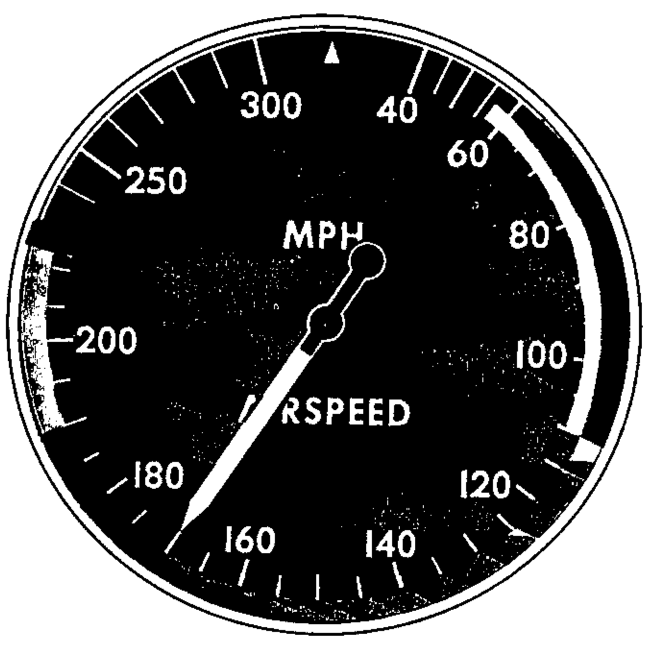


FIGURE 17—Airspeed indicator with colored arcs marking important calibrated airspeeds.

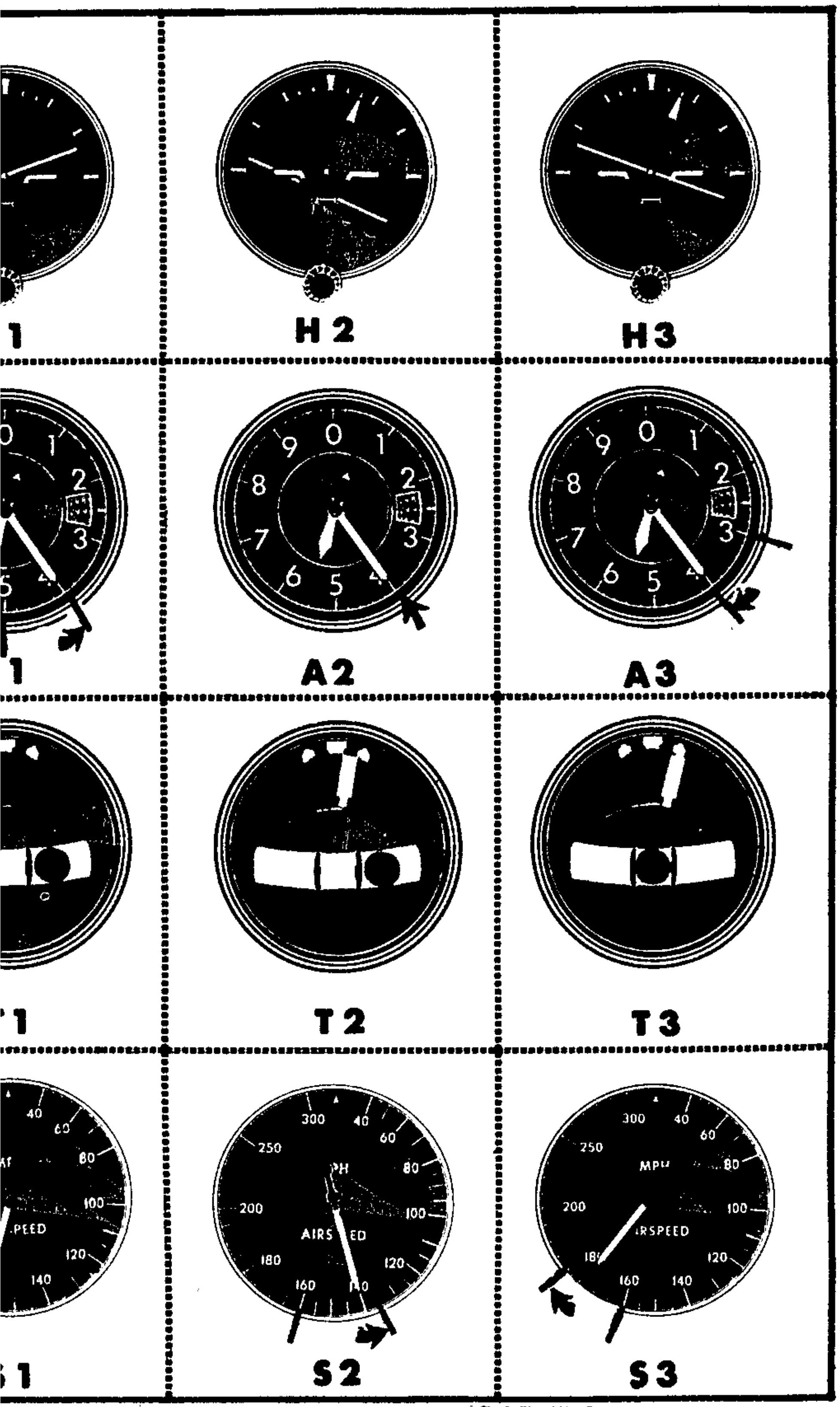


FIGURE 18—Instruments used in determining flight attitude.

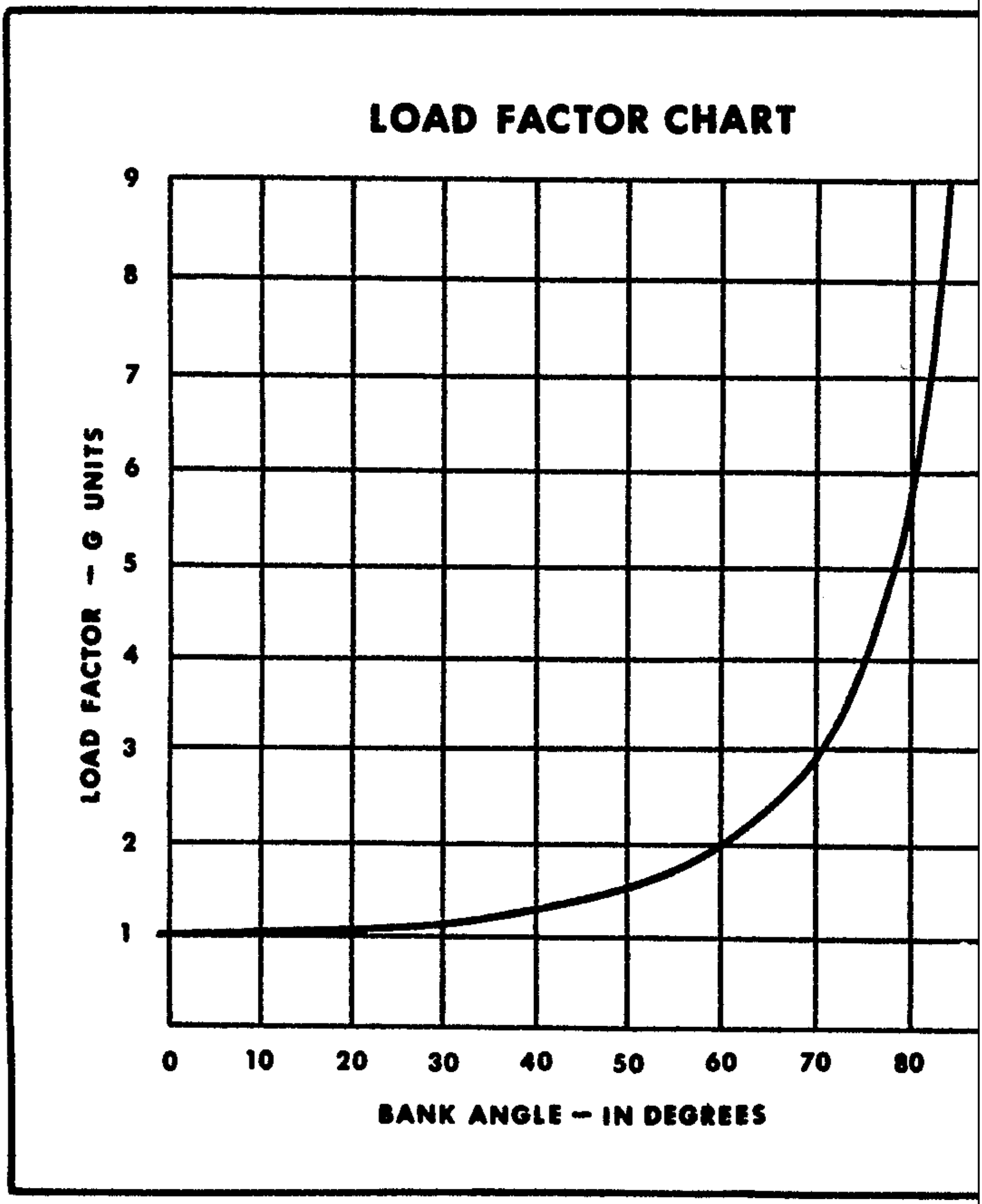


FIGURE 19—Load factor chart.

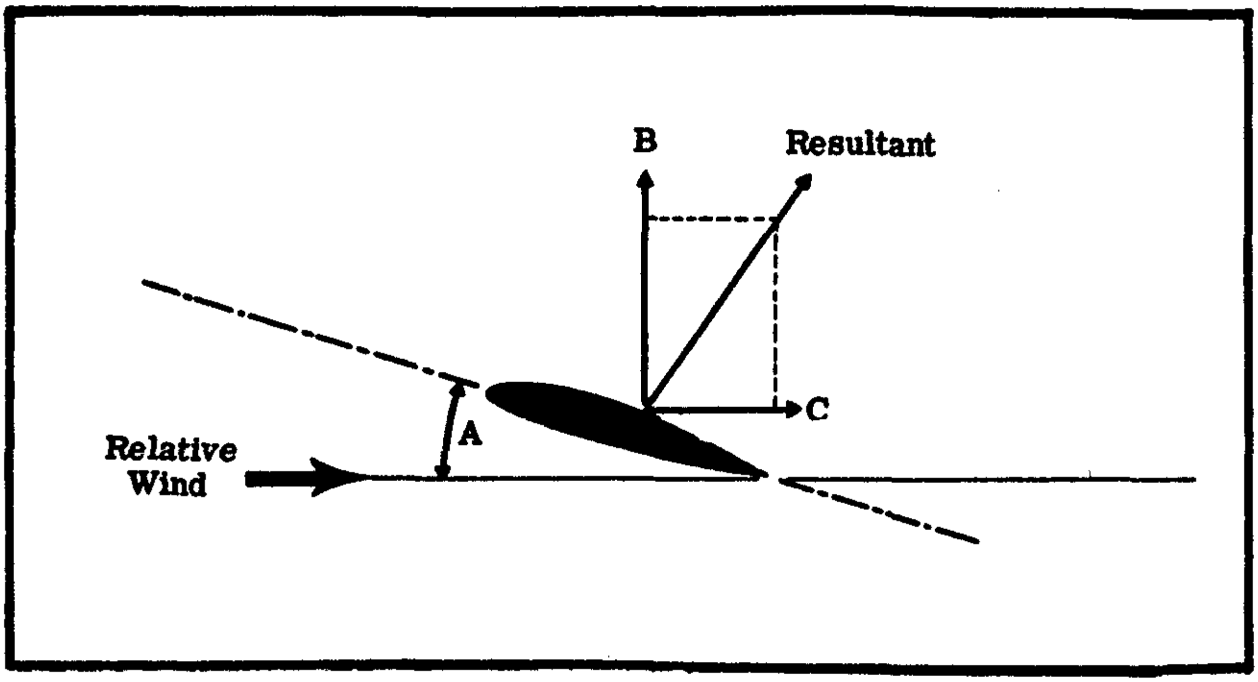


FIGURE 20—Effect of relative wind on airfoils.

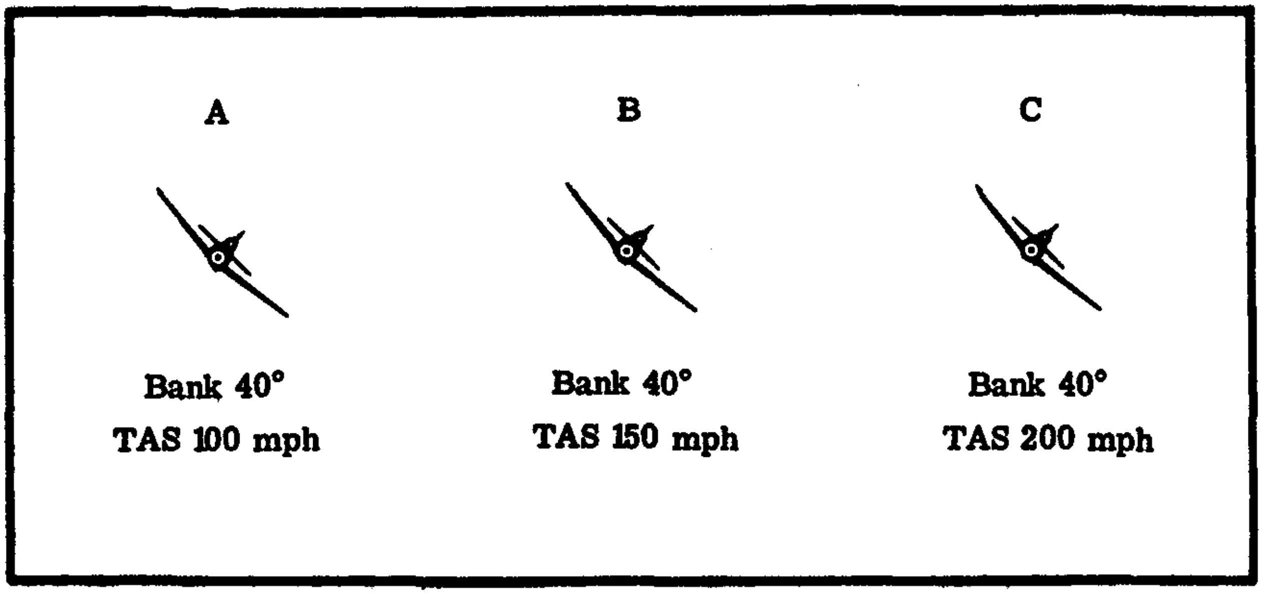


FIGURE 21—Airspeed vs. angle of bank.

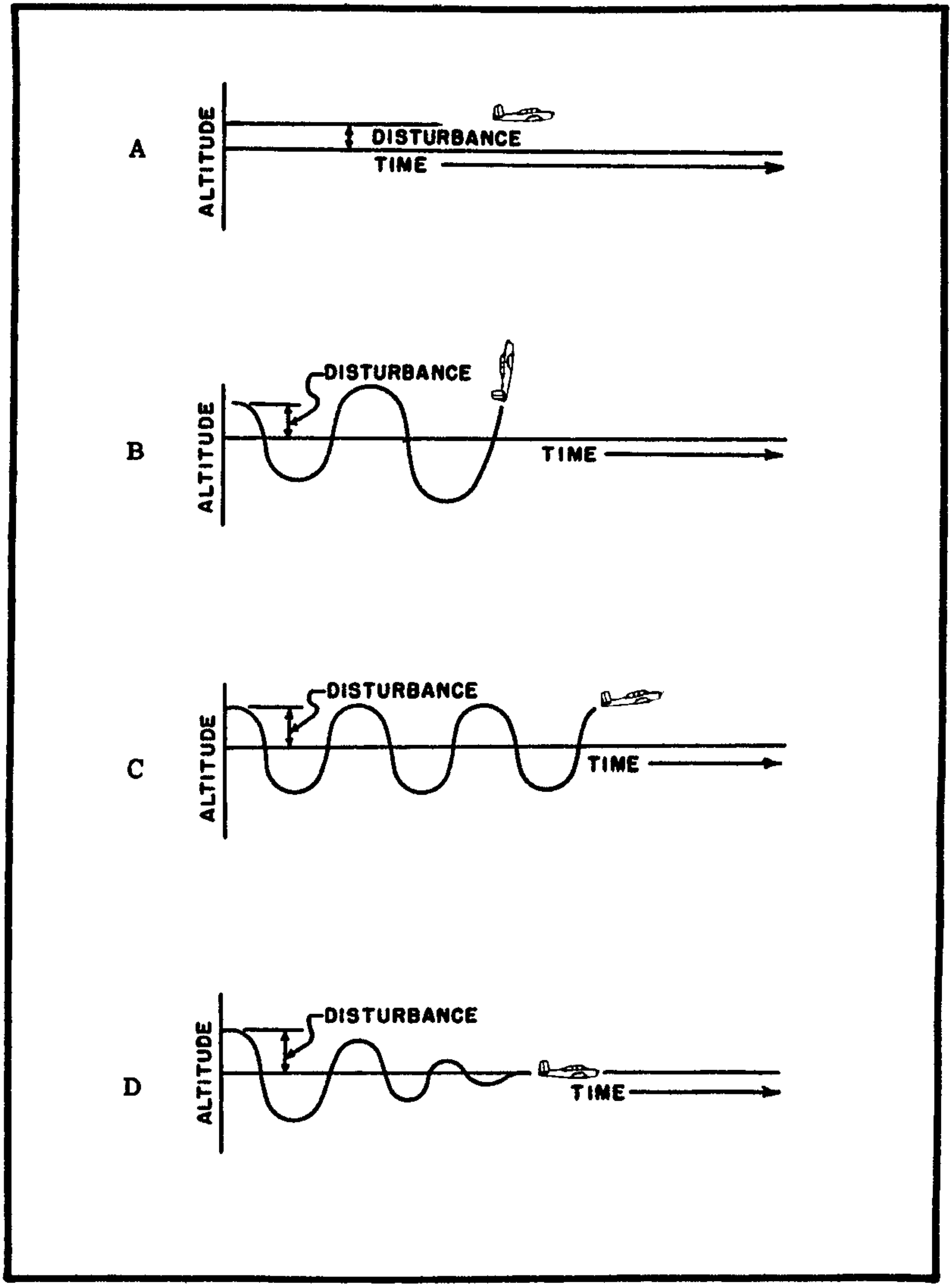


FIGURE 22—Characteristics of types of stability.

FEDERAL AVIATION AGENCY

FLIGHT PLAN

FORM APPROVED
BUDGET BUREAU NO. 04-R072.2

1. TYPE OF FLIGHT PLAN ☐ FVFR ☐ VFR ☐ IFR ☐ DVFR	2. AIRCRAFT IDENTIFICATION	3. AIRCRAFT TYPE	4. TRUE AIRSPEED KNOTS	5. DEPARTURE TIME PROPOSED (Z)	ACTUAL (Z)

6. INITIAL CRUISING ALTITUDE	7. POINT OF DEPARTURE	8. ROUTE OF FLIGHT

9. DESTINATION *(Name of airport and city)*	10. ESTIMATED TIME EN ROUTE HOURS	MINUTES	11. FUEL ON BOARD HOURS	MINUTES	12. ALTERNATE AIRPORT(S)

13. REMARKS

14. PILOT'S NAME	15. PILOT'S ADDRESS OR AIRCRAFT HOME BASE	16. NO. OF PERSONS ABOARD

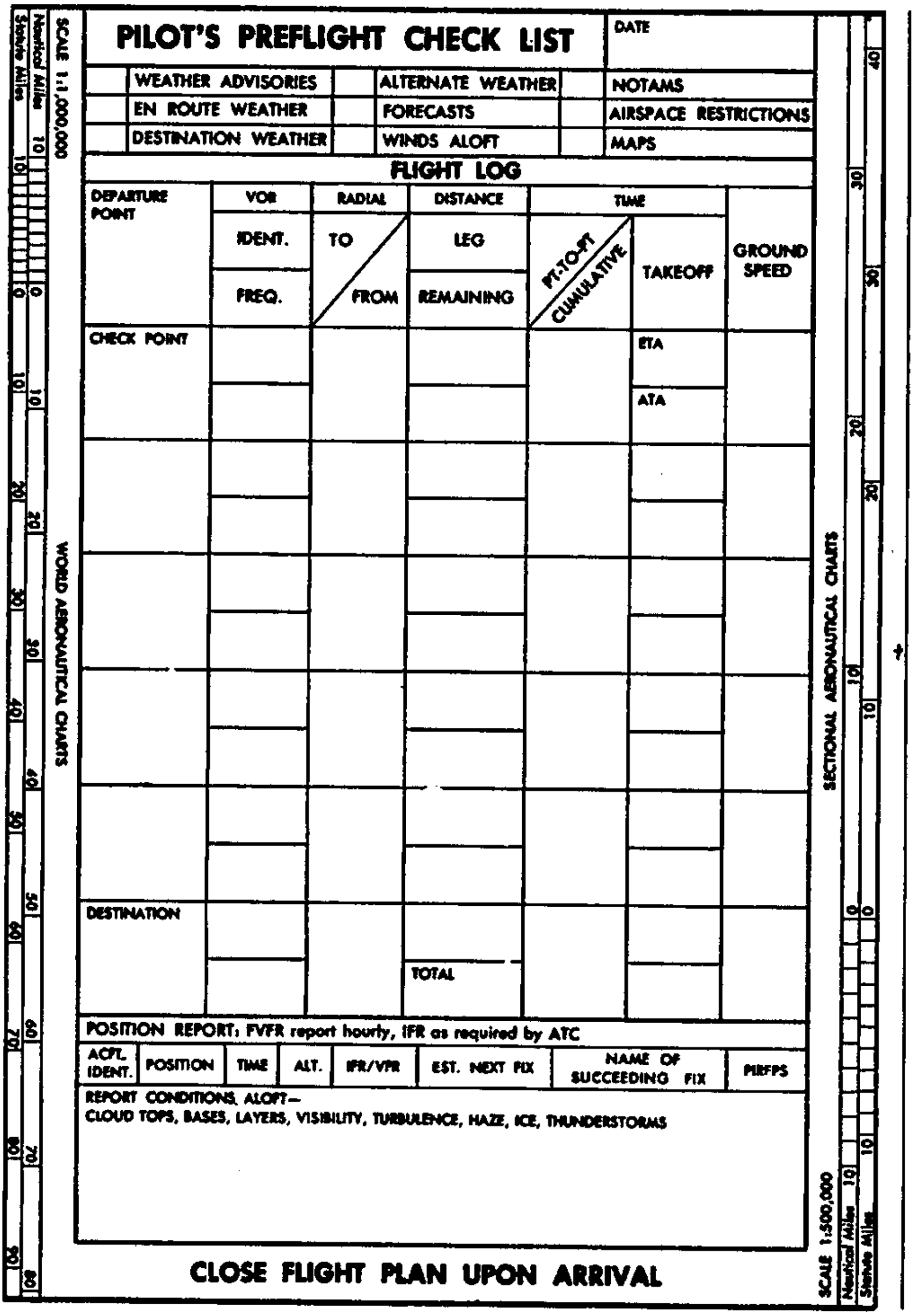
17. COLOR OF AIRCRAFT	18. FLIGHT WATCH

FAA Form 398 (7-64)
USE PREVIOUS EDITION

CLOSE FLIGHT PLAN UPON ARRIVAL

GPO : 1964 OF—730-000 SEE REVERSE (7233)

FIGURE 23—Sample FAA flight plan form.



PILOT'S PREFLIGHT CHECK LIST

DATE

	WEATHER ADVISORIES		ALTERNATE WEATHER		NOTAMS
	EN ROUTE WEATHER		FORECASTS		AIRSPACE RESTRICTIONS
	DESTINATION WEATHER		WINDS ALOFT		MAPS

FLIGHT LOG

DEPARTURE POINT	VOR IDENT. / FREQ.	RADIAL TO / FROM	DISTANCE LEG / REMAINING	TIME PT-TO-PT / CUMULATIVE	TIME TAKEOFF	GROUND SPEED
CHECK POINT					ETA / ATA	
DESTINATION			TOTAL			

POSITION REPORT: FVFR report hourly, IFR as required by ATC

ACFT. IDENT.	POSITION	TIME	ALT.	IFR/VFR	EST. NEXT FIX	NAME OF SUCCEEDING FIX	PIRFPS

REPORT CONDITIONS ALOFT—
CLOUD TOPS, BASES, LAYERS, VISIBILITY, TURBULENCE, HAZE, ICE, THUNDERSTORMS

CLOSE FLIGHT PLAN UPON ARRIVAL

Figure 24—Reverse side of FAA flight plan form, used for preflight and in-flight planning.

COMMODORE AIRCRAFT CORPORATION

AIRPLANE FLIGHT MANUAL
(Excerpts)

Aircraft Designation: Commodore 410 C.

Engine Operation Limitations: 260 HP at 2624 RPM.

Fuel System: Fuel Injection System (fuel discharged into combustion chamber)
Recommended Fuel 100/130 Minimum Grade.
Fuel capacity - Standard tanks - 65 gallons.
Usable Fuel All Flight Conditions 63 gallons.

Oil Capacity: Total 12 quarts.

Propeller: Constant-speed Hydraulically Controlled.

Landing Gear: Retractable tricycle landing gear.
Hydraulic actuators powered by engine driven hydraulic pump.
Emergency operation: Manual hydraulic pump.

Wing Flaps: Hydraulically operated; powered by engine driven hydraulic pump.

Empty Weight: 1,780 lbs.
Maximum Gross Weight: 3,000 lbs.

Load Factor:
Flaps Up + 3.8, - 1.52
Flaps Dn + 3.5

Radio Equipment:

VHF Transmitter	118.1 mc to 126.9 mc
VHF Receiver With Omni	108.1 mc to 126.9 mc
ADF Receiver	200 kc to 1,750 kc

Placards: FUEL - IF 100/130 OCTANE FUEL IS NOT AVAILABLE USE HIGHER OCTANE FUEL ONLY

MAXIMUM GEAR LOWERING SPEED 160 MPH

MANEUVERING SPEED 132 MPH

MAXIMUM ALLOWABLE WEIGHT IN BAGGAGE COMPARTMENT 120 LBS.

FIGURE 25—Excerpts from typical airplane flight manual (COMMODORE).

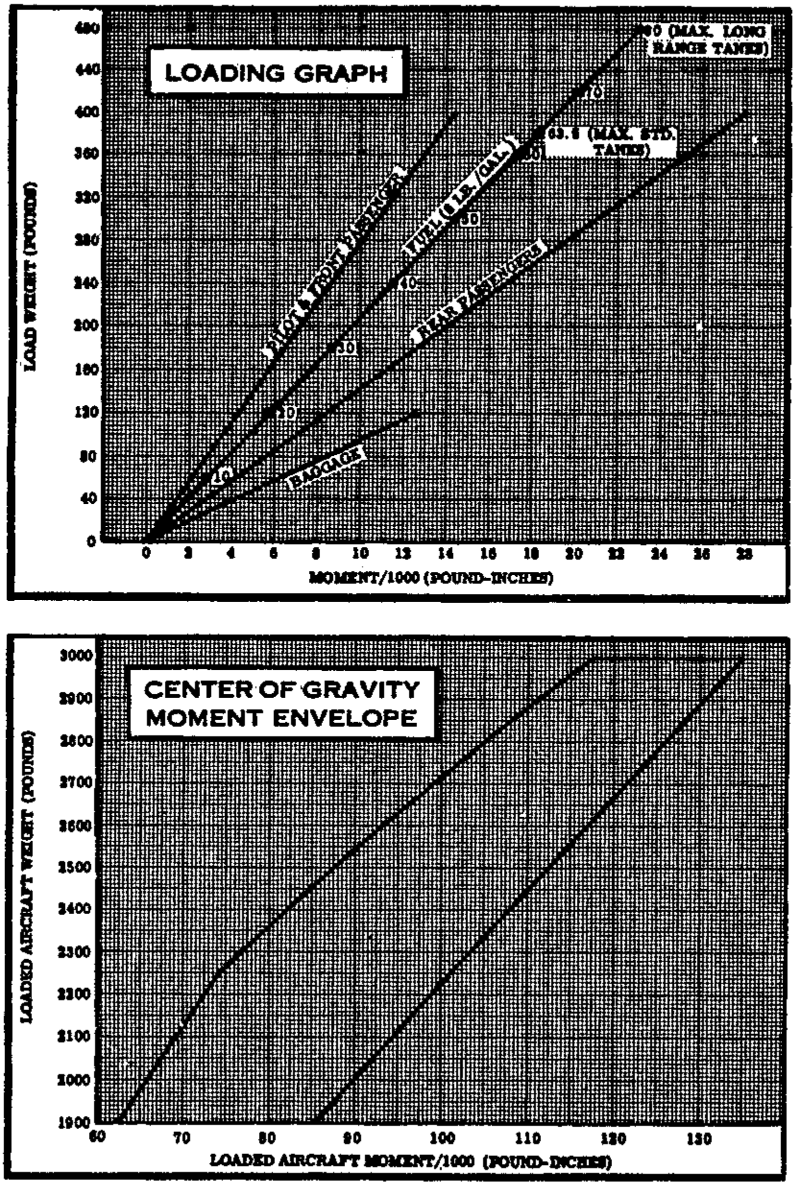


FIGURE 26—Loading graph and CG envelope.

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 FEET & 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	55	0	345	680	405	770	480	885	580	1040
		15	205	460	245	525	295	615	365	725
		30	100	375	120	320	155	380	195	460
2600	60	0	500	915	585	1045	705	1230	855	1470
		15	310	635	370	735	455	870	560	1055
		30	165	395	200	465	255	565	325	695
3000	64	0	695	1210	820	1405	990	1675	1205	2045
		15	450	855	535	1005	660	1215	815	1505
		30	250	555	310	665	390	820	500	1030

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

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	96	1900	2.0	92	1530	2.9	88	1150	3.9	83	760	5.1	78	410	6.6
2600	100	1540	2.0	97	1210	3.1	93	890	4.4	88	580	6.1	84	350	8.6
3000	105	1270	2.0	101	980	3.4	97	690	5.0	94	400	7.3	90	120	11.5

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

FIGURE 27—Takeoff data and climb chart.

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
2200	61	355	945	385	980	415	1020	445	1060
2600	66	420	1030	455	1070	490	1110	530	1155
3000	71	485	1110	525	1150	565	1200	610	1255

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

FIGURE 28—Landing distance table.

STALL SPEED, POWER OFF

Gross Weight 3000 *lbs.*

CONFIGURATION	ANGLE OF BANK 0°	20°	40°	60°
GEAR & FLAPS UP	65	67	74	92
GEAR DOWN, FLAPS 20°	61	63	70	86
GEAR DOWN, FLAPS 40°	60	62	69	85

SPEEDS ARE MPH, TIAS

FIGURE 29—Stall speed chart.

AIRSPEED CORRECTION TABLE

FLAPS 0°								
IAS - MPH	60	80	100	120	140	160	180	200
TIAS - MPH	69	82	100	119	139	160	181	202
***FLAPS 20°**								
IAS - MPH	40	50	60	70	80	90	100	110
TIAS - MPH	57	62	68	75	84	93	102	112
***FLAPS 40°**								
IAS - MPH	40	50	60	70	80	90	100	110
TIAS - MPH	57	62	68	75	83	92	102	111

*Maximum flap speed 110 MPH-TIAS

FIGURE 30—Airspeed correction table.

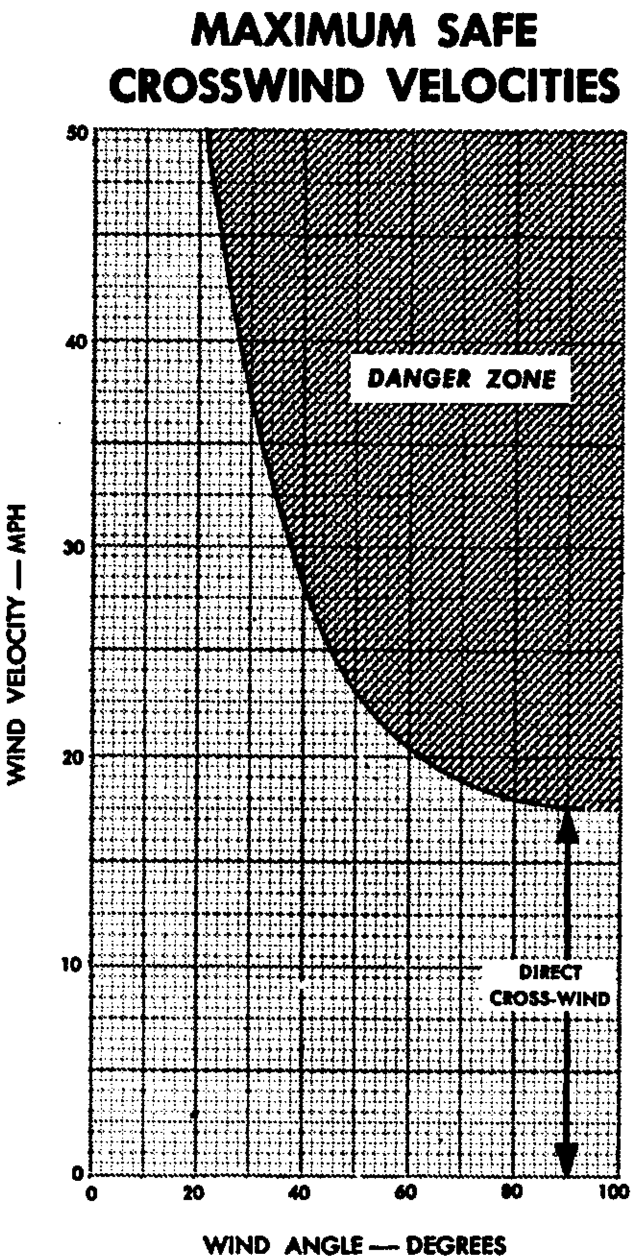


FIGURE 31—Maximum safe crosswind velocity chart.

CRUISE PERFORMANCE — 5000

NORMAL LEAN MIXTURE

Standard Atmosphere • Zero Wind • Gross Weight-3000 Pounds

5000 FEET

RPM	MP	% BHP	TAS MPH	Gal/ Hour	63.5 Gal. (No Reserve) Endr. Hours	63.5 Gal. (No Reserve) Range Miles	80 Gal. (No Reserve) Endr. Hours	80 Gal. (No Reserve) Range Miles
2450	24	79	187	14.8	4.3	800	5.4	1010
	23	74	183	14.0	4.5	830	5.7	1050
	22	70	179	13.1	4.8	870	6.1	1095
	21	65	175	12.3	5.2	905	6.5	1140
2300	24	71	180	13.3	4.8	860	6.0	1080
	23	67	177	12.6	5.0	890	6.4	1125
	22	63	173	11.8	5.4	925	6.8	1170
	21	59	169	11.1	5.7	965	7.2	1215
2200	23	62	172	11.7	5.4	935	6.8	1175
	22	58	168	11.0	5.8	970	7.2	1220
	21	55	165	10.4	6.1	1005	7.7	1265
	20	51	160	9.8	6.5	1040	8.2	1310
2100	22	53	163	10.1	6.3	1020	7.9	1290
	21	50	159	9.6	6.6	1055	8.4	1330
	20	46	154	9.0	7.1	1090	8.9	1370
	19	43	150	8.5	7.5	1115	9.4	1405
	18	40	145	8.1	7.9	1140	9.9	1435
	17	37	139	7.6	8.4	1160	10.6	1465
	16	34	132	7.1	8.9	1175	11.2	1480
	15	31	125	6.7	9.4	1180	11.9	1485

7500 — CRUISE PERFORMANCE

NORMAL LEAN MIXTURE

Standard Atmosphere • Zero Wind • Gross Weight-3000 Pounds

7500 FEET

RPM	MP	% BHP	TAS MPH	Gal/ Hour	63.5 Gal. (No Reserve) Endr. Hours	63.5 Gal. (No Reserve) Range Miles	80 Gal. (No Reserve) Endr. Hours	80 Gal. (No Reserve) Range Miles
2450	22	72	186	13.6	4.7	870	5.9	1095
	21	67	182	12.7	5.0	910	6.3	1145
	20	64	178	12.0	5.3	945	6.7	1190
	19	59	173	11.1	5.7	990	7.2	1245
2300	22	65	179	12.2	5.2	930	6.6	1175
	21	61	175	11.5	5.5	970	7.0	1220
	20	57	171	10.8	5.9	1005	7.4	1270
	19	53	167	10.1	6.3	1040	7.9	1320
2200	22	61	175	11.4	5.6	970	7.0	1225
	21	57	171	10.7	5.9	1010	7.5	1275
	20	53	166	10.1	6.3	1045	7.9	1315
	19	50	162	9.5	6.7	1080	8.4	1360
2100	21	52	165	9.8	6.4	1060	8.1	1335
	20	48	160	9.3	6.8	1095	8.6	1380
	19	45	155	8.7	7.3	1125	9.2	1420
	18	42	150	8.3	7.7	1150	9.7	1450
	17	39	145	7.8	8.1	1175	10.2	1485
	16	35	138	7.4	8.6	1190	10.9	1500
	15	32	131	6.9	9.1	1200	11.5	1510

FIGURE 32—Cruise performance charts.

CRUISE PERFORMANCE — 10,000

NORMAL LEAN MIXTURE

Standard Atmosphere • Zero Wind • Gross Weight-3000 Pounds

10,000 FEET

RPM	MP	% BHP	TAS MPH	Gal/ Hour	63.5 Gal. (No Reserve) Endr. Hours	63.5 Gal. (No Reserve) Range Miles	80 Gal. (No Reserve) Endr. Hours	80 Gal. (No Reserve) Range Miles
2450	20	65	184	12.3	5.2	950	6.5	1200
	19	61	179	11.5	5.5	995	7.0	1250
	18	57	174	10.7	5.9	1035	7.5	1305
	17	52	169	10.0	6.4	1075	8.0	1355
2300	20	59	177	11.1	5.7	1010	7.2	1275
	19	55	173	10.4	6.1	1050	7.7	1325
	18	51	168	9.8	6.5	1090	8.2	1370
	17	48	162	9.1	6.9	1125	8.7	1420
2200	20	55	173	10.4	6.1	1050	7.7	1325
	19	52	168	9.9	6.4	1085	8.1	1365
	18	48	163	9.2	6.9	1120	8.7	1410
	17	44	158	8.7	7.3	1155	9.2	1450
2100	20	50	166	9.5	6.7	1105	8.4	1390
	19	47	161	9.0	7.0	1135	8.9	1430
	18	44	156	8.5	7.4	1160	9.4	1465
	17	40	150	8.0	7.9	1185	9.9	1495
	16	37	144	7.6	8.4	1205	10.5	1520
	15	34	137	7.1	8.9	1215	11.2	1530
	14	30	126	6.6	9.6	1200	12.0	1510

15-20,000 — CRUISE PERFORMANCE

NORMAL LEAN MIXTURE

Standard Atmosphere • Zero Wind • Gross Weight-3000 Pounds

15,000 FEET

RPM	MP	% BHP	TAS MPH	Gal/ Hour	63.5 Gal. (No Reserve) Endr. Hours	63.5 Gal. (No Reserve) Range Miles	80 Gal. (No Reserve) Endr. Hours	80 Gal. (No Reserve) Range Miles
2450	16	51	176	9.8	6.5	1140	8.2	1435
	15	47	170	9.1	6.9	1180	8.8	1485
	14	42	160	8.3	7.6	1220	9.6	1540
	13	39	152	7.8	8.1	1240	10.3	1565
2300	16	46	168	9.0	7.1	1190	8.9	1495
	15	43	162	8.4	7.5	1215	9.5	1530
	14	39	153	7.8	8.1	1245	10.3	1565
	13	35	144	7.3	8.7	1250	10.9	1575
2200	16	44	163	8.5	7.4	1210	9.4	1525
	15	40	156	8.0	7.9	1235	10.0	1555
	14	36	147	7.5	8.5	1250	10.7	1575
2100	16	40	155	7.9	8.0	1235	10.1	1560
	15	36	148	7.5	8.5	1250	10.7	1575
	14	33	136	7.0	9.1	1235	11.4	1555

20,000 FEET

RPM	MP	% BHP	TAS MPH	Gal/ Hour	63.5 Gal. (No Reserve) Endr. Hours	63.5 Gal. (No Reserve) Range Miles	80 Gal. (No Reserve) Endr. Hours	80 Gal. (No Reserve) Range Miles
2450	13.5	43	168	8.4	7.5	1265	9.5	1595
	13	41	165	8.2	7.7	1275	9.7	1605
	12	37	152	7.6	8.4	1275	10.6	1605
2300	13.5	39	159	7.9	8.1	1285	10.2	1620
	13	37	155	7.6	8.3	1285	10.5	1620

FIGURE 33—Cruise performance charts.

BRIGADIER AIRCRAFT CORPORATION

AIRPLANE FLIGHT MANUAL
(Excerpts)

Aircraft Designation: Brigadier 45 H.

Engine Operation Limitations: 240 HP at 2,600 RPM.

Fuel System: Pressure Type Carburetor (Fuel discharged into induction system)
Recommended Fuel 91/96 Minimum Grade
Fuel Capacity Standard Tanks 40 gallons.
Usable Fuel All Flight Conditions 39 gallons.

Oil Capacity: Total 9 quarts.

Propeller: Constant-speed Hydraulically Controlled.

Landing Gear: Retractable Tricycle Landing Gear.
Electrically Operated.
Emergency Operation - Manual Handcrank To Lower Gear ONLY.

Wing Flaps: Electrically Operated.

Empty Weight: 1,833 lbs.
Maximum Gross Weight: 2,900 lbs.

Load Factor:
Flaps Up + 4.4, - 1.7
Flaps Dn + 1.5

Radio Equipment:

VHF Transmitter	118.1 mc to 126.9 mc
VHF Receiver with Omni	108.1 mc to 126.9 mc
ADF Receiver	200 kc to 1,750 kc

Placards: FUEL - IF 91/96 OCTANE IS NOT AVAILABLE USE NEXT HIGHER GRADE

MAXIMUM GEAR OPERATING SPEED 140 MPH

MANEUVERING SPEED 142 MPH

MAXIMUM ALLOWABLE WEIGHT IN BAGGAGE COMPARTMENT 270 LBS.

FIGURE 34—Excerpts from typical airplane flight manual (BRIGADIER).

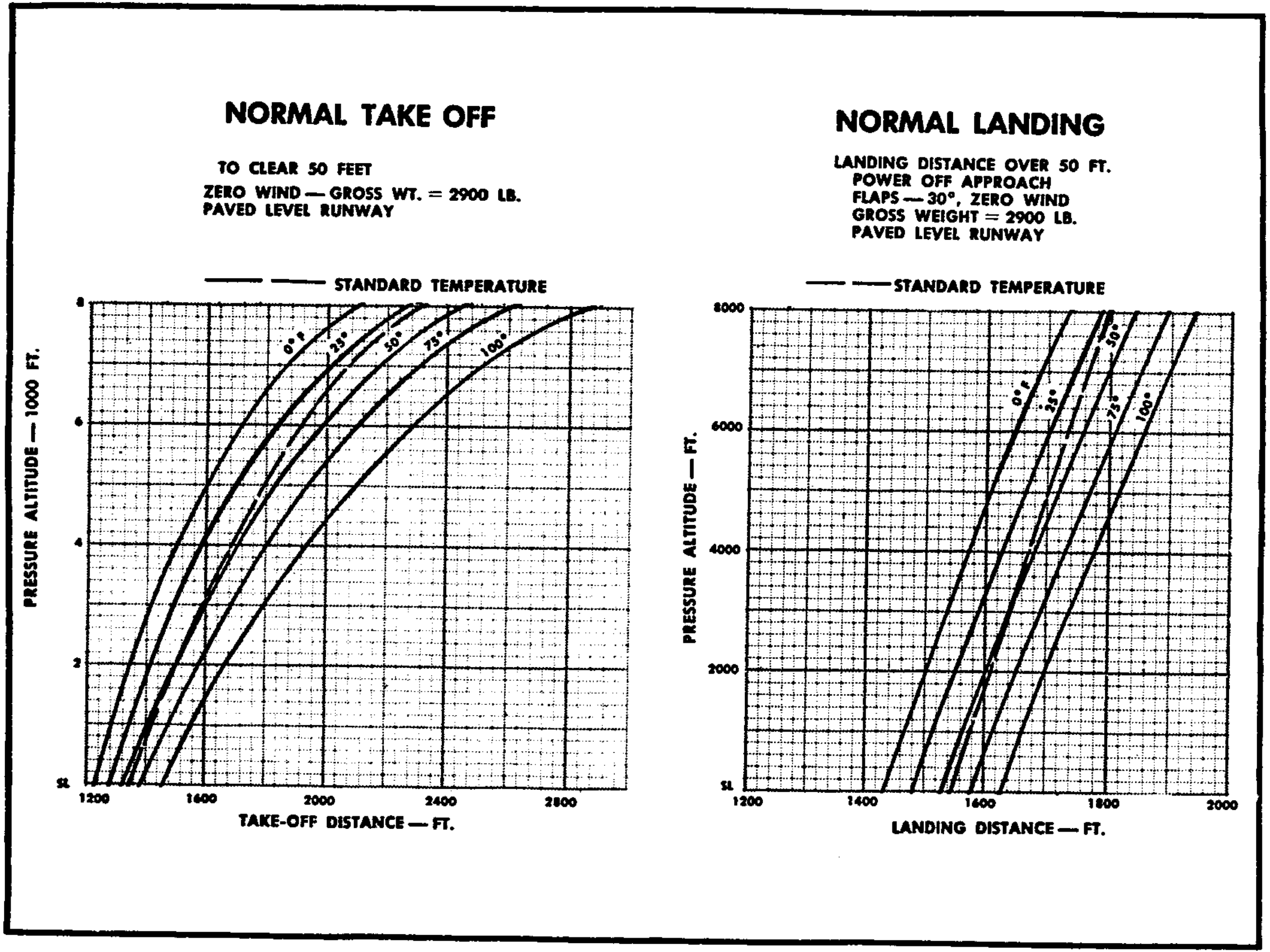


FIGURE 35—Takeoff and landing distance charts.

INSTRUCTIONS
FOR USE OF CRUISE PERFORMANCE DATA

NOTE: NO ALLOWANCES WERE MADE IN THE GRAPHS FOR RESERVES, NOR FOR VARIABLE FACTORS SUCH AS WINDS AND FUEL CONSUMED IN THE WARM-UP AND TAXIING; YOU MUST MAKE ALLOWANCES FOR THESE CONDITIONS AS THEY ACTUALLY EXIST, FROM ONE FLIGHT TO ANOTHER.

HORSEPOWER

TO DETERMINE THE HORSEPOWER BEING DEVELOPED, APPLY THE RPM AND MANIFOLD PRESSURE SETTINGS TO BE USED TO THE CRUISING HORSEPOWER CHART. NOTE THAT THE MANIFOLD PRESSURE REQUIRED TO OBTAIN A GIVEN HORSEPOWER WILL VARY WITH THE OUTSIDE AIR TEMPERATURE.

FUEL CONSUMPTION

TO DETERMINE THE RATE OF FUEL CONSUMPTION, APPLY THE HORSEPOWER BEING USED AND THE CRUISING ALTITUDE TO THE FUEL CONSUMPTION VS HORSEPOWER CHART.

CRUISING AIRSPEED

TO DETERMINE THE CRUISING AIRSPEED THAT RESULTS FROM THE HORSEPOWER BEING USED, APPLY THE HORSEPOWER AND THE CRUISING ALTITUDE TO THE CRUISING OPERATION CHART.

DENSITY ALTITUDE

FOR THE PURPOSE OF THESE CRUISE PERFORMANCE CHARTS, CONSIDER INDICATED ALTITUDE, PRESSURE ALTITUDE, AND DENSITY ALTITUDE AS BEING IDENTICAL IN DETERMINING CRUISE CONTROL DATA FOR THE BRIGADIER AIRPLANE.

FIGURE 36—Instructions for use of typical performance charts as used for Brigadier aircraft.

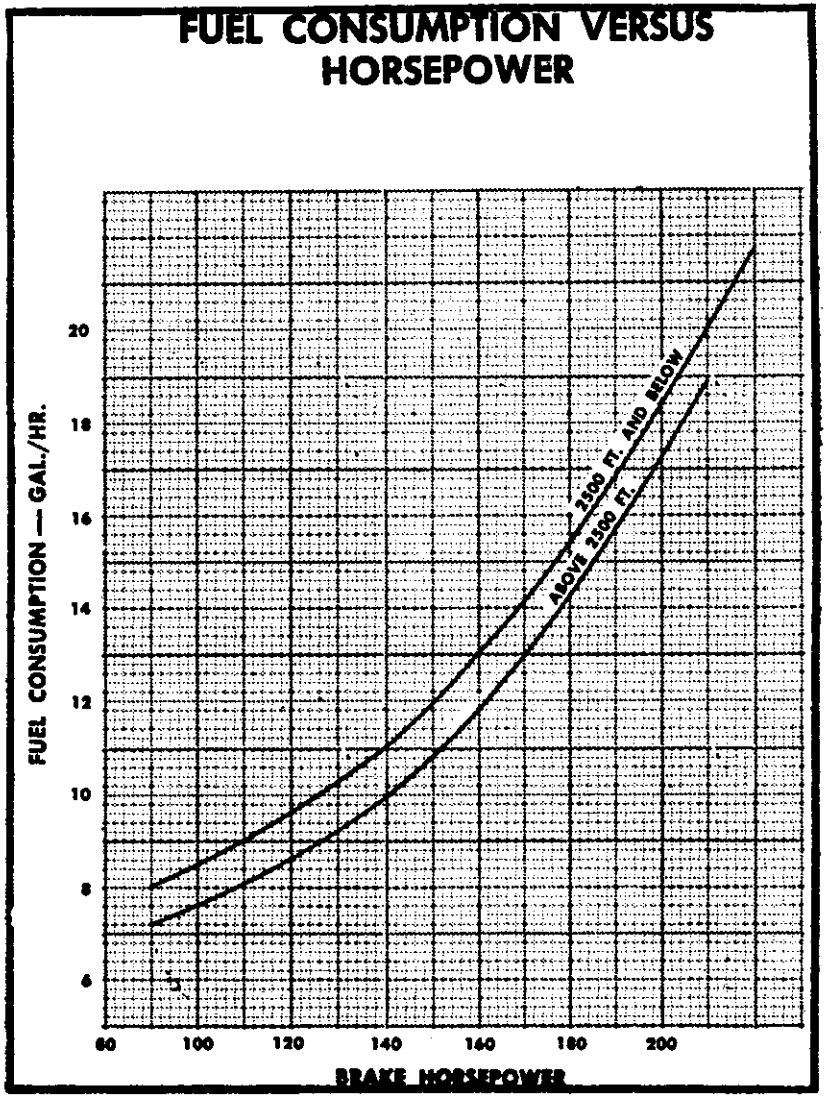


FIGURE 37—Fuel consumption vs. horsepower chart.

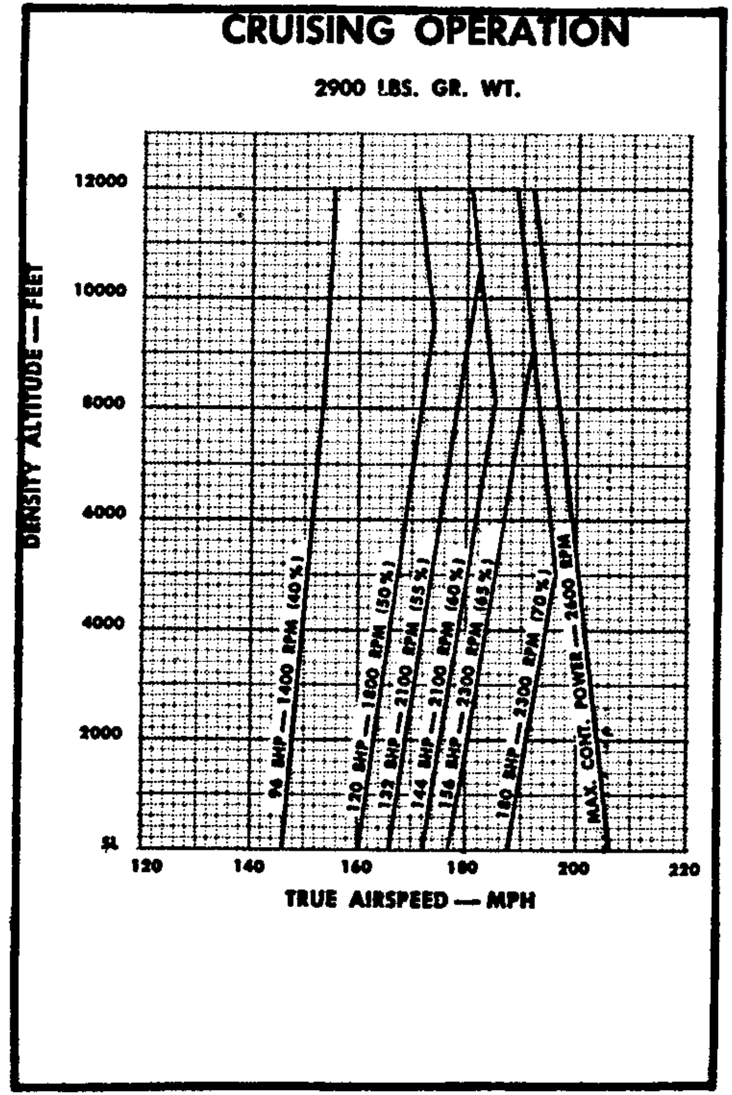


FIGURE 38—Cruising operation chart.

CRUISING HORSEPOWER SETTINGS

Sea Level MP AT 2300 RPM	Sea Level MP AT 2100 RPM	Sea Level MP AT 1900 RPM	OAT °F	BHP	OAT °F	2000 Feet MP AT 2300 RPM	2000 Feet MP AT 2100 RPM	2000 Feet MP AT 1900 RPM
21.4	23.6	26.5		156		21.3	23.6	26.3
20.2	22.3	24.8	0	144	0	20.0	22.0	24.5
19.1	21.0	23.3		132		18.7	20.6	22.8
17.9	19.6	21.8		120		17.6	19.3	21.5
21.7	24.0	26.9		156		21.6	24.0	26.7
20.5	22.7	25.2	20	144	20	20.3	22.4	24.9
19.5	21.4	23.7		132		19.1	21.0	23.2
18.2	19.9	22.2		120		17.9	19.6	21.9
22.0	24.4	27.3		156		21.9	24.3	27.1
20.8	23.0	25.6	40	144	40	20.6	22.7	25.3
19.8	21.7	24.1		132		19.4	21.3	23.6
18.5	20.2	22.5		120		18.2	19.9	22.2
22.3	24.7	27.7		156		22.0	24.5	27.3
21.1	23.3	26.0	60	144	50	20.7	22.9	25.5
20.0	22.0	24.5		132		19.5	21.4	23.8
18.7	20.5	22.8		120		18.3	20.0	22.4
22.5	24.9	27.9		156		22.2	24.6	27.5
21.2	23.5	26.1	70	144	60	20.9	23.0	25.7
20.1	22.1	24.6		132		19.6	21.6	24.0
18.8	20.6	22.9		120		18.4	20.2	22.5
22.6	25.1	28.1		156		22.3	24.8	
21.3	23.6	26.3	80	144	70	21.0	23.2	25.8
20.2	22.2	24.8		132		19.7	21.7	24.1
18.9	20.7	23.0		120		18.5	20.3	22.8
22.8	25.2	28.3		156		22.5	25.0	
21.4	23.7	26.5	90	144	80	21.1	23.3	26.0
20.3	22.3	24.9		132		19.8	21.8	24.3
18.9	20.8	23.0		120		18.6	20.4	22.7
22.9	25.4	28.5		156		22.6	25.2	
21.5	23.8	26.6	100	144	90	21.2	23.4	26.2
20.3	22.3	25.1		132		19.9	21.9	24.4
19.0	20.9	23.1		120		18.6	20.5	22.7

4000 Feet MP AT 2300 RPM	4000 Feet MP AT 2100 RPM	4000 Feet MP AT 1900 RPM	OAT °F	BHP	OAT °F	6000 Feet MP AT 2300 RPM	6000 Feet MP AT 2100 RPM	6000 Feet MP AT 1900 RPM
21.0	23.3			156		20.9	23.0	
19.8	21.8	24.3	0	144	0	19.6	21.6	
18.4	20.3	22.5		132		18.3	20.2	22.4
17.4	19.1	21.2		120		17.2	18.9	21.0
21.3	23.7			156		21.2	23.4	
20.1	22.2	24.7	20	144	20	19.9	22.0	
18.8	20.5	22.9		132		18.7	20.6	22.8
17.7	19.4	21.6		120		17.5	19.2	21.4
21.6	24.0			156		21.4	23.5	
20.4	22.5	25.2	40	144	30	20.1	22.1	
19.1	21.0	23.3		132		18.8	20.7	23.0
18.0	19.7	21.9		120		17.7	19.4	21.6
21.7	24.1			156		21.5	23.7	
20.5	22.6	25.3	50	144	40	20.2	22.3	
19.1	21.1	23.5		132		19.0	20.9	23.2
18.1	19.9	22.1		120		17.8	19.5	21.7
21.9	24.3			156		21.6		
20.7	22.8	25.5	60	144	50	20.3	22.5	
19.3	21.3	23.7		132		19.1	21.0	23.4
18.2	20.0	22.2		120		17.9	19.6	21.9
22.0	24.5			156		21.8		
20.8	23.0		70	144	60	20.5	22.6	
19.4	21.4	23.8		132		19.2	21.2	23.6
18.3	20.1	22.3		120		18.0	19.8	22.0
22.2	24.7			156		21.9		
20.9	23.1		80	144	70	20.6	22.8	
19.5	21.5	24.0		132		19.3	21.3	23.7
18.4	20.2	22.4		120		18.1	19.9	22.1
22.3	24.9			156		22.1		
21.0	23.2		90	144	80	20.7	22.9	
19.6	21.6	24.1		132		19.4	21.4	23.9
18.4	20.3	22.4		120		18.2	20.0	22.2

CRUISING HORSEPOWER SETTINGS

8000 Feet MP AT 2300 RPM	8000 Feet MP AT 2100 RPM	8000 Feet MP AT 1900 RPM	OAT °F	BHP	OAT °F	10000 Feet MP AT 2300 RPM	10000 Feet MP AT 2100 RPM	10000 Feet MP AT 1900 RPM
20.7				156		20.5		
19.4	21.5		0	144	−10	19.1		
18.1	19.9			132		17.7	19.5	
16.9	18.7	20.7		120		16.6	18.2	20.2
21.0				156				
19.7	21.9		20	144	0	19.3		
18.5	20.3			132		17.9	19.7	
17.2	19.0	21.1		120		16.8	18.4	20.4
21.2				156				
19.9	22.0		30	144	10	19.6		
18.6	20.4			132		18.1	19.9	
17.4	19.2	21.3		120		16.9	18.6	20.6
21.3				156				
20.0			40	144	20	19.6		
18.8	20.6			132		18.3	20.1	
17.5	19.3	21.4		120		17.1	18.7	
21.4				156				
20.1			50	144	30	19.8		
18.9	20.7			132		18.4	20.2	
17.6	19.4	21.6		120		17.3	18.9	
21.6				156				
20.3			60	144	40	19.9		
19.0	20.9			132		18.6	20.4	
17.7	19.6	21.7		120		17.4	19.0	
21.7				156				
20.4			70	144	50	20.0		
19.1	21.0			132		18.7	20.5	
17.8	19.7	21.8		120		17.5	19.1	
21.9				156				
20.5			80	144	60	20.2		
19.2	21.1			132		18.8		
17.9	19.8	21.9		120		17.6	19.3	

12000 Feet MP AT 2300 RPM	12000 Feet MP AT 2100 RPM	12000 Feet MP AT 1900 RPM	OAT °F	BHP
				156
18.9			−10	144
17.6				132
16.4	18.0			120
				156
19.1			0	144
17.8				132
16.6	18.2			120
				156
			10	144
18.0				132
16.7	18.4			120
				156
			20	144
18.2				132
16.9	18.5			120
				156
			30	144
18.3				132
17.1	18.7			120
				156
			40	144
18.5				132
17.2	18.8			120
				156
			50	144
18.6				132
17.3	18.9			120
				156
			60	144
18.7				132
17.4	19.1			120

75 PERCENT POWER — 180 BHP — 2300 RPM

OAT	SEA LEVEL AT 2300 RPM	2000 FEET AT 2300 RPM	4000 FEET AT 2300 RPM
0	23.7	23.6	23.4
20	24.0	23.9	23.8
40	24.4	24.3	24.2
60	24.8	24.7	24.6
80	25.2	25.2	25.0
100	25.7	25.7	25.4

FIGURE 39—Cruising horsepower charts.

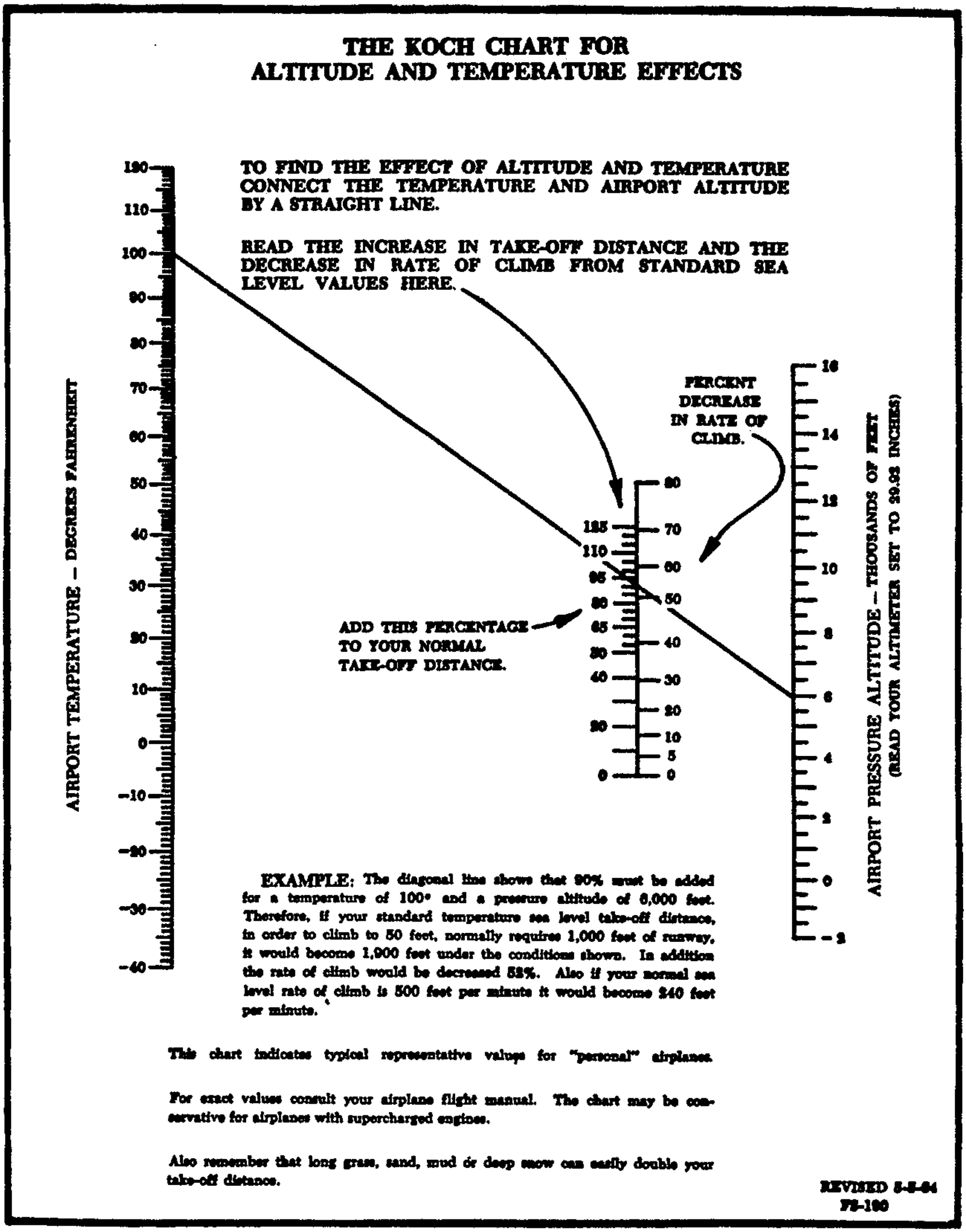


FIGURE 40—Koch chart for computing takeoff distance and rate of climb.

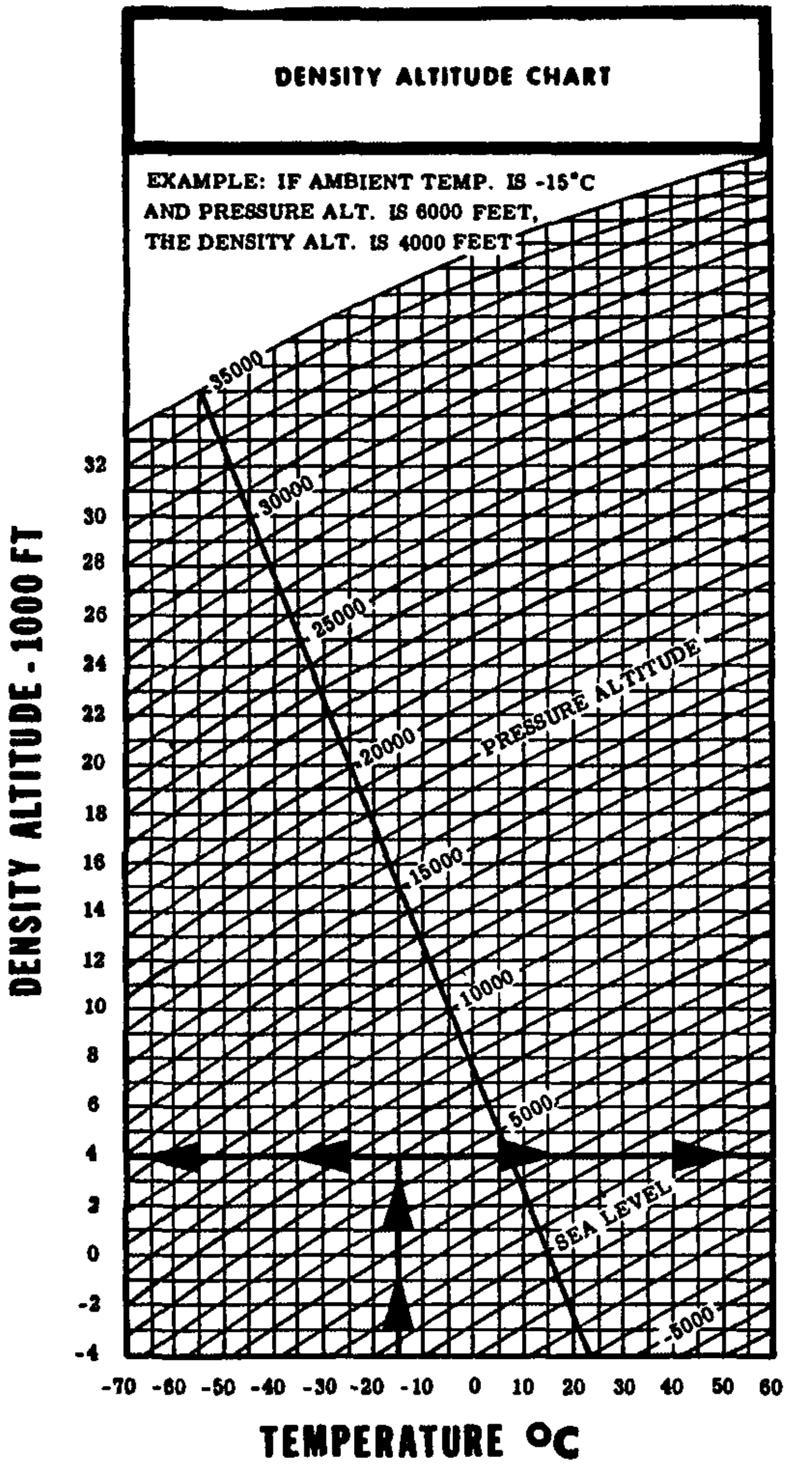


FIGURE 41—Density altitude chart.

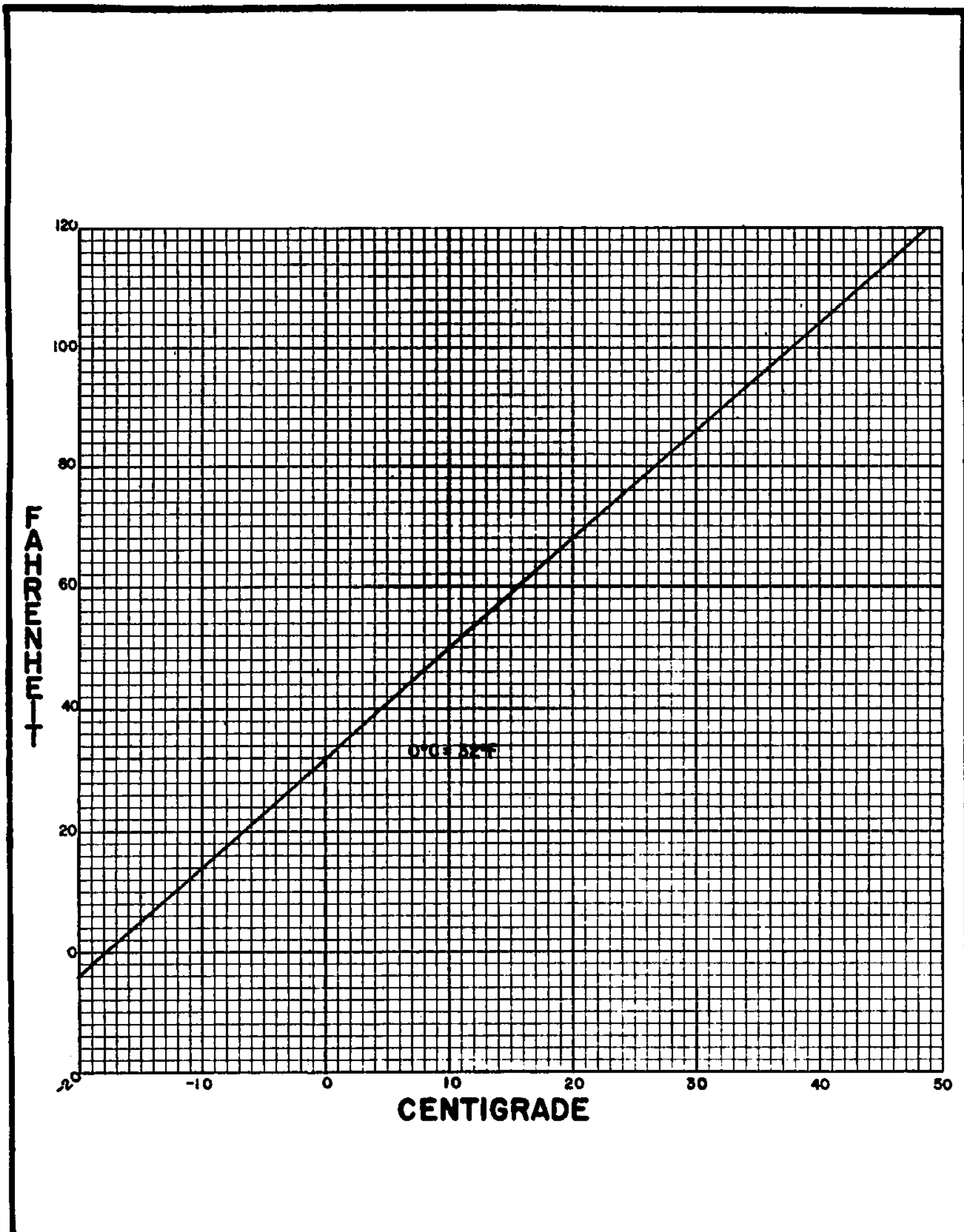


FIGURE 42—Temperature conversion chart.

EXCERPTED

Section I—BASIC FLIGHT MANUAL

AIR NAVIGATION RADIO AIDS

GENERAL

Various types of air navigation aids are in use today, each serving a special purpose in our system of air navigation.

These aids have varied owners and operators namely: the Federal Aviation Agency, the military services, private organizations; and individual states and foreign governments.

The Federal Aviation Agency has statutory responsibility for the operation and maintenance of any of these aids which are, in whole or in part, used by the general public *for air navigation in federally controlled airspace.*

LOW/MEDIUM FREQUENCY (L/MF) RADIO RANGE

1. These ranges are classified by their type of antenna and power. Two types of low-frequency ranges are in use: Loop range (L) and Adcock range (A). Their *normal power output* is divided into three power classifications.

Over 150 watts (R)
50 to 150 watts (MR)
Under 50 watts (M)

2. It is a popular misconception that loop ranges should not be used for homing. The dual-frequency or "*simultaneous*" type loop range transmits a nondirectional signal that can be used quite satisfactorily for this purpose.

3. Low-frequency radio range courses are subject to disturbances that result in multiple courses, signal fades and surges over rough country. *Pilots flying over unfamiliar* routes are cautioned to be on the alert to detect these vagaries, particularly over mountainous terrain.

4. In the near future, all but approximately 87 of the L/MF radio ranges will be decommissioned. Those remaining will be converted to nondirectional radio beacons.

RADIO BEACON

1. A low or medium-frequency radio beacon transmits nondirectional signals whereby the pilot of an aircraft equipped with a loop antenna can determine his bearing and "home" on the station. These facilities normally operate in the frequency band of 200 to 1,750 kc and transmit a continuous carrier with 1,020-cycle modulation keyed to provide *identification* except during voice transmission.

2. The operational purpose for which the facility is installed generally determines the power output and the name classification. The facilities are classified as follows:

Compass Locators: Power output less than 25 watts. (15 miles)
MH Facility: Power output less than 50 watts. (25 miles)
H Facility: Power output greater than 50 watts but less than 2,000 watts. (50 miles)
HH Facility: Power output greater than 2,000 watts. (75 miles)

3. When a LF nondirectional homing beacon is used in conjunction *with the Instrument Landing System* markers, it is called a Compass Locator.

4. All radio beacons except the compass locators transmit a continuous three-letter identification in code except during voice transmissions. Compass locators transmit a continuous two-letter identification in code. The first and second letters of the three-letter location identifier are assigned to the front course outer marker compass locator (LOM), and the second and thrid letters are assigned to the front course middle marker compass locator (LMM).

Example:
ATLANTA, ATL, LOM-AT, LMM-TL.

5. Voice transmissions are made on radio beacons unless the letter "W" (without voice) is included in the class *designator* (HW).

VHF OMNIDIRECTIONAL RANGE (VOR)

1. Omniranges operate within the 108–118 mc frequency band and have a power output of aproximately 200 watts. The equipment is VHF, thus, it is subject to line-of-sight restriction, and its range varies proportionally to the alti*tude of the receiving equipment.* There is some "spill over," however, and reception at an altitude of 1000 feet is about 40 to 45 miles. This distance increases with altitude.

2. There is voice transmission on the VOR frequency and all information broadcast over L/MF ranges is also available over the VOR's.

3. The effectiveness of the VOR depends upon proper use and adjustment of both ground and airborne equipment.

a. **Accuracy:** The accuracy of course alignment of the VOR *is excellent, being generally plus or minus* 1°.

b. **Roughness:** On some VORs, minor course roughness may be observed, evidenced by course needle or brief flag alarm activity (some receivers are more subjct to these irregularities than others). At a few stations, usually in mountainous terrain, the pilot may occasionally observe a brief course needle oscillation, similar to the indication of "approaching station." *Pilots flying over* unfamiliar routes are cautioned to be on the alert for these vagaries, and in particular, to use the "to-from" indicator to determine positive station passage.

(1) Certain propeller RPM settings can cause the VOR Course Deviation Indicator to fluctuate as much as ±6°. Slight changes to the RPM setting will normally smooth out this roughness. *Helicopter rotor speeds may* also cause VOR course disturbances. Pilots are urged to check for this propeller modulation phenomenon prior to reporting a VOR station or aircraft equipment for unsatisfactory operation.

4. The only positive method of identifying a VOR is by its Morse Code identification or by the recorded automatic *voice identification which is always indicated* by use of the word "VOR" following the range's name. Reliance on determining the identification of an omnirange should never be placed on listening to voice transmissions by the Flight Service Station (FSS) (or approach control facility) involved. Many FSS remotely operate several omniranges which have different names *from each other* and in some cases none have the name of the "parent" FSS. (During periods of maintenance the coded identification is removed. See MAINTENANCE OF FAA NAVAIDS.)

5. Voice identification has been added to numerous VHF omniranges. The transmission consists of a voice announcement, "AIRVILLE VOR" (VORTAC) alternating with the usual Morse Code identification. If no air/ground communications facility is associated with the omnirange, "AIRVILLE UNATTENDED VOR" (VORTAC) will be heard.

FIGURE 43—AIM Section I, Basic Flight Manual—Air Navigation Radio Aids.

• VOR RECEIVER CHECK

1. Part 91.25 of the Federal Aviation Regulations provides for certain VOR equipment accuracy checks prior to flight under instrument flight rules. To comply with this requirement and to ensure satisfactory operation of the airborne system, the FAA has provided pilots with the following means of checking VOR receiver accuracy: (1) VOR test facility (VOT), (2) certified airborne check points, and (3) certified check points on the airport surface.

a. The VOR test facility (VOT) transmits a test signal for VOR receivers which provides users of VOR a convenient and accurate means to determine the operational status of their receivers. The facility is designed to provide a means of checking the accuracy of a VOR receiver while the aircraft is on the ground. The radiated test signal is used by tuning the receiver to the published frequency of the test facility. With the Flight Path Deviation Indicator (FPDI) centered the omnibearing selector should read 0° with the to-from indication being "from" or the omnibearing selector should read 180° with the to-from indication reading "to." Should the VOR receiver be of the automatic indicating type, the indication should be 180°. Two means of identification are used with the VOR radiated test signal. In some cases a continuous series of dots is used while in others a continuous 1020 cycletone will identify the test signal. Information concerning an individual test signal can be obtained from the local Flight Service Station.

b. Airborne and ground check points consist of certified radials that should be received at specific points on the airport surface, or over specific landmarks while airborne in the immediate vicinity of the airport.

c. Should an error in excess of ±4° be indicated through use of the ground check, or ±6° using the airborne check, IFR flight shall not be attempted without first correcting the source of the error. CAUTION: no correction other than the "correction card" figures supplied by the manufacturer should be applied in making these VOR receiver checks.

d. The list of airborne check points and ground check points is published in Section III. VOT's are included with the airport information in Section IV A.

TACTICAL AIR NAVIGATION (TACAN)

1. For reasons peculiar to military or naval operations (unusual siting conditions, the pitching and rolling of a naval vessel, etc.) the civil VOR-DME system of air navigation was considered unsuitable for military or naval use. A new navigational system, Tactical Air Navigation (TACAN), was therefore developed by the military and naval forces to more readily lend itself to military and naval requirements. As a result, the FAA has been in the process of integrating TACAN facilities with the civil VOR-DME program. Although the theoretical, or technical principles of operation of TACAN equipment are quite different from those of VOR-DME facilities, the end result, as far as the navigating pilot is concerned, is the same. These integrated facilities are called VORTAC's.

2. TACAN ground equipment consists of either a fixed or mobile transmitting unit. The airborne unit in conjunction with the ground unit reduces the transmitted signal to a visual presentation of both azimuth and distance information. TACAN is a pulse system and operates in the UHF band of frequencies. Its use requires TACAN airborne equipment and does not operate through conventional VOR equipment.

VHF OMNIDIRECTIONAL RANGE/TACTICAL AIR NAVIGATION (VORTAC)

•1. VORTAC is a facility consisting of two components, VOR and TACAN, which provides three individual services: VOR azimuth, TACAN azimuth and TACAN distance (DME) at one site. Although consisting of more than one component, incorporating more than one operating frequency, and using more than one antenna system, a VORTAC is considered to be a unified navigational aid. Both components of a VORTAC are envisioned as operating simultaneously and providing the three services at all times.

2. Transmitted signals of VOR and TACAN are each identified by three-letter code transmission and are interlocked so that pilots using VOR azimuth with TACAN distance can be assured that both signals being received are definitely from the same ground station. A supplementary automatic voice identification is being added to the VOR. The frequency channels of the VOR and the TACAN at each VORTAC facility are "paired" in accordance with a national plan to simplify airborne operation.

• OPERATIONAL LIMITATIONS VOR/VORTAC/TACAN

1. The terms VOR, VORTAC, and TACAN are, operationally, general terms covering the VHF and UHF omnidirectional bearing type of facilities without regard to the fact that the power, the frequency protected area, the equipment configuration, and operational requirements may vary between the facilities at different locations.

2. The table below lists the intended operational service volume or volumes of the various categories of VOR's VORTAC's, and TACAN's. Below 18,000 feet msl, the operational service volume of the H class facility has been limited to the L class service volume due to signal coverage characteristics of VHF and UHF facilities at the lower altitudes. T class facilities provide terminal service at locations where it is not practicable to provide L class frequency protection. Normal signal coverage and interference free service may be expected within the operational service volume unless specific facility restrictions have been imposed. Except along established airways or routes, use of these facilities for IFR operations outside of the operational service volume without additional flight inspection is not intended and may result in undependable or inadequate indications in the cockpit.

Class of VOR, VORTAC, or TACAN	Operational Service Volume
T (Terminal)	25 nmi up to 12,000′ msl
L (Low altitude)	40 nmi up to 18,000′ msl
H (High altitude)	40 nmi up to 18,000′ msl 130 nmi from 18,000′ msl 45,000′ msl 100 nmi above 45,000′ msl

FIGURE 44—AIM Section I, Basic Flight Manual—Air Navigation Radio Aids.

MAINTENANCE OF FAA NAVAIDS

1. During periods of routine or emergency maintenance, the coded identification (or code and voice, where applicable) will be removed from certain FAA Navaids, namely, ILS localizers, VHF ranges and L/MF ranges but not from "H" facilities, compass locators or 75 mc marker beacons. The removal of identification serves as warning to pilots that the facility has been officially taken over by "Maintenance" for tune-up or repair and may be unreliable even though on the air intermittently or constantly.

NAVAIDS WITH VOICE

1. Voice equipped en route radio navigational aids are under the operational control of an FAA Flight Service Station (FSS), or an approach control facility. Most are remotely operated.

2. Unless otherwise noted on the chart, all radio navigation aids operate continuously except during interruptions for voice transmissions on the same frequencies where simultaneous transmission is not available, and during shutdowns for maintenance purposes. Hours of operation of those facilities not operating continuously are annotated on the charts.

RADIO INTERFERENCE

1. *You can do your part toward reducing radio interference* to aeronautical services from nonaeronautical sources which may be noted during flight if such is reported promptly to an FAA facility (preferably after landing) or to an FCC field office. Reports should state the frequency or channel affected, description of the interference, and the geographical area where the interference was observed. If known, reports should give the apparent cause of the interference such as radio stations, call letters when such can be identified, industrial plants, *diathermy machines, power lines, television receivers, etc.* Do not report interference caused by normal frequency congestion, i.e., signals from other aircraft using the frequency.

2. In complex aircraft radio installations involving more than one receiver, there are many combinations of possible interference between units. This interference can cause either erronous navigation indications or complete or partial blanking out of the communications. Pilots should be familiar enough with the radio installation of particular airplanes they fly to recognize this type of interference. Explanations of this type of interference are contained in Bureau of Flight Standards Release 486 and Flight Standards Service Release 450. Copies can be obtained by writing to the Federal Aviation Agency, Correspondence Inquiry Section, HQ-440, Publishing and Graphics Division, Washington, D.C., 20553.

SIMULTANEOUS VOICE TRANSMISSIONS FROM A SINGLE LOCATION

1. At several FAA facilities, simultaneous voice transmissions are made from a single location. For example, the New York FSS controls the transmitters at Hampton, Riverhead, Hempstead L/MF and VOR facilities.

2. To provide a uniformly brief announcement, generally for broadcast purposes, the name of the controlling facility, followed by the word AREA will be used, e.g., THIS IS NEW YORK AREA RADIO, etc.

3. Call from aircraft will be answered using the name of the station as stated by the pilot, e.g., a pilot calling "Riverhead Radio" will be answered by the New York FSS, *"THIS IS RIVERHEAD RADIO, etc*

4. The word "AREA" signifies that the transmission from the named (controlling) location is emanating simultaneously from two or more remotely controlled facilities, having a different name or names.

VHF/UHF DIRECTION FINDER

1. The VHF/UHF Direction Finder (VHF/UHF/DF) is one of the Common System equipments that helps the *pilot without his being aware of its operation. The VHF/* UHF/DF is a ground-based radio receiver used by the operator of the ground station where it is located.

2. The equipment consists of a directional antenna system, a VHF and a UHF radio receiver. At a radar-equipped tower or center, the cathode-ray tube indications may be superimposed on the radarscope.

3. The VHF/UHF/DF display indicates the magnetic direction of the station from the aircraft each time the aircrat transmits. Where DF equipment is tied into radar, a strobe of light is flashed from the center of the radarscope in the direction of the transmitting aircraft.

4. DF equipment is of particular value in locating lost aircraft and in helping to identify aircraft on radar.

FREQUENCY UTILIZATION PLAN

AIR NAVIGATION AIDS

108.1–111.9 mc: ILS localizer with simultaneous radiotelephone channel operating on odd-tenth decimal frequencies (108.1, 108.3 etc.)

108.2–111.8 mc: VOR's operating on even-tenth decimal frequencies (108.2, 108.4 etc.).

112.0–117.9 mc: Airway track guidance. (VORs)

COMMUNICATIONS

118.0–121.4 mc: AIR TRAFFIC CONTROL COMMUNICATIONS

121.5 mc: EMERGENCY (WORLD-WIDE)

121.6–121.95 mc: AIRPORT UTILITY

122.1, 122.2 mc: PRIVATE AIRCRAFT ENROUTE

122.5, 122.7, 122.6, 122.4 mc: PRIVATE AIRCRAFT TO TOWERS

122.8, 123.0 mc: AERONAUTICAL ADVISORY STATIONS (UNICOM)

122.9 mc: AERONAUTICAL MULTICOM STATIONS

123.1–123.55 mc: FLIGHT TEST AND FLYING SCHOOLS

123.6–128.8 mc: AIR TRAFFIC CONTROL COMMUNICATIONS

126.7 mc: FLIGHT SERVICE STATIONS

128.85–132.0 mc: AERONAUTICAL ENROUTE STATIONS (AIR CARRIER)

132.05–135.95 mc: AIR TRAFFIC CONTROL COMMUNICATIONS

135.9 mc: FLIGHT SERVICE STATIONS

FIGURE 45—AIM Section I, Basic Flight Manual—Air Navigation Radio Aids.

GENERAL

1. The U.S. Weather Bureau maintains a comprehensive surface and upper air weather observing program and a nation-wide aviation weather forecasting an pilot briefing service.
2. Weather observations are made each hour or more often at over 600 locations in the United States. These observations may be used to determine the present weather conditions for flight planning purposes.
3. Every six hours the Weather Bureau's Aviation Forecasting Centers prepare detailed flying weather forecasts for 12-hour periods for about 385 air terminals in the United States including Alaska and Hawaii. In addition, 24-hour terminal forecasts are provided for about 120 major airports throughout the country. Every six hours a detailed 12-hour area forecast is prepared for each of the 29 areas into which the continental United States has been divided for forecasting purposes. In Hawaii, forecasts are issued for the main traveled air routes instead of areas. Winds aloft forecasts are provided for about 150 locations in the United States including Alaska and Hawaii for flight operational purposes. All of the above flying weather forecasts are given wide distribution via teletypewriter circuits.
4. Available aviation weather reports and forecasts are displayed at each Weather Bureau Station and FAA Flight Service Station. Pilots should feel free to help themselves to this information or to ask the assistance of the duty employee.
5. When telephoning for information, use the following procedures:
   a. Identify yourself as a pilot and give aircraft identification if known. (Many persons calling WB stations want information for purposes other than flying.)
   b. State your intended route, destination, proposed departure time, and estimated time en route.
   c. Advise if prepared to fly IFR.
6. Direct pilot-to-weather briefer service is available by radio contact with any Flight Service Station operated by the FAA. Flight Service Specialists are qualified and certificated by the USWB as Pilot Weather Briefers. They are not authorized to make original forecasts but are authorized to adapt, translate and interpret available forecasts and reports directly into terms of the weather conditions which you can expect along your flight route and at destination. They also will assist you in selecting an alternate course of action in the event adverse weather is encountered. It is not necessary to be thoroughly familiar with the standard phraseologies and procedures for air/ground communications. A brief call stating your message in your own words will receive immediate attention.

TRANSCRIBED WEATHER BROADCASTS

1. Equipment is provided at selected FAA FSSs by which meteorological and Notice to Airmen data is recorded on tapes and broadcast continuously over the low-frequency (200–400 kc) navigational aid (L/MF range or H facility).
2. Broadcasts are made from a series of individual tape recordings. The first three tapes identify the station, give general weather forecast conditions in the area, pilot reports (PIREP), radar reports when available, and winds aloft data. The remaining tapes contain weather at selected locations within a 400-mile radius of the central point. Changes, as they occur are transcribed onto the tapes.

3. Automatic transcribed broadcasts service is available on class H facilities designated as:

a. HSAB—A class H radio beacon required for IFR radio navigation and/or airtraffic control and for automatic transcribed weather broadcast service. This class facility will be depicted on radio facility, Sectional and WAC type charts.

b. SABH—A class H radio beacon having limited navigational use in that it is not flight inspected for IFR certification or primarily used for air traffic control. This aid will provide the automatic transcribed weather broadcast service and will be depicted on Sectional and WAC type charts, only.

4. Operation of either type facility will be essentially the same. Both will have a code identification sent at frequency intervals keyed simultaneously with the voice signals. Although, not essential, it may be advantageous to listeners to equip their receivers with a 1020 cycle code rejection filter which, when switched to the "voice" position, will silence the keyed code identification signal.

5. The AB (automatic transcribed service) component of HSAB's and SABH's will operate continuously except during those periods when the transcription equipment is inoperative. During these periods manual broadcasts, scheduled (H+45 hourly) and non-scheduled will be made.

FIGURE 46—AIM Section I, Basic Flight Manual—Weather.

SCHEDULED WEATHER BROADCASTS

1. All Flight Service Stations having voice facilities on continuously operated radio ranges or radio beacons broadcast weather reports and other airway information at 15 and 45-minutes past each hour. The 45-minute past the hour broadcast is an "airway" broadcast consisting of weather reports from important terminals located on airways within approximately 400 miles of the broadcasting station. The 15-minute past the hour broadcast is an "area" broadcast consisting of weather reports from the stations within approximately 150 miles of the broadcasting station.

2. At each station, the material broadcast on schedule and the order in which it is broadcast follows:

a. Alert notice announcement.

b. SIGMET (Significant Meterology) or Advisory for Light Aircraft (if available).

c. Pilot report/s when available.

d. Radar report/s if available.

e. Aviation weather.

f. Flight information—any non-meteorological information not a part of a weather report but which requires broadcast.

g. Additional special weather reports and some Notice to Airmen data are broadcast off-schedule upon receipt.

NOTE.—Winds aloft forecast will be transmitted only on pilot's request.

3. The time *of observation of* weather reports included in a scheduled broadcast normally is 58 minutes past the hour preceding the broadcast. When the time of observation is otherwise, the observation time is given.

● IN-FLIGHT WEATHER ADVISORIES
(Effective July 1, 1965)

1. The *U.S. Weather Bureau* issues in-flight safety advisories, in the 48 contiguous States, designated as SIGMETs and AIRMETs.

2. The purpose of this service is to make available to any aircraft in-flight information on weather which may be hazardous to the flight. Whether or not the condition described is potentially hazardous to a particular flight is for the pilot himself to evaluate on the *basis of his own experience* and the operational limits of his aircraft.

3. SIGMET advisories include weather phenomena potentially hazardous to *all* aircraft, specifically:

a. Tornadoes.

b. Line of thunderstorms (squall lines).

c. Hail ¾" or more.

d. Severe and extreme turbulence.

e. Heavy icing.

f. Widespread duststorms/sandstorms, lowering visibilities of less than two miles.

EXCERPTED

4. AIRMETs (formerly designated "Advisories for Light Aircraft") include weather phenomena of less severity than that covered by SIGMETs which are potentially hazardous to aircraft having limited capability because of lack of equipment or instrumentation, or pilot qualifications and are at least of operational *interest to all aircraft, specifically:*

a. Moderate icing.

b. Moderate turbulence.

c. The initial onset of phenomena producing extensive areas of visibilities less than two miles or ceilings less than 1000 feet, including mountain ridges and passes, and winds of 40 knots or more within 2000 feet of the surface.

NOTE.—SIGMETs apply to *all categories of aircraft.* When SIGMET and AIRMET weather categories apply simultaneously for approximately the same area, AIRMET information is appended to the SIGMET as an "additional AIRMET" advisory.

5. Identification of SIGMETs and AIRMETs—Advisories are identified by a letter and number beginning each midnight local standard time (LST) in the Flight Advisory Service (FAWS) office where issued. The first Advisory, SIGMET or AIRMET, is identified as "Alfa 1" and each succeding *related* advisory retains the same letter designator but is given the next number, i.e., "Alfa 2," "Alfa 3," etc. If a SIGMET or AIRMET condition develops in a second distinctly separate sector of the FAWS area, the advisory is identified as "Bravo 1," "Bravo 2," etc. Similarly, a third area is identified as "Charlie 1," "Charlie 2," etc.

6. The following are examples of a SIGMET, AIRMET, and a combination of the two:

a. KANSAS CITY SIGMET ALFA 2. SOLID LINE THUNDERSTORMS 50 MILES WIDE FROM WEST OF GRAND ISLAND NEBRASKA TO HILL CITY TO GARDEN CITY AT 1400 CST MOVING EAST AT 35 KNOTS REACHING LINCOLN-SALINA-HUTCHINSON LINE BY 1900 CST. THUNDERSTORMS LOCALLY SEVERE WITH TOPS TO 45 THOUSAND.

b. MEMPHIS AIRMET BRAVO 1. TENNESSEE SOUTH OF LINE FROM DYERSBURG TO NASHVILLE TO CROSSVILLE CONDITIONS LOWERING RAPIDLY IN RAIN AND FOG TO BELOW 1 THOUSAND FEET AND BELOW 2 MILES BY NOON WITH HIGHER TERRAIN OBSCURED. CONDITIONS CONTINUING BEYOND 1400 CST.

c. WASHINGTON AIRMET ALFA 1 CANCELED. SIGMET ALFA 2. MODERATE OR MORE CLEAR AIR TURBULENCE EXTENDING FROM SOUTH CENTRAL VIRGINIA THROUGH DELAWARE AT 14 THOUSAND TO 24 THOUSAND FEET CONTINUING TO 0800 EST OR LATER. ADDITIONAL AIRMET. OVER EASTERN VIRGINIA EASTERN MARYLAND AND DELAWARE MODERATE ICING 2 THOUSAND TO 8 THOUSAND FEET DECREASING BUT WITH WINDS LOWER LEVELS BECOMING 40 TO 50 KNOTS BY 0800 EST WITH MODERATE TURBULENCE.

7. FAA flight service stations (FSSs) broadcast SIGMETs and AIRMETs during their valid period when they pertain to the area within 150 NM of the FSS as follows:

a. SIGMETs—At 15 minute intervals: H+00, H+15*, H+30, and H+45*; AIRMETs—At 30 minute intervals: H+15* and H+45*.

*Included in the regular scheduled broadcasts.

FIGURE 47—AIM Section I, Basic Flight Manual—Weather.

COMMUNICATIONS

1. Pilots of departing aircraft should communicate with the control tower on the appropriate ground control frequency for taxi and clearance information and, unless otherwise advised, should remain on that frequency until they are ready to request take-off clearance. At that time, the pilot should communicate with the tower on the appropriate local control quency.

EXCERPTED

2. The airport ground control frequencies 121.7 and 121.9 mc are normally provided to eliminate frequency congestion on the tower (local control) frequency. Provision of these frequencies for ground control and their use by aircraft and airport utility vehicles operated on the surface of the airport thus provides a clear VHF channel for arriving and departing aircraft. They are used for issuance of taxi information, clearances, and other necessary contacts between the tower and aircraft or other vehicles operated on the airport. Normally, only one of these ground control frequencies is assigned for use at an airport; however, at locations where the amount of traffic so warrants, both frequencies may be assigned with one or the other designated as a clearance delivery frequency.

3. Where the "ground control" frequency is not available (tower or aircraft), the tower normally will transmit to aircraft over an appropriae ground to air frequency.

4. Pilots of aircraft not equipped to transmit on a ground control frequency should transmit on the tower frequency and tune their receivers to the appropriate ground control frequency in accordance with the above.

c. Special VFR Flight Clearance Procedures (F.A.R. Part 91.107)

(1) An Air Traffic Control clearance is necessary to avoid collision when operating under special VFR weather minimums in a control zone. When a control tower is located within the control zone, a clearance must obtained from the tower before entering the control zone. If no control tower is located within the control zone, a clearance must be obtained from the nearest tower, center, or Flight Service Station, prior to entering the control zone. In this instance, clearance arrangements can be made by telephone.

(2) It is not necessary to file a complete flight plan with the request for clearance but the pilot should state his intentions in sufficient detail to permit air traffic control to fit his flight into the traffic flow. The clearance will not contain a specific altitude as the pilot must remain clear of clouds. The controller may require the pilot to fly at or below a certain altitude due to other traffic, but the altitude specified will permit flight at or above the minimum safe altitude. In addition, at radar locations, flights may be vectored if necessary for control purposes or on pilot request.

VFR ADVISORY INFORMATION

1. VFR advisory information is provided by numerous radar and nonradar *Approach Control* facilities to those pilots intending to land at an airport served by an approach control tower. This information includes: wind, runway, traffic and NOTAM information.

2. Such information will be furnished upon initial contact with concerned approach control facility. The pilot will be requested to change to the *tower* frequency at a predetermined time or point, to receive further landing information.

3. Where available, use of this procedure will not hinder the operation of VFR flights by requiring excessive spacing between aircraft or devious routing. Radio contact points will be based on time or distance rather than on landmarks.

4. Compliance with this procedure is not mandatory but pilot participation is encouraged.

AIRPORT ADVISORY SERVICE (NONRADAR)

1. Flight Service Stations (FSS) located at airports where there are no control towers in operation provide advisory information to arriving and departing aircraft. This service is offered for safety purposes; traffic control is not exercised.

3. Airport advisories provide: wind direction and velocity, favored runway, altimeter setting, pertinent known traffic, Notices to Airmen, airport taxi routes, airport traffic patterns, and instrument approach procedures. These elements are varied so as to best serve the current traffic situation. Pilots using other than the favored runways should advise the FSS immediately.

AERONAUTICAL ADVISORY STATIONS (UNICOM)—122.8, 123.0 MC.

1. 122.8 mc. is assigned to airports *not* served by a control tower. Its use is limited to the necessities of safe and expeditious operation of private aircraft pertaining to runway and wind conditions, types of fuel available, weather, and dispatching. Secondarily, communications may be transmitted concerning ground transportation, food and lodging during transit.

2. 123.0 mc. is assigned to airport *served* by a control tower. Communications on this frequency are identical to those permitted on 122.8 mc., with the exception of information such as runway and wind conditions, weather, etc. which would be furnished by the tower. THIS SERVICE SHALL NOT BE USED FOR AIR TRAFFIC CONTROL PURPOSES.

FIGURE 48—AIM Section II, ATC Operations—Departure/Arrival.

GLOSSARY OF AERONAUTICAL TERMS

AIR DEFENSE IDENTIFICATION ZONE (ADIZ)—The area of airspace over land or water within which the ready identification, the location, and the control of aircraft are required in the interest of national security. For operating details see ADIZ procedures.

AIRPORT ADVISORY AREA—The area within five statute miles of an uncontrolled airport on which is located a Flight Service Station so depicted on the appropriate Sectional Aeronautical Chart.

AIRPORT ADVISORY SERVICE—A service provided by a Flight Service Station to enhance the safety of terminal operations of airports where a station is operating but where there is no control tower.

AIRPORT SURVEILLANCE RADAR (ASR)—Radar providing position of aircraft by azimuth and range data without elevation data. It is designed for a range of 50 miles.

AIRPORT TRAFFIC AREA—The airspace within a circular limit defined by a five statute mile horizontal radius from the geographical center of an airport at which an operative airport traffic control tower is located and extending upwards from the surface to, but not including, 2,000 feet above the surface.

APPROACH CONTROL SERVICE—Air traffic control service, provided by a terminal area traffic control facility, for arriving and or departing IFR flights and, on occasion, VFR flights.

CEILING—The height above the ground or water of the lowest layer of clouds or obscuration phenomena that is reported as "broken," "overcast," or "obscuration" and not classified as "thin" or "partial."

CONTERMINOUS U.S.—Forty-eight states and the District of Columbia.

CONTINENTAL CONTROL AREA—The area, which includes that airspace within the conterminous United States at and above 14,500 feet MSL, excluding airspace less than 1,500 feet above terrain, and prohibited and restricted areas (except certain specified restricted areas).

CONTINENTAL U.S.—Forty-nine states. The original 48 states and Alaska.

CONTROL AREA—Controlled airspace extending upwards from a specified height above the surface of the earth. Unless otherwise provided in appropriate cases, control areas extend upward from 700 feet above the surface until designated from 1,200 feet above the surface or from at least 500 feet below the MEA, whichever is higher, to the base of the continental control area.

CONTROL ZONE—Controlled airspace extending upwards from the surface of the earth. Control zones may include one or more airports and are normally circular areas 5 statute miles in radius with extension where necessary to include instrument approach and departure paths.

FINAL APPROACH—VFR—A flight path of a landing aircraft in the direction of landing along the extended runway center line from the base leg to the runway.

FIX—A geographical position determined visually, by reference to one or more radio navigational aids, by celestial plotting, or by another navigational device.

FLIGHT ADVISORY SERVICE—Advice and information provided by a facility to assist pilots in the safe conduct of flight.

FLIP—Flight Information Publication.

FLIGHT LEVEL (FL)—A level of constant atmospheric pressure related to a reference datum 29.92" HG. For example: Flight Level 250 is equivalent to an altimeter indication of 25,000 feet, and Flight Level 265 to 26,500 feet.

FLIGHT SERVICE STATION (FSS)—A facility operated by the FAA to provide flight assistance service.

RADIAL—A radial is a magnetic bearing extending from a VOR, VORTAC, or TACAN.

TRANSITION AREA—An area extending upward from 1,200 feet or higher above the surface when designated to complement control zones; from 700 feet above the surface when designated in conjunction with an airport with no control zone but for which an instrument approach procedure has been prescribed; or from 1,200 feet or higher above the surface when designated in conjunction with airway route structures or segments. Unless otherwise limited, transition areas terminate at the base of the overlying control area or Continental Control Area.

VECTOR—A heading issued to the pilot for the purpose of providing navigational guidance by means of radar.

VISIBILITY, PREVAILING—The horizontal distance at which targets of known distance are visible over at least half of the horizon. It is normally determined by an observer on or close to the ground viewing buildings or other similar objects during the day and ordinary city lights at night. Under low visibility conditions the observations are usually made at the control tower. Visibility is REPORTED IN MILES AND FRACTIONS OF MILES in the Aviation Weather Report. If a single value does not adequately describe the visibility, additional information is reported in the "Remarks" section of the report.

VOT—VHF facility transmitting a test signal to determine the operational status of VOR receivers.

FIGURE 49—AIM Section III, Flight Data and Special Operations—Glossary.

SECTIONAL CHART BULLETIN

The purpose of this Bulletin is to provide a tabulation of the major changes in aeronautical information that have occurred since the last publication date of each Sectional Aeronautical Chart. The general policy is to include only those changes to controlled airspace and special use airspace that present a hazardous condition or impose a restriction on the pilot; major changes to airports and radio navigational facilities, thereby providing the VFR pilot with the essential data necessary to update and maintain his chart current. When the Sectional Aeronautical Chart is republished, the corrective tabulation will be removed from this Bulletin.

EXCERPTED

ABERDEEN

38th Edition, August 20, 1964

Delete Madison arpt 44°01'N, 97°03'W. Delete Nicholas arpt 45°37'N, 101°30'W. Add obstn 2029' MSL 43°56'59"N, 96°54'36". Add obstn 2040' MSL 44°23'02"N, 97°00'37"W. In northern border change Bismarck VOR freq 115.7 to 116.5.

ALBANY

53rd Edition, July 23, 1964

Delete Dades arpt 43°28'N, 75°12'W. Delete East Greenbush arpt 42°34'N, 73°43'W. Add V196 airway Utica to Plattsburgh via Utica 016°T & Plattsburgh 236°T. Add obstn 1344' MSL 43°33'41"N, 72°17'14" W. Add obstn 2161' MSL 43°12'29"N, 72°09'40"W. Correct Schenectady Co ctl twr freq 321 to 321.1. Change Chester VOR freq from 108.6 to 117.3. Change Utica VOR freq from 112.0 to 113.9. Change Watertown VOR freq from 110.6 to 109.8. Change Binghamton VORTAC freq from 114.1 ch 88 to 114.3 ch 90. Change Griffis (AF) VOR freq 111.4 to 112.5. In southern border change Clermont VOR freq 114.3 to 117.6. Change De Lancey VOR freq 109.6 to 112.1. Add circular restricted area R-5207 with a radius of 1,350' centered at 42°46'59"N, 76°53'06"W. Add obstn 994' MSL 43°33'41"N, 72°17'14" W. Add Becksgrove RBn freq 329, ident BKG class MHW 43°13'20"N, 75°28'58"W. In northern border change Massen VOR freq 112.1 to 114.1.

ALBUQUERQUE

53rd Edition, August 20, 1964

Add obstn 4100' MSL 34°31'00"N, 102°17'00"W. Add obstn 5012' MSL 35°08'03"N, 103°41'52"W. Delete Bacaville VOR 34°35'N, 106°50'W. Delete Dalhart RBn 36°01'N, 102°03'W. In eastern border correct Borger VOR ident BDG to BGD.

DENVER

53rd Edition, December 19, 1964

No hazardous changes.

OKLAHOMA CITY

56th Edition, November 12, 1964

Add obstn 2749 MSL 35°34'07"N, 97°29'20"W.

ORLANDO

52nd Edition, November 12, 1964

Delete Strickland arpt 28°52'N, 81°57'W. Add obstn 457' MSL 2803'02"N, 81°47'58"W. Delete NAS Sanford ctl twr freq 296. Add obstn 506' MSL 28°22'53"N, 80°36'30"W. Add obstn 344' MSL 28°20'58"N, 80°47'23"W. Add obstn 522' MSL 28°30'01"N, 80°34'52"W. Add obstn 428' MSL 28°04'26"N, 81°40'52"W. Add obstn 420' MSL 28°33'33"N, 81°32'40"W. Delete St. Petersburg-Clearwater Intnl ctl twr freq 317.

PHOENIX

52nd Edition, January 7, 1965

No hazardous changes.

POCATELLO

48th Edition, October 15, 1964

Delete Crowheart Butte arpt 43°16'N, 109°06'W.

PORTLAND

51st Edition, July 23, 1964

Delete Pugh arpt 44°29'N, 123°08'W. Twr comsnd at Mahlon Sweet arpt freqs 118.9 & 257.8. Delete Portland Intl ctl twr freq 278. Delete Troutdale ctl twr freq 283. Add obstn 2049' MSL 45°31'19"N, 122°44'53"W.

PRESCOTT

42nd Edition, September 17, 1964

Delete Gray Mountain arpt 35°44'N, 111°29'W. Delete Drake VOR 34°54'N, 112° 25'W. Add V 291 airway from Winslow to Peach Springs.

TRINIDAD

40th Edition, September 17, 1964

Add V211 airway via 270°M from Durango. Add V421 airway Farmington to Durango to Gunnison. Delete Hermit Lakes arpt 37°49'N, 107°13'W. Add obstn 4290' MSL 37°55'27"N, 107°13'W.

NOTE: WAC Charts may be maintained in a current status by applying the Sectional Chart information which is pertinent to appropriate WAC Charts.

FIGURE 50—AIM Section III, Flight Data and Special Operations—Sectional Chart Bulletin.

EXCERPTED

RESTRICTIONS TO ENROUTE NAVIGATION AIDS

Radio Facility Restrictions are cited until cancelled by the Associated Station.

COLORADO

ALAMOSA RDO: VORTAC unusable beyond 40 nmi below 18,000' MSL from 025-045° and below 18,500' MSL 150-165° acct reduced coverage.

COLORADO SPRINGS RDO: VOR unusable below 11,000' MSL, 320-020°; 10,000' MSL, 020-072°; 9000' MSL, 072-140°; 12,000' MSL, 190-220°; 16,500' MSL, 220-280°; 12,500' MSL, 280-320°, beyond 30 nmi acct reception VORTAC (COS) unusable beyond 40 nmi below 15,200' MSL, 300-340°; below 14,800' MSL, 340-005°; below 13,200' MSL, 005-020°; below 12,100' MSL, 020-080° acct reception.

DENVER RDO: Efctv immediately J-20, Denver, Colo. VORTAC to Gage, Okla. VORTAC changeover point 145 nmi from DEN VORTAC. Continuous navigaition signal coverage does not exist over entire route segment 27,000'.

HANOVER RDO: H facil bearings unreliable beyond 25 nmi in shadow area of Pikes Peak

CONNECTICUT

BRIDGEPORT RDO: VOR unusable beyond 10 nmi from 265° clockwise to 280°; beyond 6 nmi 290-305° beyond 20 nmi 315-340° at MOCA. VOR unusable beyond 18 nmi below 7000' MSL 200-215°.

GROTON RDO: H facil unusable beyond 15 nmi.

NEW HAVEN RDO: VOR unusable beyond 20 nmi at MOCA.

WINDSOR LOCKS RDO: TACAN unusable below 3500' MSL beyond 35 nmi 090° to 290° due both azimuth and distance unlocks.

DISTRICT OF COLUMBIA

WASHINGTON RDO: DCA VOR unusable beyond 30 nmi 010-045°; beyond 10 nmi 045-055°; beyond 15 nmi 055-070°; beyond 20 nmi 070-180°; beyond 32 nmi 180-210°; beyond 30 nmi 210-260°; beyond 20 nmi 260-300° beyond 35 nmi 300-340° account roughness and scalloping. Change over point established 16 nmi from Baltimore VOR on V-157.

FLORIDA

KEY WEST RDO: VOR unusable below 14,500 from 095-340° beyond 15 nmi.

LAKELAND RDO: VOR unusable below 18,000' MSL except the published apch and airway radials acct reported crs displacements.

KANSAS

HILL CITY RDO: TACAN azimuth unusable beyond 15 nmi below 5000' MSL from 350-010° due roughness.

RHODE ISLAND

PROVIDENCE RDO: VOR unusable beyond 30 nmi below 3000' acct reduced coverage from 220-310°.

SOUTH CAROLINA

MYRTLE BEACH RDO: VOR rads 220-245° unusable below 2500' MSL beyond 15 nmi.

SOUTH DAKOTA

MITCHELL RDO: VOR restricted to VFR use only UFN.

MOBRIDGE RDO: State owned and operd VOR operg 0700-1900, VFR use only. Class: L-VOR. Freq: 108.6, receivers 122.1. Ident MBG. Lctd lat 45°33'-07", long. 100°21'56".

WATERTOWN RDO: TACAN unusable 218-288° between 19-25 mi acct crs roughness.

TEXAS

AMARILLO RDO: TACAN unusable beyond 15 nmi below 7,000' MSL 110-235° acct roughness.

AUSTIN RDO: VOR unusable beyond 35 nmi below *3500' MSL 260-320°.*

BROWNWOOD RDO: VOR coverage restricted to 25 nmi at min instr alt 015-085°.

EL PASO RDO: TACAN unusable beyond 30 nmi at MOCA from 265° clockwise thru 300°.

FORT WORTH, GREATER SOUTHWEST RDO: TACAN unusable beyond 30 nmi below 3000' MSL.

HOUSTON RDO: TACAN unusable beyond 35 nmi below 2500' MSL 065-210°.

GALVESTON RDO: TACAN unusable beyond 20 nmi below 3000' MSL 040-075 °acct crs roughness.

LUBBOCK RDO: VOR unusable on 004° rad from 23 to 25 nmi acct freq interference.

PALACIOS RDO: TACAN unusable 265-330° acct roughness.

WACO RDO: TACAN unusable beyond 15 nmi below 5000' MSL 175-195°.

WINK RDO: TACAN unusable beyond 17 nmi below 7000' MSL 030-060°.

FIGURE 51—AIM Section III, Flight Data and Special Operations—Restrictions to Enroute Navigation Aids.

Section III-A-NOTICES TO AIRMEN

This section is issued every 14 days and is primarily designed to supplement Section III of the AIM. It contains appropriate notices from the daily NOTAM Summary, Airman Advisories, new or revised Oil Burner Routes, hazardous airspace activities and other items considered essential to flight safety.

NOTE: Data printed entirely in bold face type are considered permanent and will usually be cited only once. Such information should be noted on charts and records. Temporary information is continuously cited until the condition is no longer in effect.
NOTE: Data is 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.

EXCERPTED

ALABAMA

ANNISTON, LEE BROS ARPT: Clsd to public.
BAYOU LA BATRE, BAY VIEW ARPT: Paved 3000' drag strip 75'S and parallel to turf rnwy. P-line each side of drag strip and wire across strip 75' from E end. N/S turf rnwy under constr, covered with stumps not to be used for acft operns.
CATHERINE, MARTIN FLD: Clsd until spring.
FT RUCKER: Extsv IFR and VFR student trng conducted in area bounded by V-115 W, V-241 S, V-70 N and V-241 E. Normal hrs of operns 0600-2400 Mon-Fri from surface to 10,000'.
HALEYVILLE MUN ARPT: Abandoned.

COLORADO

BROOMFIELD, JEFFERSON CO ARPT: First 3000' of rnwy 11 plus associated txwy clsd for resurfacing, usable length both directions 3000'. Ctc unicom for instructions.
DENVER, LOWRY AFB: Ctld firing (demolition area in use daily except Sat, Sun and holidays 1430-2330Z within a radius of 2500' of point lctd 104° 41'11"W, 39°36'30"N up to 1000' above surface.
DOVE CREEK ARPT: Reactivated. Lctd 0.5 mi E at lat 37°46', long 108°53'30". Elev: 6910'. One rnwy 1-19 3700 x 135' dirt. Unattended.
EAGLE: Ctld firing for use of Camp Hale. Area is 5 nmi radius from point lat 39°27', long 106°19'20", max ordinate of firing 15,000' MSL. Time of use: continuous 24 hrs daily. Controlling agency: Commanding General, Fort Carson.
HANOVER RDO: About March 4, H facility will be decomsnd.
HOOPER, BRADLEY RANCH ARPT: Clsd to the pbl.
HUDSON, PACKARD ARPT: New. Lctd 11 mi S Keenesburg at lat 39°57' long. 104°31'. Elev: 5280' 5280'. One rnwy E/W 300 x 50' dirt. 80/87 fuel only. Unattended. Associated FSS is Denver.
LEADVILLE, PAN ARK LODGE ARPT: Open to public. Lctd 9 mi S at lat 39°08', long 106°19. Elev: 9187'. One rnwy 15-33 3000 x 85' gravel. Rnwy 33 apch restricted by sign and bldg. Associated FSS: Eagle.
PUEBLO: Controlled Firing (demolition) area for use of the Pueblo Ordnance Depot established within the following described area: bounded on N by lat 38°22'00"; E, long 104°21'22"; S, lat 38°18'00"; W, long 104°22'50". Hrs of usage: 0900-1600 MST, Mon-Fri. Max alt 5000' above the surface.
SAGUACHE MUN ARPT: Reactivated. Lctd 2 mi NW at lat 38°05'45", long 106°10'45". Elev: 7635'. One rnwy 10-28 5200 x 120'. Gravel. Unattended.

KANSAS

HUTCHINSON, HARPERS FLD: Abandoned.
SALINA MUN ARPT: VOR Proc. No. 1, Amdt. 5, efctv 30 September 1961, is revised as follows effective immediately: Add Note: Radar vectoring to final approach course authorized.
TOPEKA, PHILIP BILLARD ARPT: ADF No. 1, Amdt. 16: ILS-13. Amdt 17 and ILS-31. Amdt 7 are amended as follows, effective immediately: C-dn, two eng or less, 65 kt or less, 600-1 vice 500-1. Unlighted smoke stack 1137' msl within circling criteria.

OKLAHOMA

ENID: Efctv Nov 15, 1964 ctl zone times will be 0700-1800 local time Mon thru Thurs 0700-2200 local time Fir, from 0800-1600 local time Sat. and 1200-1800 local time Suns. Control zone not designated on holidays.

TEXAS

AMARILLO: Controlled Firing Area lctd 10 mi NE of end of NE/SW rnwy of Amarillo AFB/Mun: Lat 35°21'09", long 101°37'04" E to 35°21'12", 101° 32'26", S to 35°17'56", 101°32'26" w to 35°17'56", 101°37'04", N to point of beginning. Time of use: 24 hrs per day. Altitudes: up to 3552'.
ASPERMONT ARPTL New. Lctd 2 mi SW at lat 33° 06'45", long 100°15'. Elev: 1790'. Two rnwys 17-35 2050 x 40 and 8-26 2470 x 40. Rnwys 8 and 35 apchs restricted by fence. Glide angle 0 to 1. P-line at middle of N/S rnwy.
AUSTIN, MUELLER MUN ARPT: 1199' (2049') lgtd TV twr constrd 5.5 nmi WNW (287° T) at lat 30° 19'33", long 97°47'58".
BIG SPRING: Due intsv jet tfc at Webb operg Mon-Fri during dalgt hrs it is suggested all acft operg VFR remain at or above 9000' MSL when traversing area encompassed by 15 nmi arc of BGS VOR, excluding any overlap of V-66, including area W along V-16S to point 20 nmi SW of BGS VOR, and an extsn E to include area bounded N by S bndry of Trng Area Webb AFB/Reese Three, bounded S by N bndry of V-66, to N-S line drawn through town of Loraine, Tex. Concentrated jet trng within 10 nmi radius of Colorado City Aux Arpt lctd aprxly 38 nmi E Big Spring. VFR student jet tfc crossing airways within radius of 60 nmi BGS VOR utilizing appropriate VFR hemispherical crossing for tfc advisories.
OZONE MUN ARPT: 200' (2626' MSL) lgtd rdo twr constrd 2 nmi S (172° T) at lat 30°41'54", long 101°11'42".
PERRYTON MUN ARPT: 300' (3168' MSL) lgtd rdo twr constrd 2 nmi WNW (248° T) at lat 36°24'34", long 100°47'39".
PRESIDO, SOLAR AIRLINES FLD: New. Lctd 3 mi N at lat 29°36'30", long 104°21'30". Elev: 2700'. One rnwy 2-20 5000 x 120 Dirt.
MULESHOE, WARREN FLD: 500' AGL twr constrd

FIGURE 52—AIM Section IIIA, Notices to Airmen (NOTAMS).

AIRPORT/FACILITY DIRECTORY LEGEND

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, reciprocal headings, 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., 1468 feet would be shown as "14"; 1474 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

Add 000 to figure following S, T, TT 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.

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

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

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

A blank space following the letter designation is used to indicate the runway weight bearing capacity to sustain aircraft with the same type landing gear, although definite figures are not available, e.g., (T-).

MAX–Maximum runway gross weight bearing capacity for all aircraft.

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.

SEAPLANE BASE FACILITIES

A number preceding the parenthetical designation, indicates the number (quantity) available.

Beaching gear, consisting of the quantity and type of beaching gear available.

The number (quantity) if available, of Mooring Buoys (MB) and Crash Boats (CB) available. MB & CB indicates details of quantity are not available.

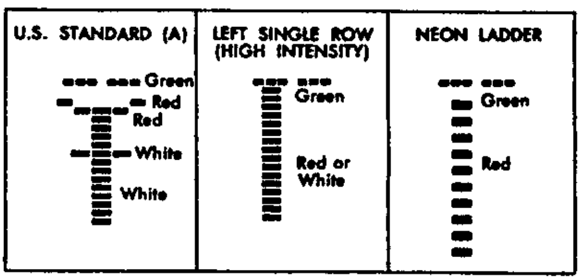
LIGHTING

B: Rotating Light (Rotating beacon). (Green and white, split-beam and other types.) Omission of **B** indicates rotating light is either not available or not operating standard hours (sunset-sunrise).

Note.—Code lights are not codified, and are carried in Remarks.

L: Field Lighting (when code **L4-7** is indicated, lighting **4, 5, 6, 7** is available). An asterisk (*) preceding an element indicates that it operates on prior request only (by phone call, telegram or letter). Where the asterisk is not shown, the lights are in operation or available sunset to sunrise or by request (circling the field or radio call). **L** by itself indicates temporary lighting, such as flares, smudge pots, lanterns.

1—Strip lights or portable runway lights (electrical)
2—Boundary
3—Runway Floods
4—Low Intensity Runway
5—Medium Intensity Runway
6—High Intensity Runway
7—Instrument Approach (neon)
8A, B, or C—High Intensity Instrument Approach



9—Sequence Flashing Lights (3,000' out unless otherwise stated)
10—Visual Approach Slope Indicator (VASI)
11—Runway end identification lights (threshold strobe) (REIL)
12—Short approach light systems (SALS)

Figure 53—AIM Section IV, Airport Facility Directory (Legend).

Lighting (Con't)

13—Runway alignment lights (RAIL)
14—Runway centerline
15—Touchdown zone

Because the obst- EXCERPTED tually all lighted fields are lighted, o- have not been included in the codi-

SERVICING

S1: Storage.
S2: Storage, minor airframe repairs.
S3: Storage, minor airframe and minor powerplant repairs.
S4: Storage, major airframe and minor powerplant repairs.
S5: Storage, major airframe and major powerplant repairs.

FUEL

F1	80 oct., at least.
F2	80/87 oct., or lower.
F3	91/96 oct., or lower.
F4	100/130 performance rating, or lower.
F5	115/145 performance rating, or lower.

TURBINE FUELS

TP-1	650 turbine fuels for civil jets.
JP-1	(Kerosene), JP-3, JP-4, JP-5.

OTHER

AOE—Airport of Entry.

VASI—Visual Approach Slope Indicator, applicable runway provided.

RVV—Runway visibility, applicable runway provided.

RVR—Runway Visual Range, applicable runway provided.

TPA—Traffic Pattern Altitude—This information is provided only at those airports without a 24-hour operating control tower or without an FSS providing Airport Advisory Service. Directions of turns are indicated only when turns of the pattern(s) are to the right (non-standard). TPA data is related to the runway listed under the tabulated airport information. Generally, only one altitude is listed; however, at some airports two altitudes have been established; one for conventional aircraft and one for high performance aircraft. They are shown in this manner; TPA 8/15-R (increments of 100 feet). The higher figure being the higher performance aircraft altitude.

FSS—The name of the controlling 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 Intephone 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)."

AIRPORT REMARKS

"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.

Limited—intended for private use, but use by public is not prohibited.

Remarks data is 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.

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 communication 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 otherwise by a cross-out: 121.5

Radar available is listed under "RADAR SERVICES" Radar beacons are indicated by "(BCN)" after "RADAR SERVICES", when available.

FIGURE 54—AIM Section IV, Airport Facility Directory (Legend).

VOICE CALL

The voice call for contact with the traffic control services listed at each airport is the airport name followed by the call of the particular service desired, i.e., "LAGUARDIA TOWER." In these instances, only the name of the service is listed. When the voice call of the facility is not the same as the airport name, the complete voice call is listed.

SERVICES AVAILABLE

(See ATC Operations and Procedures, Section II)

TOWER

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) Non-Radar.
Traffic Information Service (TFC INFO) Radar.
Surveillance Radar Approach (ASR).
Precision Radar Approach (PAR).
Ground Control (GND CON).
VHF Direction Finding (VHF/DF).

RADAR APPROACH PROCEDURE MINIMA

Weather minima for precision and surveillance radar approaches (PAR/ASR) specify only the lowest straight-in authorized for the approach.

FLIGHT SERVICE STATION (FSS)

Airport Advisory Service (AAS).
Flight Following Service.
Island, Mountain and Lake Reporting Service.

UNICOM

Private aeronautical station, operates same hours as the airport, transmits and receives on one of the following frequencies:

U–1—122.8 mc (at airports without a control tower).

U–2—123.0 mc (at airports with a control tower). tower).

SAMPLE

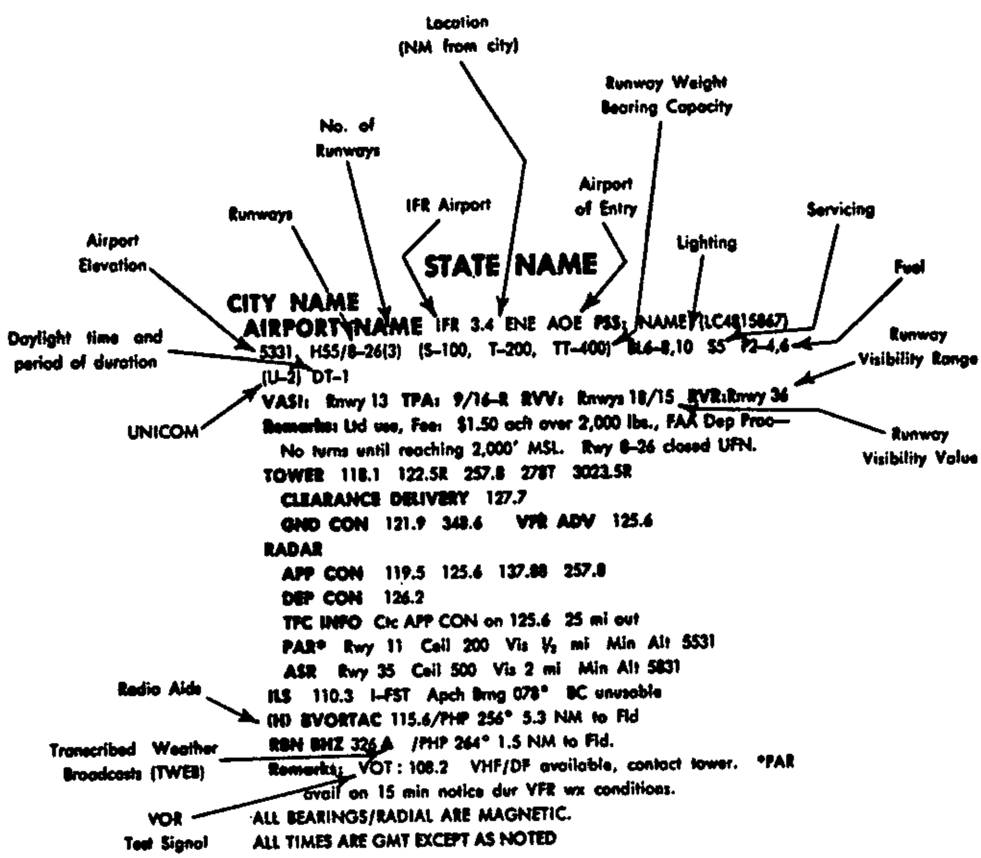


FIGURE 55—AIM Section IV, Airport Facility Directory (Legend).

RADIO CLASS DESIGNATIONS

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

Class	Normally Anticipated Altitude Service	Normally Anticipated Interference-Free Distance Service
H	Up to 45,000 MSL	149.75 sml (130 nml)
	Above 45,000' MSL	115.2 sml (100 nml)
L	Up to 18,000' MSL	46.06 sml (40 nml)
T	Up to 12,000' MSL	28.79 sml (25 nml)

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 ---------- Continuous automatic transcribed broadcast service.

B ---------- Scheduled Broadcast Station (broadcasts weather at 15 and 45 minutes after the hour; Air Force Broadcasts, generally, 29 minutes).

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 on localizer channel).

LMM ---------- Compass locator station when installed at middle marker site.

LOM ---------- Compass locator station when installed at outer marker site.

MA ---------- Range (adcock, vertical raditors), power less than 50 watts.

MH ---------- Non-directional radio beacon (homing) power less than 50 watts.

ML ---------- Range (loop radiators), power less than 50 watts.

MRA ---------- Range (adcock, vertical radiators), power 50 watts or more but less than 150 watts.

MRL ---------- Range (loop radiators), power 50 watts or more, but less than 150 watts.

RA ---------- Range (adcock, vertical radiators), power 150 watts or more.

RL ---------- Range (loop radiators), power 150 watts or more.

S ---------- Simultaneous range, homing signal and/or voice.

SABH ---------- Non-directional radio beacon having limited navigational use. Provides automatic weather broadcasts.

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 facilities on range frequency.

Z ---------- VHF station location marker at a LF range station.

NOTES

1. All FAA MH facilities operate continuously unless otherwise cited.
2. All FAA ranges operate continuously. Those which are not manned continuously are cited in the remarks with hours of operation in parentheses, e.g., (0600–2400).
3. LMF and VHF ranges listed at the same location are controlled by the same FSS.
4. Military navigational facilities which are not part of the common system are not listed in this publication.

FIGURE 56—AIM Section IV, Airport Facility Directory—Radio Class Designations.

AIRPORT DIRECTORY

EXCERPTED

COLORADO

AROYA
MAURER RANCH 1 E
4550 32 (2) L4 S1 F4 FSS: LA JUNTA
Remarks: Unattended. Fuel emgcy only lgts avbl by circling fld.

ALAMOSA MUNI *IFR* 2 S
7535 H59 (1) BL4 S3 F4 U-1 FSS: TRINIDAD
Remarks: NE/SW rnwy rut.

ASPEN
SARDY FLD 3 NW
7773 H60 (1) F4 U-1 FSS: EAGLE
Remarks: Aspen, Sardy Fld–P-line NW; hill SW. Land SSE, take-off NNW. Due hillside background acft on final apch invisible to pilot in take-off position; avoid lndg apchs when acft on rnwy or climb out. After take-off rnwy 33-acft should not turn more than 30° to rgt until 2 mi from end of rnwy. Acft equipped to guard 122.8 mc must do so when operg on arpt and while in tfc patn. Clsd ngts on prior approval of arpt mgr. Overrun each end rnwy 15-33.

BOULDER MUNI 3 NE
5288 H41 (1) BL4 S5 F4 U-1 FSS: DENVER (DL)
Remarks: Under calm winds, lnd & tkof to the E.

BROOMFIELD
JEFFERSON CO 2 SW
5648 H60 (2) BL4 S5 F4 U-1 FSS: DENVER (DL)
Remarks: UNICOM prior entering tfc patn.

COLORADO SPRINGS
PETERSON FLD See Section IV-A

ROCKY MOUNTAIN 5 NE
5985 53 (3) D5 FSS: DENVER

DENVER
SKY RANCH 10 E
5478 40 (3) L4 S5 F4 U-1 VFR ADV: For APP CON, DEP CON See Denver, STAPLETON AIR FLD in Section IV-A FSS: DENVER (LC DU 8-4279)
Remarks: Rgt tfc strips 26, 30, 36. Ditch W.

STAPLETON AIRFLD See Section IV-A

GRAND JUNCTION WALKER FLD See Section IV-A

JEFFERSON CO See BROOMFIELD

KIT CARSON
TRADING POST 1 NW
4290 33 (3) F2 FSS: LA JUNTA
Remarks: P-line S.

MAURER RANCH See AROYA

LAKE COUNTY See LEADVILLE

LA JUNTA MUNI 3 N
4238 H83 (2) BL4 S5 F4 FSS: LA JUNTA on Fld

LAMAR MUNI 3 W
3673 H48 (1) BL4 S5 F4 FSS: LA JUNTA
Remarks: P-line S.

LAS ANIMAS 1 S
3900 25(1) S5 F4 FSS: LA JUNTA
Remarks: P-line S.

LAS ANIMAS CO See TRINIDAD

LA VETA MUNI 1 N
7154 58 (1) F2 U-1 FSS: TRINIDAD
Remarks: Unattended.

LEADVILLE
LAKE COUNTY 2 SW
9927 H48 (1) FSS: EAGLE

MONTE VISTA
MOVIE MANOR 3 W
7770 50 (2) FSS: TRINIDAD
Remarks: Movie screen in apch rnwy 19.

SAN LUIS VALLEY 5 SE
7608 63 (1) B*L4 S5 F4 FSS: TRINIDAD

PUEBLO-MEMORIAL See Section IV-A

PETERSON FLD See COLORADO SPRINGS, PETERSON FLD in Section IV-A

SAN LUIS 1 W
7900 40 (1)

SAN LUIS VALLEY See MONTE VISTA

STAPLETON AIRFLD See DENVER, STAPLETON AIRFLD in Section IV-A

TRINIDAD
LAS ANIMAS CO 9 NE
5761 H55 (2) BL4 F4 FSS: TRINIDAD on Fld
Remarks: Rnwy 9-27 rstd to 10,000 lbs gross wt. Use rnwys.

WALSENBURG
JOHNSON FLD 5 N
6042 53 (2) FSS: TRINIDAD

FIGURE 57—AIM Section IV, Airport Directory.

EXCERPTED

AIRPORT DIRECTORY

KANSAS

ABILENE MUNI 1 SW
1148 H30 (1) BL4 S1 F4 FSS: SALINA
Remarks: P-line SE; ruf, soft-wet.

WRIGHT AIRPARK 1 S
1150 27 (1) L1 S5 F4 FSS: SALINA

DODGE CITY
DODGE CITY MUNI *IFR* 3 E
2594 H46 (2) BL4 S5 F4 U-1 FSS: DODGE CITY
Remarks: Wea bureau bldg wind most erected btn rnwys 2-20 and 14-32 N of Int 800' from centerline

EXPERIMENT STATION See **GARDEN CITY**

GARDEN CITY
EXPERIMENT STATION 3 NE
2885 28 (3) FSS: GARDEN CITY
Remarks: Tower SE.

GARDEN CITY MUNI 7 SE
2895 H65 (4) BL4 F4 U-1
FSS: GARDEN CITY on Fld
Remarks: Only rnwy 17-35 usuable ngts.

GARDNER MUNI 1 W
1040 36 (2) S1 F2 U-1 FSS: KANSAS CITY
Remarks: P-line N.

GOODLAND MUNI *IFR* 2 N
3653 H44 (1) BL 4 S5 F4 FSS: GOODLAND on Fld

HILL CITY MUNI 1 NE
2200 28 (3) BL4 S5 F4 FSS: HILL CITY on Fld
Remarks: Use strips

JUNCTION CITY MUNI 1 NW
1104 37 (3) BL4 S5 F3 U-1 FSS: GARDEN CITY
Remarks: P-lines NE, SSW. Use strips rnwy 1 threshold displaced 360' rnwy 19 displaced 300'

LIBERAL MUNI *IFR* 2 W
2884 H70 (6) BL4 S5 F5 U-1 FSS: GARDEN CITY

MEADE MUNI 1 W
2528 25 (2) BL4 S1 F2 FSS: DODGE CITY
Remarks: P-line N & S.

NORTON MUNI 1 N
2365 H25 (1) BL4 S3 F4 U-1 FSS: HILL CITY
Remarks: Ruf. 4500' strip avbl.

RUSSELL MUNI *IFR* 3 SE
1863 H26 (1) VL4 S5 F4 U-1 FSS: RUSSELL on Fld
Remarks: Ditch crosses NE end rnwy 3-21

SCOTT CITY MUNI 1 SE
2970 H25 (1) *L4 S1 F4 U-1 FSS: GARDEN CITY
Remarks: 3200' strip avail. P-lines N. NE, SW, W. Ruf. Use strips.

OKLAHOMA

BEAVER MUNI 1 SW
2500 33 (2) L4 FSS: GAGE
Remarks: Soft when wet.

BOISE CITY 3 N
4200 34 (2) *L4 S1 F4 U-1 FSS: DALHART
Remarks: Unattended. Rnwy 16 blkd.

GAGE MUNI (FAA) *IFR* 2 SW
2223 H54 (2) BL4 S1 F4 FSS: GAGE on Fld
Remarks: N/S rnwy restricted to acft under 35,000 lbs GWT.

GUYMON MUNI 2 W
3123 H43 (1) BL4 S5 F4
FSS: DALHART (LC 338-6135)

SHATTUCK Adj S
2323 24 (2) S3 F2 FSS: GAGE
Remarks: Two 603' lgtd twrs NE. Unattended.

TEXAS

BOOKER 1 SE
2830 39 (1) L4 F4
Remarks: P-line N, NE; soft-wet.

DALHART MUNI *IFR* 3 SW
3989 H90 (3) BL4 S5 F4 FSS: DALHART on Fld

PERRYTON
PATTISON 14 SW
3020 26 (1) FSS: GAGE

PERRYTON MUNI 3 E
2915 H41 (1) BL4 S5 F4 U-1 FSS: GAGE

SPEARMAN Adj W
3104 H29 (1) L4 S5 F2 FSS: DALHART
Remarks: SW blkd.

TRIBUNE MUNI 1 S
3620 26 (2) F4 FSS: GARDEN CITY
Remarks: P-line W, fence N.

TRI CITY See **PARSONS**

ULYSSES
HUGOTON STATION 11 SE
3025 38 (2) FSS: GARDEN CITY

ULSSES 1 NW
3065 H26 (1) L4 S5 F4 U-1 FSS: GARDEN CITY
Remarks: Ant. S.

FIGURE 58—AIM Section IV, Airport Directory.

AIRPORT/FACILITY DIRECTORY

COLORADO

AKRON (L) BVOR 114.4/AKO FSS: AKRON
RBn BH 388/AKO

ALAMOSA (H) BVORTAC 113.9/ALS FSS: TRINIDAD

COLORADO SPRINGS
PETERSON FIELD *IFR* 6 SE
FSS: DENVER (LC 634-3127)
6172 H110/17-35 (3) (S-125, T-200, TT-400) BL4, 6, 8 S5 F5, JP1, 4 RVV: Rnwy 35
TOWER 119.9 126.2 122.5R GND CON 121.7
RADAR SERVICES:
COLORADO SPRINGS APP CON 118.5 126.2 122.5R 109.9T
COLORADO SPRINGS DEP CON 120.2
TFC INFO Ctc APP CON 20 mi out.
PAR[3] Rnwy 35 Ceil 200 Vsby 1/2 mi Min Alt 6372
ASR Rnwys 17, 21, 30, 35 Ceil 500 Vsby 1 mi Min Alt 6672
ILS[1] 109.9 I-COS Apch Brg 346° COLORADO SPRINGS LOM: 407/CO
COLORADO SPRINGS (L) BVORTAC 112.5/COS 191° 9 NM to fld.
COLORADO SPRINGS RBn MHW 407/CO 346° 3.3 NM to fld.
VHF/DF[2] available, contact tower.
REMARKS: [1]Glide scope unusable MM to touchdown. [2]Coverage 30 nmi at MEA except 24 nmi 340-055° and 15 nmi 245-270° from facil. [3]PAR unusable from MM to touchdown acct gnd clutter.

DENVER
STAPLETON INTL *IFR* 4 E FSS: DENVER on Fld
5331 H115/17-35 (4) (S-120, T-200, TT-350) BL4, 6, 8, 9, 10, 11, 14, 15 S5 F5, JP1 U2 VASI: Rnwys 8R, 17
RVV: Rnwy 35 RVR: Rnwy 26L REIL: Rnwy 17
REMARKS: Twr unable to determine whether acft are on correct final apch to rnwys 8L-26R and 8R-26L.
TOWER 118.3 126.2 119.3 122.5R
GND CON 121.9 121.7
RADAR SERVICES:
DENVER APP CON 119.5[1] 126.2 122.5R 120.5[2] 116.3T 110.3T 108.1T
DENVER DEP CON 124.8
TFC INFO Ctc APP CON 20 mi. out
ASR Rnwys 17, 26L, 35 Ceil 500 Vsby 1 mi Min Alt 5831
ILS 110.3 I-DEN Apch Brg 256° 108.1 I-SPO Apch Brg 349° LOM: 362/DE
VHF/DF available contact tower.
DENVER (H) BVORTAC 116.3/DEN 213° 8.1 NM to fld.
DENVER RBn SABH 379A/DEN 142° 1.4 NM to fld.
REMARKS: [1]270° - 089°. [2]090° - 269°. VOT: 111.0

HANOVER RBn MHW 356/HNR

HUGO (L) BVOR 108.4/HGO FSS: LA JUNTA

KIOWA (L) BVORTAC 114.2/IOC FSS: DENVER

KREMMLING (H) BVORTAC 113.8/RLG FSS: EAGLE

LAMAR (H) BVOR 116.9/LAA FSS: LA JUNTA

COLORADO—*Continued*

PUEBLO MEML *IFR* 5 E (248° 2.4 NM from PUB VOR)
4725 H85/7-25 (3) (S-90, T-129, TT-216) BL4, 6, 8A, 9 S5 F5 JP1 RVV: Rnwy 7
FSS: PUEBLO on Fld
TOWER 119.1 126.2 122.5R GND CON 121.9
APP CON 120.1 126.2 119.1 116.7T
ILS 109.5 I-PUB Apch Brg 075° LOM: 302/PU
(H) BVORTAC 116.7/PUB 248° 2.4 NM to fld.
RBn MHW 373/PCX 225° 6 NM to fld.

THURMAN (L) VORW 112.9/TXC

TOBE (L) BVORTAC 115.8/TBE FSS: TRINIDAD

TRINIDAD RBn SABH 329/TAD FSS: TRINIDAD

KANSAS

ANTHONY (L) BVOR 112.9/ANY FSS: WICHITA

CHANUTE (L) BVOR 109.2/CNU FSS: CHANUTE

EMPORIA (L) BVORTAC 112.8/EMP FSS: EMPORIA

FORT RILEY (L) VORW 109.4/FRI
RBn MHW 317/FRI

GARDEN CITY (H) BVORTAC 113.3/GCK
FSS: GARDEN CITY
RBn H-SAB 257A/GCK

GOODLAND (L) BVORTAC 115.1/GLD FSS: GOODLAND

HILL CITY (H) BVORTAC 113.7/HLC FSS: HILL CITY

KANSAS CITY
FAIRFAX MUNI *IFR* 3 NE
FSS: KANSAS CITY (LC GRI-4572)
746 H73/17-35 (4) (S-, T-75, TT-170) BL6 S-5 F-5, JP-1 U2
REMARKS: Tfc ptn alt for acft under 12,500 lbs GWT is 600 ft AGL, vsby N ans NW greatly reduced. 1042' (2049' MSL) twr 5 nmi S. and 1023' (1946' MSL) twr 6 nmi SE.
TOWER 119.1 126.2 122.5R GND CON 121.7
RADAR SERVICES:
KANSAS CITY APP CON 126.2 122.7R 121.1[1] 119.5[2] 112.6T 109.9T
KANSAS CITY DEP CON 118.1
REMARKS: [1]W Sector [2]E Sector

LIBERAL (L) BVOR 116.6/LBL FSS: GARDEN CITY

OKLAHOMA

ALTUS (L) VORW 109.8/LTS
RBn HW 410/LTS

ARDMORE (L) BVOR 116.7/ADM FSS: ARDMORE
RBn BMH 400/ADM

BARTLESVILLE (L) BVOR 117.9/BVO FSS: TULSA
RBn H 388/BVO

DUNCAN (L) BVOR 111.0/DUC FSS: ARDMORE

GAGE (H) BVORTAC 115.6/GAG FSS: GAGE

FIGURE 60—AIM Section IVA, FSS and Weather Bureau Telephone Numbers.

FSS AND WEATHER BUREAU TELEPHONE NUMBERS

Flight Service Stations (FSS) provide information on airport conditions, radio aids and other facilities, and process flight plans. Stations providing Airport Advisory Service (AAS) are indicated by the letters AAS following the FSS name. 122.2T is the standard FSS transmitting frequency for this service.

In addition, they provide an aviation weather briefing service. Flight and weather briefing service is provided on the telephone numbers listed. The telephone area code number is shown in parentheses. Each number given is the preferred telephone number to obtain flight weather information. Automatic answering devices are sometimes used on listed lines to give general local weather information during peak workloads. To avoid getting the recorded general weather announcement, use the selected telephone number listed.

*—indicates Pilot's Automatic Telephone Weather Answering Service (PATWAS) available, providing transcribed aviation weather information.

†—indicates a restricted number, use for aviation weather information only.

%—call FSS for "one call" FSS/WBAS briefing service.

Flight Service Stations are listed alphabetically, by state. The airport name, on which the FSS is located, is shown in parentheses when different from the FSS name.

FSS's transmit on navigational aid frequencies of the NAVAID.

Standard Flight Service Station civil communications frequencies are: 126.7 122.2T 122.1R 135.9 and emergency 121.5. These frequencies are available at all stations listed, unless annotated by a diamond (◆), identifying those stations where complete standard FSS communications frequencies are not available. This diamond is then supplemented with those standard FSS communications frequencies not available, listed by a cross-out, i.e., ~~135.9~~. Additional frequencies, e.g., 3023.5R, are listed when available. Frequencies transmit and receive unless annotated by the addition of: R—Receive Only, T—Transmit Only, X—On Request.

Location	COLORADO	Area Code	Telephone
Akron (AAS) (AKO)	FSS	(303)	345-2271
Alamosa	WB	(303)	598-2547 (0400-2000)
Colorado Springs	WB	(303)	632-0535†
Denver (Stapleton Air Field) (DEN)	FSS	(303)	DU 8-4279
	WB	(303)	297-3049†
	WB	(303)	388-3653*
Eagle (AAS) (EGE)	FSS	(303)	328-2125
Grand Junction (Walker Field) (GJT)	FSS	(303)	CH 2-1801
	WB	(303)	243-0914
La Junta (AAS) (LHX)	FSS	(303)	DU 4-4311
Pueblo (Memorial) (PUB)	FSS	(303)	948-3301
	WB	(303)	948-3376†
Trinidad (TAD)	FSS	(303)	846-2623

EXCERPTED

Location	KANSAS	Area Code	Telephone
Concordia	WB	(913)	CH 3-3141
Chanute (CNU)	FSS	(316)	HE 1-4450
Dodge City (AAS) (DDC)	FSS	(316)	HU 3-3441
	WB	(316)	HU 3-3311
Emporia (EMP)	FSS	(316)	DI 2-7475
Garden City (AAS) (New Municipal) (GCK)	FSS	(316)	BR 6-2531
Goodland (AAS) (GLD)	FSS	(913)	TW 9-7154
	WB	(913)	TW 9-2360†
Hill City (AAS) (HLC)	FSS	(913)	674-5642
Hutchinson (HUT)	FSS	(316)	2-4851
Manhattan (AAS) (MHK)	FSS	(913)	PR 6-9751
Russell (RSL)	FSS	(913)	483-2312
Salina (SLN)	FSS	(913)	TA 5-5309
Topeka (Phillip Billard) (TOP)	FSS	(913)	CE 2-5478
	WB	(913)	CE 4-2592†
Wichita (ICT)	FSS	(316)	WH 2-2261/2
	WB	(316)	WH 2-3284*
	WB	(316)	WH 3-1063†

Location	OKLAHOMA	Area Code	Telephone
Ardmore (AAS) (ADM)	FSS	(405)	CA 3-6772
	FSS	(405)	DU 9-5441
Gage (AAS) (GAG)	FSS	(405)	923-2601
Hobart (AAS) (HBR)	FSS	(405)	GE 6-4234
McAlester (AAS) (MLC)	FSS	(918)	GA 3-4091
Oklahoma City (Will Rogers) (OKC)	FSS	(405)	SU 9-7452
	WB	(405)	MU 5-4433*
	WB	(405)	MU 5-6350†
Ponca City (AAS) (PNC)	FSS	(405)	RO 5-5485
Tulsa (TUL)	FSS	(918)	TE 8-3316
	WB	(918)	TE 5-4775†
			TE 5-2364*

Location	NEW MEXICO	Area Code	Telephone
Alburquerque (ABQ)	FSS	(505)	CH 3-7832
	WB	(505)	242-2661*
	WB	(505)	CH 3-7832
Carlsbad (AAS) (CNM)	FSS	(505)	TU 5-2042
Clayton	WB	(505)	374-9511 (0430-1130 Mon-Fri)

Location	TEXAS	Area Code	Telephone
Abilene (ABI)	FSS	(915)	OR 4-6915
	WB	(915)	OR 4-8844†
Alice (AAS) (ALI)	FSS	(512)	MO 4-4291
Amarillo (Air Terminal) (AMA)	FSS	(806)	DI 9-1608
	WB	(806)	DI 9-2261
Austin (Robert Mueller) (AUS)	FSS	(512)	GR 8-6695
	WB	(512)	GR 6-0940
Beaumont (Jefferson County) (BPT)	FSS	(512)	RA 2-0288
	WB	(512)	RA 2-7011†
Brownsville (Rio Grande Valley International) (BRO)	FSS	(512)	LI 6-6421
			LI 2-8231†
Childress (CDS)	FSS	(817)	WE 7-3892
College Station (AAS) (Easterwood) (CLL)	FSS	(713)	VI 6-8784/5
Corpus Christi	WB	(512)	TU 3-3008†
Cotulla (AAS) (COT)	FSS	(512)	TR 9-2417
Dalhart (DHT)	FSS	(806)	CH 9-2006

FIGURE 59—AIM Section IVA, Airport/Facility Directory.