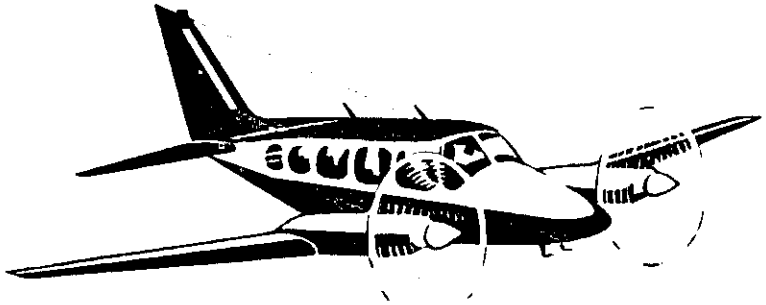
INSTRUMENT RATING
(AIRPLANE)

Written Test Guide



DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

INSTRUMENT RATING (Airplane) WRITTEN TEST GUIDE

Revised 1972

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Preface

The *Instrument Rating (Airplane) Written Guide* has been prepared by the Federal Aviation Administration as an aid to pilots who are preparing for the Instrument Rating. Its purpose is to outline the scope of the written test and direct applicants to appropriate study materials. The guide details subject areas covered in the test and indicates areas of aviation knowledge in which instrument pilots should be well informed. A representative sample test is included.

This guide supersedes AC 61-8B, *Instrument Rating (Airplane) Written Test Guide*, dated 1969, and is issued as AC 61-8C.

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

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INSTRUMENT RATING (AIRPLANE) WRITTEN TEST GUIDE

Introduction

This guide is not offered as an easy shortcut for passing the written test for the Instrument Rating without obtaining the required background of experience, knowledge, and skill. Rather, the intent of the guides is to define the scope and narrow the field of study to the basic knowledge required.

In preparing for the official written test, you will derive benefit by taking the sample written test in this guide. However, you should not attempt to answer these test items without a thorough study and review of appropriate reference or source materials. Ability to answer these sample test items alone is an indication, but not a guarantee, that you possess the background knowledge required for this certification area.

Your study for the Instrument Rating will be more meaningful and profitable if you visit a Flight Service Station and a National Weather Service office to discuss questions and problems you may have in preflight briefing and aviation weather. Similar visits to an Air Traffic Control Center and an Approach Control location will broaden your perspective of the air traffic control system and your understanding of air traffic control procedures. We strongly recommend that you make one or more IFR cross-country flights in actual IFR weather conditions with an instructor before taking your flight check.

When your written test and flight test have been successfully accomplished, and your instrument rating issued, your study and practice must not stop. Instrument flying skills must be used to be retained, and you should plan regular practice in a synthetic trainer or "under the hood" unless you fly frequently in actual IFR conditions. You are encouraged to file IFR flight plans for flights in good weather. This practice, in the more relaxed environment of VFR flight conditions, will help you develop and maintain proficiency in instrument procedures and techniques.

Eligibility requirements for rating

Federal Aviation Regulation (FAR) 61.35 sets forth the knowledge and experience requirements for the Instrument Rating. Skill requirements are detailed in FAR 61.37 and in the *Instrument Pilot (Airplane) Flight Test Guide*—AC 61-17B.

Knowledge requirements are detailed in the study outline contained in this test guide.

THE TEST

Nature of the test

The Instrument Rating (Airplane) Written Test is based on the planning and execution of a "typical" flight operation made under instrument flight rules and in instrument conditions. Test items present a progression of problems from flight planning to arrival at destination. The test requires approximately 4 hours to complete and the result is mailed to the applicant on AC Form 8060–37. Appropriate planning materials, including charts, aircraft data, weather information, and *Airman's Information Manual* excerpts, are provided for taking the test. Similar materials, for use with the sample test in this guide, are provided in the Appendix.

The passing grade is 70 per cent. All answer sheets are graded by a computer which is programmed to indicate the areas missed. It prints the subject matter codes on the test result form so that the applicant can determine the areas in which he had difficulty. A subject matter outline is mailed with the test result form.

NOTE: The subject matter outlines are revised periodically and may not be in agreement with the study outline contained in this guide.

Taking the test

The test may be taken at FAA Flight Standards District Offices, certain Flight Service Stations, and other designated places. Bear in mind the following points while taking the test:

1. Answer test items in accordance with the latest regulations and procedures.

2. Read every question thoroughly. Failure on the written test is frequently caused by not reading carefully, rather than lack of knowledge. Do not try to solve the problem before you understand the question.

3. Do not consider a complicated problem a "trick" question; each test item has a specific objective. There is only one correct and complete answer.

4. Do not waste too much time on problems that stump you. Go on to the test items that you can answer readily, then return to those which are causing difficulty.

5. For a computer problem, select the answer closest to your own solution. The problem has been checked with various types of computers, and if you have solved the problem correctly your answer will be closer to the correct answer than to any of the other choices.

6. Enter personal data in appropriate spaces on the test answer sheet in a complete and legible manner to aid in scoring.

Retesting

An applicant who receives a failing grade may apply for retesting by presenting his Airman Written Test Report, AC Form 8060–37

(1) after 30 days from the date he failed the test; or

(2) sooner, by presenting a statement from an appropriately rated flight or ground instructor certifying that he has given the applicant additional instruction and considers him ready and prepared for retesting.

NOTE: Whenever an applicant makes a failing grade, the statement above will be printed on AC Form 8060–37 for the convenience of both the applicant and instructor.

RECOMMENDED STUDY MATERIALS

Persons studying for the Instrument Rating (Airplane) Written Test will find the publications listed in this section most helpful. The list identifies material essential to preparing for the test, but does not include all material available in the subject areas. Textbooks and other references are available from many commercial publishers. It is the responsibility of each applicant to obtain study materials appropriate to his needs.

AIRMAN'S INFORMATION MANUAL (AIM)

This publication presents, in four parts, information necessary for the planning and conduct of flights in the National Airspace System. Besides providing frequently updated airport and NAVAID data, the AIM includes instructional and procedural information and is designed for use in the cockpit. Each part is available by annual subscription at the prices shown.

	Price	*Additional for Foreign Mailing*
Part 1, *Basic Flight Manual and ATC Procedures.* (Issued quarterly)	$4.00	$1.00
Part 2, *Airport Directory.* (Issued semiannually)	$4.00	$1.00
Part 3 and 3A, *Operational Data and Notices to Airmen,* (Operational data issued every 28 days; Notices to Airmen issued every 14 days	$20.00	$5.00
Part 4, *Graphic Notices and Supplemental Data* (Issued semiannually)	$1.50	$0.50

FEDERAL AVIATION REGULATIONS

The subscription prices listed include automatic revision service to all Parts contained in the Volume ordered. The FAR Parts contained in each Volume are listed in the "Advisory Circular Checklist and Status of Federal Aviation Regulations."

	Price	*Additional for Foreign Mailing*
Vol. I, Part 1, *Definitions and Abbreviations*	$1.50	$0.50
Vol. IX, Part 61, *Certification: Pilots and Flight Instructors*	$6.00	$1.50
Vol. VI, Part 91, *General Operating and Flight Rules*	$5.00	$1.25
Vol. XI, Part 95, *IFR Altitudes;* Part 97, *Standard Instrument Approach Procedures*	$2.75	$0.75
Vol. VII, Part 135, *Air Taxi Operators and Commercial Operators of Small Aircraft*	$6.50	$1.75
Vol. IX, Part 141, *Pilot Schools;* Part 43, *Ground Instructors*	$6.00	$1.50

HANDBOOKS

Instrument Flying Handbook, AC 61-27B ($2.50—GPO—TD 4.408:In 7/3). This is a basic text for instrument pilots. It deals with training considerations, aerodynamic factors, physiological factors, flight instruments and their use, air navigation aids, communications, the air traffic system, and flight planning.

Aviation Weather, AC 00-6 ($4.00—GPO—FAA 5.8/2:W 37). An excellent reference treating phases of meteorology of interest to the pilot. Aviation weather reports and forecasts are also covered with respect to format and content.

Pilot's Weight and Balance Handbook, AC 91-23 ($0.70—GPO—TD 4.408:P64/3). An excellent reference on loading and weight and balance for both the small and large aircraft.

CHARTS

Instrument Approach Procedure Charts. Individual charts give detailed information on procedures for specific airports. (AC 90-1A clarifies the symbols and abbreviations used on these charts.)

Enroute Charts: Low-Altitude and High-Altitude —(35¢ each). These charts provide the necessary aeronautical information for enroute instrument navigation.

Low-Altitude Area Charts—(35¢ each). These charts supplement the Enroute Charts by providing

departure, arrival, and holding procedures at principal airports.

ADVISORY CIRCULARS

The following Advisory Circulars may be obtained free of charge from:

Department of Transportation
Federal Aviation Administration
Distribution Unit, TAD-484.3
Washington, D.C. 20590

AC 00-17,	Turbulence in Clear Air
AC 00-24,	Thunderstorms
AC 20-32A,	Carbon Monoxide (CO) Contamination in Aircraft—Detection and Prevention
AC 60-4,	Pilot's Spatial Disorientation
AC 60-6,	FAA Approved Airplane Flight Manuals, Placards, Listings, Instrument Markings—Small Airplanes
AC 90-1A,	Civil Use of U.S. Government Produced Instrument Approach Charts (AC 90-1A is included in AC 61-27B, Instrument Flying Handbook)
AC 90-12,	Severe Weather Avoidance
AC 90-14A,	Altitude—Temperature Effect on Aircraft Performance
AC 90-22C,	Automatic Terminal Information Service (ATIS)
AC 90-23C,	Wake Turbulence
AC 90-36,	The Use of Chaff as an In-Flight Emergency Signal
AC 90-38A,	Use of Preferred IFR Routes
AC 90-41C,	Standard Terminal Arrival Routes
AC 91-8A,	Use of Oxygen by General Aviation Pilots/Passengers
AC 91-30,	Terminal Control Area
AC 170-3B,	Distance Measuring Equipment (DME)

EXAM-O-GRAMS

Exam-O-Grams are prepared on subjects which prove particularly troublesome to applicants in written tests. They provide information on items which are operationally important but commonly misunderstood.

VFR Exam-O-Grams—single copy (Free).
IFR Exam-O-Grams—single copy (Free).

How to Obtain Study Materials

The study materials listed, except charts, free Advisory Circulars, and Exam-O-Grams, may be obtained by remitting check or money order to:

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

or, from GPO Book Stores at the following addresses:

Federal Office Building
Room 1463 14th Floor
219 South Dearborn St.
Chicago, Ill. 60640

Room G-25
J.F.K. Federal Building
Government Center
Boston, Mass. 02203

Federal Building
Room 1023
450 Golden Gate Avenue
San Francisco, Calif. 94102

Federal Building
Room 100
275 Peachtree St., N.E.
Atlanta, Ga. 30303

Federal Building
Room 135
601 East 12th Street
Kansas City, Mo. 64106

Federal Building
U.S. Courthouse
Room 1C46
1100 Commerce Street
Dallas, Texas 75202

Federal Building
Room 1015
300 N. Los Angeles St.
Los Angeles, Calif. 90012

26 Federal Plaza
Room 110
New York, N.Y. 10007

Federal Building
Room 1421
1961 Stout St.
Denver, Colo. 80202

To expedite your order when ordering publications from the Superintendent of Documents, be sure to include with the title the GPO catalog number given in the price line (e.g., TD 4.408:In 7/3 or FAA 5/8:W 37).

Checks or money orders for charts should be made payable to "NOS, Department of Commerce," and sent to:

Distribution Division (C-44)
National Ocean Survey
Washington, D.C. 20235

Single copies of Exam-O-Grams may be obtained free of charge from:

FAA Aeronautical Center
Flight Standards Technical Division
Operations Branch
P. O. Box 25082
Oklahoma City, Oklahoma 73125

STUDY OUTLINE

This study outline indicates the areas of aeronautical knowledge which pertain to the written test. It expands the general aeronautical knowledge requirements set forth in Federal Aviation Regulations, and is based on airman activity for flight under Instrument Flight Rules.

Reference Code:

AIM—Airman's Information Manual
EOG—IFR Exam-O-Gram
AC—Advisory Circular
AW—Aviation Weather (AC 00-6)
FAR—Federal Aviation Regulations
IFH—Instrument Flying Handbook

Pilot Responsibilities (FAR)

A01. *Authority and Limitations*
- Pilot-in-Command (91.3)
- Emergency action (91.3)
  - deviation from rules
  - reports required

A02. *Certificates and Ratings (61.3, 61.15, 61.16, 61.101)*
- General privileges (61.101)
- When required (61.3, 91.97)
- Medical certificates (61.43)
- Instrument flight time
  - pilot logbooks (61.39)
  - recent flight experience (61.47, 91.21)
- Certificate reports
  - change name (61.13)
  - lost certificate (61.13)
  - change of address (61.51)

A03. *Preflight Action for Flight (91.5, 91.23, AIM-1, EOG-31)* weather check; fuel required; alternate course of action; delays

A04. *Preflight Action for Aircraft*
- Documents (91.27, 91.29, 91.31)
  - Airworthiness Certificate; Registration Certificate; Operating Limitations
- Aircraft inspections (91.165, 91.169)
- Equipment and systems
  - equipment required (91.32, 91.33, 91.90, 91.97) tests and inspections: VOR receiver (91.25); altimeter system (91.170)
- Portable electronic devices (91.19)

A05. *Flight Plan (AIM-1)*
- When required (91.97, 91.115)
- Information required (91.83)
- Alternate airport (91.83, EOG-29)
- Closing flight plan (91.83)

A06. *Compliance With Clearances (91.75, EOG-6, AIM-1)*
- Communications reports (91.125)
- Communications failure: procedures (91.127); reports (91.129)
- Emergency deviation (91.75, AIM-1)
- Mid-air avoidance (VFR EOG-22, 29, 48)

A07. *Terminal Area Limitations (AIM-1)*
- Terminal control area (91.90)
- Airport traffic area (91.85)
- Airport operations (91.87, 91.89)
- Takeoff and landing minimums (91.105, 91.107, 91.116)
- IFR approaches (91.117)
- Aircraft speed (91.70)

A08. *Enroute Limitations (AIM-1)*
- Minimum altitudes (91.119, EOG-8): MEA; MOCA; MCA; MRA; MAA
- Cruising altitudes (91.121)
- Courses to be flown (91.123)
- Altimeter settings (91.81)
- Special use airspace (91.97, 91.99)
- Oxygen requirements (91.32)

Basic Knowledge

B01. *Physiological Factors (Ch. II—IFH, AIM-1)*
- Physiologic altitude effects:
  - aerotitis; aerosinusitis; hypoxia (AC 91-8A)
- Hypoxic effects
  - carbon monoxide (AC 20-32A); alcohol; hyperventilation; drugs
- Sensations of instrument flying (AC 60-4): motion; postural sense; sight
- Spatial disorientation

B02. *Aerodynamic Factors (Ch. III—IFH, Private Pilot Handbook)*

Forces

Power; airspeed; vertical speed

Turns: forces in turn; constant rate; rate-speed angle of bank; coordination

B03. *Gyroscopic Instruments and Systems (Ch. IV—IFH)*

Systems: vacuum; electric

Operating principles

Attitude Indicator (EOG–24)

principles of operation and use

preflight and flight limits

Turn Indicator

preflight and flight limits

principles of operation and use (EOG–18)

calibration

Heading Indicator

principles of operation and use

preflight and flight limits

B04. *Magnetic Compass (Ch. IV—IFH)*

Types; principles of operation; use; errors; corrections

B05. *Pitot-Static Instruments (Ch. IV—IFH)*

Pitot-static system

Altimeter (EOG–10)

principles of operation and use

terms: indicated; pressure; density; true; absolute

Vertical Speed Indicator

principles of operation and use

limits and adjustment

Airspeed Indicator

principles of operation and use

markings (VFR EOG–45)

airspeed definitions: indicated; calibrated; equivalent; true

B06. *Attitude Instrument Flying (Ch. V—IFH)*

Instruments: pitch; bank; power

Preflight instrument check

Basic maneuvers

straight and level

climbs and descents

turns (EOG–18)

Unusual attitudes; flight patterns

B07. *Unusual Flight Conditions (AC 90–12)*

Wake turbulence (AC 90–23C, AIM–1)

Thunderstorms (AC 00–24, page 110–AW)

Ice accumulation (Ch. 12—AW):

structural; carburetor or induction system; frost

Clear air turbulence (AC 00–17)

B08. *Flight Planning Computer Operations (Ch. XIII—IFH)*

Slide rule face

groundspeed; fuel; conversions

Wind face

headings; drift angle; groundspeed

B09. *Density Altitude Chart (VFR EOG–33)*

B10. *Aircraft Performance (Aircraft Owner's Handbook, VFR EOG–33), EOG–32, AC 90–14A)*

Performance Charts

cruise performance: altitude; gross weight; power settings (VFR EOG–38); fuel flow

takeoff distance

climb performance: angle; rate; balked landing; single engine landing distance

airspeed: IAS; CAS; EAS; TAS

Instrument markings

Placards

B11. *Aircraft Operating Limitations (document in aircraft, AC 60–6)*

Weight and balance (EOG–21, AC 91–23)

Instrument limit markings

Limiting placards

Charts: turbulent air penetration; maximum safe crosswinds (VFR EOG–27)

B12. *Properties of the Atmosphere*

Composition (Ch. 1—AW)

Temperature (Ch. 2—AW)

measurements: surface; aloft

Atmospheric pressure (Ch. 3—AW)

measurements; systems; standards

Wind (Ch. 4—AW)

circulation; systems; local variations

Moisture (Ch. 5—AW)

changes of state

measurements: relative humidity; dew point condensation; precipitation; sublimation

B13. *Stability*

Atmosphere (Ch. 6—AW)

lapse rate; stability determinations; effects of stability and instability

Wind (Ch. 7—AW)

convections; obstructions to flow; shear; CAT; intensity

B14. *Air Masses and Fronts (Ch. 9, 10—AW)*
- Sources
  - air mass; frontogenesis
- Classification
  - air mass; front
- Modification
- Characteristics
- Associated clouds (Ch. 8—AW)

B15. *IFR Weather Hazards*
- Thunderstorms (Ch. 11—AW, AIM–1)
  - detouring; structure and formation; turbulence; hail; lightning
- Icing (Ch. 12—AW)
  - types; conditions
- Fog and obstructions to vision
  - types; formation

B16. *Weather Observations (Ch. 15—AW)*
- Aviation weather reports (SA) (EOG–5)
- Pilot weather reports (UA)
- Weather radar observations (SD)
- Upper air observations: RAWIN, PIBAL

B17. *Weather Charts (Ch. 16—AW)*
- Weather depiction (EOG–15)
- Surface weather
- Constant pressure
- Radar summary (EOG–17)
- Prognostic
  - surface (EOG–16); constant pressure; significant weather; 12-hr. upper wind

B18. *Aviation Weather Forecasts (Ch. 17—AW)*
- Terminal (EOG–5)
  - 12-hr. (FT1); 24-hr. (FT2)
- Area (FA) (EOG–5)
- Winds aloft (FD) (EOG–5)
- In-flight weather advisories (FL)
- Severe weather
  - hurricane advisories (WH); outlook (AC); forecasts (WU)
- Prognoses
  - surface analysis (AS–2 and FS–1)
  - regional prognosis (FN–1)

B19. *Interpretation of Combined Weather Reports and Forecasts*

B20. *Weather Services (Ch. 14, 18—AW, AIM–1)*
- National Weather Services
  - telephone listings (AIM–2)
  - pilot-forecaster (Enroute Chart)
- FSS
  - location and telephone listing (AIM–2)
  - air-ground frequencies (AIM–3)
  - weather briefing information (EOG–19)
- Scheduled broadcasts
  - ATIS; NAV facilities
- Unscheduled broadcasts
  - SIGMET; AIRMET

Facilities

C01. *Airport Physical Facilities (AIM–3, 3A, Enroute, Area Charts, and Approach Charts)*
- Service
  - fuel; storage; repair; oxygen
  - number and longest; surface and load
- Runways
  - bearing capacity; elevation; traffic pattern; obstructions; markings (AIM–1, EOG–26, 28)
- Lighting (AIM–1)
  - rotating beacon
  - runway lighting aids
    - boundary; ALS; REIL; VASI
    - centerline; threshold (EOG–33)
- Unicom (AIM–3)
  - controlled; non-controlled airport

C02. *Radio Navigation Facilities (Ch. VI—IFH, AIM–1)*
- VOR; VORTAC; homing beacons; ILS; marker beacons; DF; radar

C03. *Use of Navigation Facilities (Ch. VII—IFH, AIM–1)*
- VOR (EOG–7, 14)
  - accuracy check (EOG–22)
    - VOT (AIM–3); VOR receiver check points (AIM–4)
  - orientation: position; intersection; tracking
- ADF (Ch. VII—IFH, EOG–23)
  - orientation; homing; tracking
- ILS (Ch. VI—IFH)
  - localizer; glide slope; marker beacons; lighting aids
- VASI (AIM–1)
- DME (Ch. VI—IFH, AC 170–3B)
- Transponder (EOG–25)
  - code; mode; sensitivity

C04. *Control Tower Facility (Ch. VIII—IFH, AIM–1, 3, 3A, 4, Approach Charts)*
- Ground control (AIM–1, 3)
  - clearance delivery; taxi; frequency
- Departure control (AIM–1, 3)
  - radar services; frequencies
- Takeoff and landing control (AIM–1, 3)
  - separation; frequencies

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Approach control (AIM–1, 3)
radar—services; approach; monitor non-radar frequencies
VHF direction finding (DFH) (AIM–1)
ATIS (AIM–3, AC 90–22C)
use; frequencies; information
Use of runways (AIM–1)
Light signals (91.77, AIM–1)

C05. *Flight Service Station Facility (AIM–1)*
Weather services
briefing; telephone listing (AIM–2)
Flight plan service
file; close; reporting; frequencies (AIM–3, Enroute Chart)
Airport advisory service
information; frequencies (AIM–3)
VHF direction finding (DF)

C06. *Air Route Traffic Control Center (ARTCC) (Ch. XI—IFH, AIM–1)*
Aircraft control (Enroute Chart)
geographic area; frequencies
Advisories; services; assistance

C07. *Use of Communication Facilities*
Communication phraseology (Ch. IX—IFH, AIM–1, EOG–11)
Airborne equipment (Ch. VII, VIII—IFH)
systems; frequencies (AIM–3)
Clearances and control sequence (AIM–1, Ch. X, XI—IFH, EOG–3, 4)
shorthand (Ch. XIV—IFH); items

C08. *Status of Facilities and Airways*
Airport/Facility Directory (AIM–3)
NOTAMS (AIM–3A)
Restrictions to Enroute Navigation Aids (AIM–4)
Special Notices (AIM–4)
Preferred Routes (AIM–3, AC 90–38A)
SIDs and STARs (AIM–3)
Substitute Route Structure (AIM–3)
Area Navigation Rules (AIM–3)
Charts: Enroute; Area

Airspace and Airway Route System

D01. *Controlled Airspace (AIM–1, Enroute and Area Charts)*
Terminal Control Area (AC 91–30); Airport Traffic Area; Control Zone; Control Area; Continental Control Area; Positive Control Area

D02. *Special Use Air Airspace*
Prohibited Area; Restricted Area; Climb Corridor; Warning Area; Intensive Student Jet Training Area; Alert Area

D03. *National Security: ADIZ; SCATANA (AIM–1)*

D04. *Victor (VOR) Airways (Low Altitude Enroute and Area Charts, AIM–1)*
Limits
Radials and bearings
Route identification
airway; military route; substitute route; unusable route
Altitude limits
MOCA; MEA; MRA; MCA; MAA
Compulsory and non-compulsory reporting points
facilities: VOR, VORTAC; NDB
intermediate fixes: intersections; DME
Segment limits
mileage breakdown; minimum altitude change; changeover points; altimeter settting boundary; time zone boundary

D05. *Area Navigation (AIM–3, EOG–30)*
Area Navigation Route (RNAV)
Waypoints
Use

D06. *Direct Flights (AIM–1)*

ATC Operations and Procedures

E01. *Pre-takeoff Procedures (AIM–1, Ch. XII—IFH, EOG–34)*
Flight plan; ATIS; clearance delivery; taxi

E02. *Takeoff and Departure Procedures (AIM–1, Ch. XII—IFH, IFR Minimum and Takeoff Procedures)*
Takeoff
Departure: radar; non-radar; SID
Altitude control: climb; crossing

E03. *Enroute Procedures (AIM–1, Ch. XII—IFH)*
Radar environment
vectors; reporting; handoffs
Non-radar environment
reporting; handoffs
Altitude
climb; descent; VFR-on-Top; cruise; maintain
Delays (AIM–1)
clearance limits; holding

E04. *Arrival (AIM–1, Ch. XII—IFH)*

STARs (AC 90–41C); radar vectors

Holding (shuttle)

E05. *Approaches (AIM–1, AC 90–1A, IFH, Approach Charts, EOG–27)*

VOR; VOR-DME; NDB; ILS; Localizer (BC); RNAV; PAR; ASR; Contact; Visual

Missed approaches

E06. *V/STOL Operations (when available)*

E07. *Emergencies (AIM–1, EOG–2)*

Lost: transponder code; triangle; emergency frequency; chaff (AC 90–36)

Forced landing or locator beacon; search and rescue (AIM–1)

Difficulty with communications

Malfunction of equipment

Part 430, Aircraft Accidents, Incidents, Overdue Aircraft, and Safety Investigations

immediate notification

manner of notification

reports

F01. *Aeronautical Terms (FAR–1 and AIM–1, Glossary)*

SAMPLE TEST

The following sample test is similar to the Instrument Rating Airplane Written Test.

Knowledge in all areas presented in the study outline—not just the ability to answer sample test items—should be the goal in preparing for the written test. For example, applicants should expect to encounter many test items dealing with detailed ATC procedures, and may prepare themselves for such test items by careful study of Part 1 of the *Airman's Information Manual.* Correct answers, references, and detailed explanations for the sample test items are included at the end of the test.

This test is based on an instrument flight from Grand Canyon National Park, Arizona, to Amarillo Air Terminal, Amarillo, Texas. You will be flying a single-engine aircraft accompanied by two business associates.

NOTE: The sample test items, answers, and analyses are based on procedures and regulations in effect at the time of preparation of this publication. Regulatory and procedural changes subsequent to the date of this guide should be checked for their effect on the applicable item.

* * * * *

NOTE: Most of the airplane performance charts in the light airplane handbooks are based on temperatures in degrees Fahrenheit and speeds in statute miles per hour. Since Low Altitude Enroute Chart distances are given in nautical miles, winds are given in knots, and upper air temperatures are given in Celsius (Centigrade), be sure to make necessary conversions.

An excerpt from the L-4 Low Altitude Chart appears in the Appendix, Figure 29. Center frequencies and a chart legend may be found in Figures 27 and 28.

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DEPARTMENT OF TRANSPORTATION—FEDERAL AVIATION ADMINISTRATION

FLIGHT PLAN

Form Approved
OMB No. 04-R0072

1. TYPE	2. AIRCRAFT IDENTIFICATION	3. AIRCRAFT TYPE/ SPECIAL EQUIPMENT	4. TRUE AIRSPEED	5. DEPARTURE POINT	6. DEPARTURE TIME		7. CRUISING ALTITUDE
					PROPOSED (Z)	ACTUAL (Z)	
VFR / X IFR / DVFR	N7232V	HIFLIER/A	150 KTS	GCN	2030		11,000

8. ROUTE OF FLIGHT

V257 PRC V12 AMA

9. DESTINATION (Name of airport and city)	10. EST. TIME ENROUTE		11. REMARKS
	HOURS	MINUTES	
Amarillo Air Terminal Amarillo			

12. FUEL ON BOARD		13. ALTERNATE AIRPORT(S)	14. PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE	15. NUMBER ABOARD
HOURS	MINUTES			3

16. COLOR OF AIRCRAFT

CLOSE VFR FLIGHT PLAN WITH_____FSS ON ARRIVAL

FAA Form 7233-1 (5-72)

1. Which statements regarding pilot responsibility are true under the conditions given for this flight?

   A. A commercial license is required for this flight.

   B. You must have received a Class I, Class II, or Class III Medical Certificate within the preceding 24 months.

   C. You must have made, within the preceding 90 days, at least five takeoffs and landings to a full stop in the airplane you will fly on this flight.

   D. You must have had at least 6 hours of instrument time within the preceding 6 months. At least 3 hours must have been in flight in an aircraft other than a helicopter, and not more than 3 hours in an approved trainer may be credited.

   1—A, B, C, D.
   2—A, C, D only.
   3—B and C only.
   4—B and D only.

2. Which preflight actions are required for this flight?

   A. A study of the weather reports and forecasts or have a weather briefing.

   B. Determine the fuel requirement.

   C. Have alternates available in case the flight cannot be completed as filed.

   D. Know lengths of usable runways at departure and landing airports; know your airplane's takeoff and landing requirements.

   1—A, B, C, D.
   2—A and B only.
   3—A and C only.
   4—B and D only.

3. Which documents are required to be in the airplane?

   A. Airworthiness Certificate
   B. Registration Certificate
   C. Weight and Balance Data
   D. FCC Radio Transmitter License
   E. Airplane Log

   1—A, B, C, D, E.
   2—A, B, C, D only.
   3—A and C only.
   4—B, D, E only.

4. Where would you look to determine if Grand Canyon National Park Airport has any special takeoff procedures?

   1—Part 3 of AIM.
   2—Part 1 of AIM under SIDs.
   3—Part 2 of AIM.
   4—Approach Chart for the airport.

5. The altimeter setting found in the Aviation Weather Reports is in inches of mecury and is the

   1—surface atmospheric pressure at the station.
   2—surface atmospheric pressure at the station corrected to sea level.
   3—average surface pressure for the area.
   4—sea level pressure corrected to surface pressure for the particular station.

6. What runway lighting aids are indicated on the aerodrome sketch for Runway 21? (Figure 25)

   1—Instrument Approach Lights and HIRL.
   2—HIRL only.
   3—HIRL and VASI.
   4—VASI only.

7. Which is a true statement regarding the LOC BC RWY 21 approach? (Figure 25)

   1—A procedure turn is required for this approach.
   2—The final fix for this approach is the intersection formed by the 125 radial of the Amarillo VORTAC and the LOC course.
   3—This approach has a step-down fix 4.5 n.m. from the end of the runway.
   4—The height of the MDA above the airport elevation is 336 feet.

8. Which statement is correct pertaining to altitudes for the LOC BC RWY 21 approach for Amarillo? (Figure 25)

   1—Five thousand feet is both a minimum and maximum altitude for the procedure turn.
   2—The minimum altitude at the final fix is 5,000 feet.
   3—This approach has a DH of 3,940 feet.
   4—The MDA, when landing on another runway, is 4,000 feet.

9. Which statement pertaining to your takeoff at Grand Canyon National Airport is true? (Figure 26)

   1—It will be necessary for you to climb to an altitude of 10,000 feet in a holding pattern before starting on course.
   2—You must climb to a minimum of 9,000 feet before starting on course.
   3—Your climb must be such that you have a *minimum* altitude of 7,500 feet over the VOR before starting on course.
   4—You may climb to your assigned altitude while on course unless instructed otherwise by ATC.

10. The Instrument Approach Procedure Chart for Grand Canyon National Airport uses the old format which lists ceiling and visibility as landing minimums. Which statement applies for a landing at this airport?

   1—The ceiling of 500 feet is the applicable minimum.
   2—The visibility of 1 mile is the applicable minimum.
   3—Both the ceiling of 500 feet and the visibility of 1 mile apply.
   4—To make this approach, you need a ceiling of at least 500 feet, a visibility of at least 1 mile, and an MDA of 7,111 feet.

11. Using the conditions listed below, determine the IAS for best rate of climb. (See Figures 11 and 15)

Temperature	78°F.
Altimeter	29.65.
Elevation	6,700 feet.
Gear and Flaps	Up.
Gross Weight	3,000 lbs.

   1—79k.
   2—90k.
   3—92k.
   4—103k.

12. Determine the takeoff distance over a 50-foot obstacle under the following conditions. (Figure 14)

Gross weight	3,000 lbs.
Temperature	80°F.
Headwind	6 knots.
Pressure Altitude	7,000 feet.
Flap Setting	15°.

   1—3,700 feet.
   2—4,500 feet.
   3—4,250 feet.
   4—4,000 feet.

13. With full throttle and 2400 RPM, what TAS should you have at 11,000 feet if the Pressure Altitude is 11,100 feet and the OAT is −5°C.? (Figure 13)

   1—152k.
   2—159k.
   3—170k.
   4—176k.

14. Approximately what manifold pressure would you have in test item 13? (Figure 9)

   1—20.5.
   2—19.8.
   3—17.5.
   4—20.0.

15. Choose the correct statement based on the 1500Z Aviation Weather Report. (Figure 17)

   1—Prescott (PRC) had a wind shift to the northwest.
   2—The temperature-dewpoint spread at Winslow (INW) was 26°F.
   3—Lubbock (LBB), a possible alternate, had a ceiling of 40 feet.
   4—Amarillo (AMA) had a very light fog.

16. The 1600Z Aviation Weather Report (Figure 17) indicates

   1—Winslow (INW) had a ceiling of 3,000 feet at 1600Z.
   2—Zuni (ZUN) had a broken cloud condition estimated to be at 2,000 feet.
   3—the ceiling at Grants (GNT) was 8,000 feet.
   4—Tucumcari (TCC), a possible alternate, had a lower ceiling at 1600Z than at 1500Z, but the temperature-dew point spread remained the same.

17. The ABQ Area Forecast (Figure 21) indicates

   1—that there should be a few embedded thunderstorms along your route of flight in New Mexico.
   2—you will have light to moderate icing through all of New Mexico.
   3—that you should encounter some severe turbulence.
   4—lower ceilings as you proceed along your course to AMA.

* * * * *

NOTE: To determine if either LBB or TCC can be used for an alternate, you will need to know their alternate minimums. TCC has a non-precision approach with standard alternate minimums; LBB has a precision approach with standard minimums.

* * * * *

18. From the Terminal Forecast (Figure 18) you determine that

    1—both LBB and TCC meet the conditions necessary for use as an alternate for this flight.

    2—by the time you arrive at AMA the ceiling will be obscured.

    3—the surface wind should be such that you will probably be given the ILS approach to Runway 3 at AMA.

    4—you will not be able to list either LBB or TCC as an alternate unless your ETA is before 1800Z.

19. The Pilot Weather Reports (UA) (Figure 20)

    1—were sent from Albuquerque and Greater Southwest (GSW).

    2—indicate a pilot should expect icing on a flight above 11,00 from ABQ to FMN.

    3—indicate that VFR conditions exists all along the route from ABQ to FMN.

    4—indicate that at the time of the report, Otto has solid IFR conditions at 11,000 and ice was forming on the planes.

20. You determine from the Weather Depiction Chart (Figure 22) that

    1—the ceiling at AMA should be 400 feet for the next 3 hours.

    2—should you have a complete electrical failure, the best direction to fly would be north.

    3—the visibility at AMA was 4 miles.

    4—you should expect rain for most of your flight across New Mexico.

21. The Radar Summary Chart (Figure 23) indicates that at 1645Z

    1—there was a line of thunderstorms in New Mexico.

    2—rain in Texas panhandle was decreasing in intensity.

    3—the base of the overcast in the Texas panhandle was 14,000 feet MSL.

    4—there were no thunderstorms along your route.

22. Which charts show forecast weather?

    A. Radar Summary.
    B. Weather Depiction.
    C. Significant Weather Prog.
    D. Clouds and Freezing Level Prog.
    E. Upper Wind Prog.

    1—A, B, and C only.
    2—B, C, and D only.
    3—C, D, and E only.
    4—B, C, D, and E only.

23. Determine the average groundspeed on a flight from ABQ to AMA, flying at 12,000 feet, at a CAS of 120k. Base your computation on an average of the winds and temperatures for ABQ and AMA shown on the "Wind Prog." (Figure 24)

    1—166k.
    2—171k.
    3—141k.
    4—146k.

24. Determine the required CAS for your flight from Prescott to Albuquerque to obtain 150k TAS at 11,000 feet pressure altitude. (Obtain temperature from Figure 19)

    1—125k.
    2—130k.
    3—135k.
    4—139k.

25. Transponder Mode A/3, Code 7600 is used

    1—to alert ATC that you are in an emergency condition.

    2—when operating below 10,000 feet MSL.

    3—to alert ATC that you have experienced a loss of two-way radio capability.

    4—when operating above 10,000 feet MSL.

26. Choose the correct statement regarding errors in the Attitude Indicator.

    1—Acceleration causes the attitude indicator to show a lower pitch attitude than the actual aircraft attitude.

    2—Turn error, due to precession, may cause the horizon bar to lift as much as 5° in 180° turn.

    3—The attitude indicators in general aviation airplanes have no upset limits.

    4—Poor coordination in a turn has no effect on the accuracy of the attitude indication.

* * * * *

The Flight Time Analysis Form (Figure 1) may be removed from the Appendix for use in your computations.

This Flight Time Analysis contains necessary information for your preflight calculations. The first leg and the approach leg have the time and fuel burn recorded. At the bottom of the form are instructions for determining the wind and fuel burn for the other legs of the flight.

Figure 29 is an excerpt from an L-4 Low Altitude Enroute Chart and covers the area for this flight. Figures 27 and 28 are also excerpts from this Enroute Chart. Figure 27 contains the Air Route Control Center/Remote Control Frequencies and Figure 28 contains the Chart Legend.

* * * * *

27. The estimated time enroute from takeoff to the completion of your approach at Amarillo is nearest to

    1—4 hours 27 minutes.
    2—4 hours 32 minutes.
    3—4 hours 37 minutes.
    4—4 hours 42 minutes.

28. The quantity of fuel required by regulations for this flight is approximately

    1—414 lbs.
    2—408 lbs.
    3—490 lbs.
    4—460 lbs.

29. Your preflight compass heading for the leg from Prescott to Winslow is (see Figure 7 for Compass Correction Card.)

    1—057°.
    2—060°.
    3—065°.
    4—062°.

30. With your plane loaded as shown below, determine the CG location and if it is within limits. (Use necessary information and weights given in Figures 7 and 8.)

Weight of rear seat passenger	160 lbs.
Inboard fuel tanks	Full.
Outboard fuel tanks	26 gals.
Baggage	222 lbs.

    1—93.0″ aft of datum and within limits.
    2—90.7″ aft of datum and within limits.
    3—88.1″ aft of datum and out of limits.
    4—93.1″ aft of datum and out of limits.

* * * * *

Aboute 45 minutes before your planned departure, you call Prescott FSS and file your flight plan. Under "Remarks" you indicate you will contact Los Angeles Center to obtain your clearance.

Upon contacting Los Angeles Center, you receive this clearance: CLEARED AS FILED, MAINTAIN ONE ONE THOUSAND, REPORT BISHOPS LAKE.

* * * * *

31. Which phraseology is recommended for your report at Bishops Lake?

    LOS ANGELES CENTER, HIFLIER SEVEN TWO THREE TWO UNIFORM,

    1—BISHOPS LAKE, THREE FIVE, ONE ONE THOUSAND, PRESCOTT (time), WINSLOW, OVER.
    2—ONE ONE THOUSAND, OVER
    3—BISHOPS LAKE, ONE ONE THOUSAND, OVER.
    4—BISHOPS LAKE, ONE ONE THOUSAND, IFR, PRESCOTT (time).

32. The minimum altitude for identification of Bishops Lake by use of the 077 radial of Peach Springs and the 196 radial of GCN is

    1—9,000 feet.
    2—10,000 feet.
    3—11,000 feet.
    4—9,500 feet if VFR.

* * * * *

Upon contacting Los Angeles Center at Bishops Lake, you are instructed to squawk 1100 and to "ident," after which you are informed that you are in radar contact.

* * * * *

33. What frequency would you expect to be assigned when handed off from Los Angeles Center to Albuquerque Center?

    1—123.9.
    2—126.9.
    3—125.2.
    4—126.3.

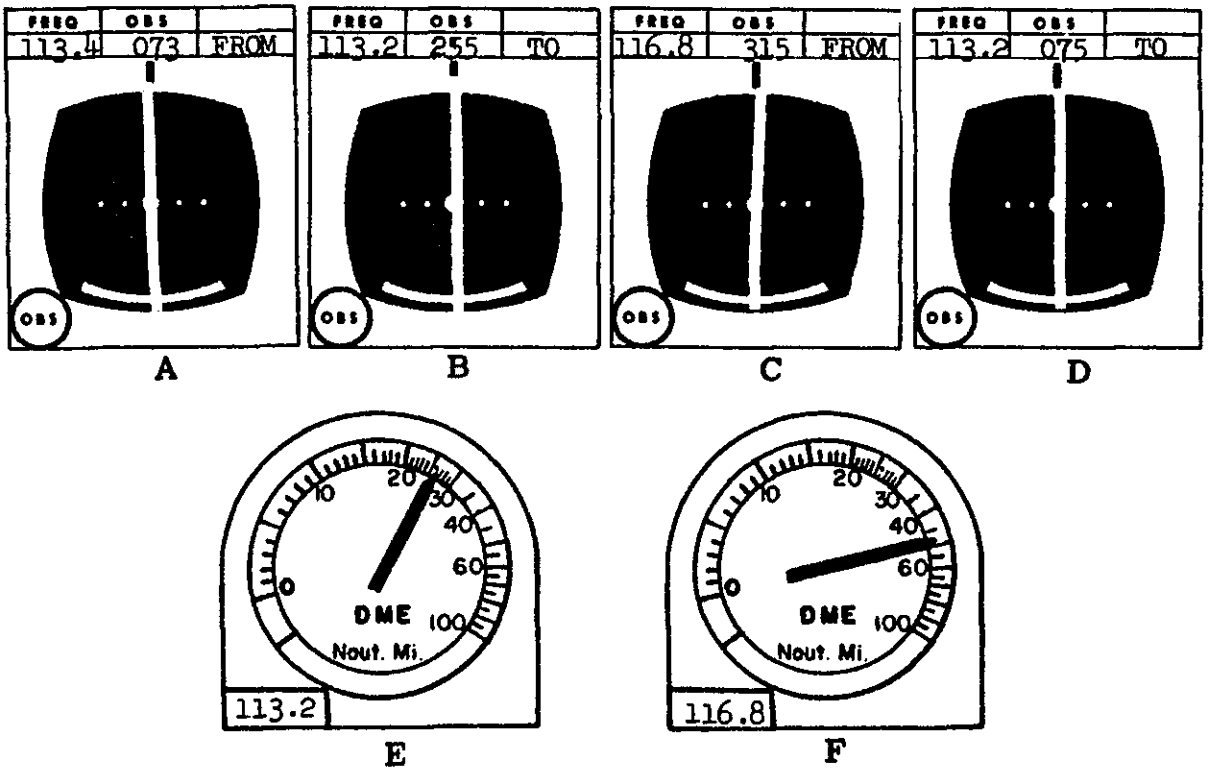
34. A position report should be made

    1—when you are handed off to Albuquerque Center.
    2—at all VORTACs along your route since all are designated reporting points.
    3—only at Prescott.
    4—only if you are requested to do so or if informed by ATC that Radar Contact has been lost or Radar Service terminated.

35. Select all of the VFR frequencies on which Winslow Radio can be contacted, as indicated on the Enroute Chart.

    1—122.2.
    2—112.6 and 122.2.
    3—122.1, 122.6, and 123.6.
    4—122.1, 123.6, 122.6, and 122.2.

36. Referring to the illustrations below and panel G of the Enroute Chart, Laguna Intersection may be determined by



1—a combination of A and C, or A and F.

2—a combination of B and C, or B and E.

3—a combination of D and E, or D and C.

4—E alone, or a combination of C and F.

37. Select the true statement pertaining to your flight in the Albuquerque area.

1—Your minimum crossing altitude at ABQ is 13,000 feet.

2—ATC must assign you 13,000 feet for the leg from ABQ to OTO, but you would not have to cross ABQ at 13,000 feet.

3—If you have not received an amended clearance pertaining to altitude or route by the time you arrive at ABQ, you should contact Albuquerque Center.

4—If you continue on V12, you must cross ABQ at 12,000 feet.

38. Which is a correct statement pertaining to the VOR changeover points between OTO and Tucumcari?

1—To determine the VOR changeover between OTO and ACH, you should tune your DME to OTO and changeover at 22 DME miles.

2—The VOR changeover point between ACH and TCC is at the halfway point.

3—To determine the VOR changeover point OTO and ACH, set your DME on 110.0; when your DME indicates 22 miles, navigate on the receiver tuned to ACH.

4—There is no VOR changeover point between OTO and ACH, and the changeover point between ACH and TCC is 30 miles from ACH.

39. Santa Rosa Airport (printed in brown on the actual Enroute Chart) is 23 miles SE of Anton Chico (Panel H). Which statement pertaining to this airport is correct?

1—KSYX Tower is 1,420 feet above the surface.

2—The length of the longest runway is 4,782 feet.

3—Santa Rosa is not in controlled airspace.

4—Santa Rosa does not have an approved instrument approach.

40. After passing Anton Chico, Albuquerque Center instructs you to contact Albuquerque Center on 125.9. Which phraseology is recommended for this contact? (You have been instructed to descend to 11,000.)

ALBUQUERQUE CENTER, HIFLIER SEVEN TWO THREE TWO UNIFORM

1—(miles) PAST ANTON CHICO, TRANSMITTING ON 125.9 OVER.

2—DESCENDING ONE ONE THOUSAND, OVER.

3—(miles) PAST ANTON CHICO, ONE ONE THOUSAND, AMARILLO, OVER.

4—DESCENDING ONE ONE THOUSAND, AMARILLO, OVER.

41. Albuquerque Center gives you the following clearance:

HIFLIER SEVEN TWO THREE TWO UNIFORM, CLEARED TO THE TOWER INTERSECTION; AFTER PASSING TUCUMCARI VORTAC, DESCEND AND MAINTAIN SIX THOUSAND.

Which statement regarding this clearance is true?

1—You must start a 500 ft./min. descent as soon as you pass Tucumcari.

2—Holding instructions should have been issued with this clearance.

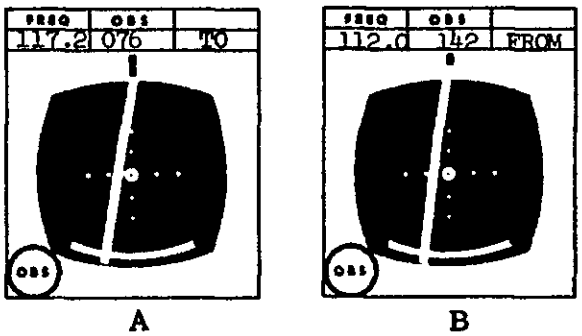
3—It indicates your flight will be delayed.

4—You should plan your action at Tower Intersection in case you do not receive further clearance.

42. What is your approximate position if your navigation receivers indicate as shown by the illustration? (See Enroute Chart, Panel H.)

1—Five miles west by northwest of Tower Intersection.

2—Five miles west by southwest of Tower Intersection.



A B

3—Five miles east by northeast of Tower Intersection.

4—Five miles east by southeast of Tower Intersection.

43. To navigate on V12 from Tower Intersection (Panel H) to Amarillo VORTAC, what is the minimum altitude you could fly and be assured of acceptable navigational signals?

1—7,000 feet.
2—6,000 feet.
3—5,900 feet.
4—5,500 feet.

44. What is the MEA for the transition route from Tower Intersection to the outer marker? (ILS RWY 3, Figure 25.)

1—5,000 feet.
2—5,900 feet.
3—6,000 feet.
4—The assigned altitude.

45. Assume that you are executing an ILS approach to RWY 3 at Amarillo with the glide slope inoperative. Where should the missed approach start if the runway or its environment is not in sight?

1—When you reach the DH.
2—At the middle marker.
3—Upon reaching the MDA.
4—At the runway threshold.

ANALYSIS OF THE ANSWERS TO SAMPLE TEST ITEMS

The three-letter code after the correct answer to the test item refers to the codes used in the Study Outline which starts on page 5.

1—(4) A02

Since this flight requires only a private certificate (see FAR 61.101) a Class I, II, or III Medical Certificate would be current for 24 months. Recency of experience requires 5 takeoffs and landings to a full stop in the same category, class, and type aircraft (not in same airplane), within the preceding 90 days. See Code A02 of the Study Outline for further references.

2—(1) A03

All of the statements are correct (see FAR 91.5). Additional references are found under A03 of the Study Outline.

3—(2) A04

All of the documents except E are required. D is required by an FCC regulation (see EOG-31). E is covered in FAR 91.173.

4—(4) E02

If the Instrument Approach Procedure Chart for an airport is in the old format, the takeoff procedure, if not standard, is written on the chart. The new format charts have a "T" at the bottom of the "Minimums Section." The pilot can than find the takeoff minimums or procedure by looking in the front of the particular Instrument Approach Procedure Charts booklet under "IFR Takeoff Minimums and Departure Procedures."

5—(2) B12

Altimeter settings are pressures above sea level. The weather observer takes the station pressure and then changes this to sea level pressure. See Aviation Weather, AC 00-6, page 171.

6—(3) C01

The symbol "v" by the side of the runway number indicates VASI. HIRL is indicated near the bottom of the sketch.

7—(2) E05

If the pilot is vectored to the final approach (ASR available at AMA), no procedure turn is necessary. The number "336" which appears in the minimums section of the approach chart, is the height of the MDA above the touchdown zone (see AC 90-1A). The final fix is identified in the profile view of the chart by the maltese cross symbol.

8—(4) E05

Minimum altitudes are underlined, while maximum altitudes have a line above the altitude. If the altitude has a line both above and below, this altitude is mandatory. DH is decision height used for straight-in precision approaches. MDA is the minimum descent altitude used for non-precision approaches. All circling approaches have an MDA.

9—(4) E02

The special departure instructions on the chart pertain to eastbound departures; there is no special procedure for your departure.

10—(2) A07

Ceiling is no longer a landing minimum; use only the visibility.

11—(2) B10

The use of the "Speeds for Best Rate of Climb" chart (Figure 11) requires density altitude. This is obtained from the density altitude chart in Figure 15 by first determining pressure altitude (see example on chart). An altimeter setting of 29.65 requires an addition of 253 feet to the field elevation (pressure altitude is 6,953 feet). Using this pressure altitude and the given temperature of 78°F. you should determine the density altitude to be approximately 9,600 feet. From Figure 11, using this density altitude and a gross weight of 3,000 lbs., you should obtain a best rate-of-climb speed of 104 m.p.h. or 90k.

12—(1) B10

Since the chart (Figure 14) uses miles per hour, change the given wind from 6 knots to 7 m.p.h. Follow the procedure shown on the chart to obtain a takeoff distance of approximately 3,700 feet.

13—(1) B10

The density altitude, determined from Figure 15, is approximately 11,200 feet. By use of the TAS

chart (Figure 13), you should obtain a TAS of 176 m.p.h. or 153k.

14—(2) B10

The True Airspeed vs. Density Altitude Chart (Figure 13) used in test item 13, indicates that the engine should develop 65% rated horsepower. The Power Setting Table (Figure 9) indicates that at 11,000 feet, 169 hp (65%) should be developed with a manifold pressure of 19.8 and 2400 r.p.m.

15—(2) B16

Arrows in a weather report (SA) are teletypewriter codes to indicate either a NOTAM to follow or currency status. Arrows are no longer used in the weather codes. The temperature-dewpoint spread at INW is 53−27=26°F. LBB, at the time of the observation, had a ceiling of 400 feet. AMA had very light rain and fog (dashes are not used with fog).

16—(2) B16

INW did not report a ceiling, only scattered clouds ZUN reported a ceiling of 2,000 feet (broken clouds). The ceiling at GNT was estimated at 1,000 feet both at 1500Z and 1600Z.

17—(4) B18

The forecast indicates that Arizona will be clear; western New Mexico should have ceilings around 17,000 feet; and eastern New Mexico should have ceilings from 200 to 800 feet.

18—(3) B18

According to the Terminal Forecast (Figure 18), LBB should have a ceiling of 600 feet variable 300 feet at the time of your ETA. Since the minimum ceiling must be 600 feet, you would not be able to use LBB as a alternate. AMA forecast indicates a ceiling of 600 feet, variable 200 feet *sky* obscured. The forecast for TCC indicates a ceiling of 1,500 feet until 2000Z and then 2,500 feet, so TCC can be used as an alternate. The AMA wind is forecast to be 040° at 12 knots; therefore, you would expect the ILS runway to be in use.

19—(1) B16

The station transmitting the report is given at the top of the reports.

20—(2) B17

The ceiling at AMA was 400 feet at 1600Z, but this is not a forecast. From this chart, you see that north of your route the sky is clear; so without your radios, the best direction to fly would be to the north. Rain is indicated only in eastern New Mexico and at AMA.

21—(4) B17

The thunderstorms are shown in southwest New Mexico and central and southern Texas. There was light rain in the panhandle and the chart indicates no change. The line under the altitude indicates the top of the echo. Only very light rain showers and light rain are shown along your route.

22—(3) B17

The Prog charts are forecast weather; the other charts depict the weather that existed at the time the chart was prepared.

23—(1) B08

The wind prog indicates a wind for ABQ of 320° at 26k and for AMA 270° at 24k. The average wind, based on this forecast, is 295° at 25k. An average true course can be obtained by drawing a line from ABQ to AMA and then measuring the degrees at the nearest middle meridian, or by taking an average of magnetic courses for each leg and adding the average east variation (12°). The average true course is 86° or 87° depending on the method used. The average temperature is −7.5°C. By use of the slide rule side of your computer, you should obtain a TAS of approximately 145k. The groundspeed can then be determined by use of the "grid" side of your computer (166k).

24—(1) B08

By interpolation, the temperature for PRC is 03°C. and for ABQ 02°C. Use slide rule side of computer to obtain CAS.

25—(3) C03

See Part 1 of AIM under Transponder Operation.

26—(2) B03

See the *Instrument Flying Handbook*, AC 61-27B, and IFR Exam-O-Gram 24 for information on the Attitude Indicator.

27—(1) B08

Leg	*Wind*	*GS*
Bishop-PRC	027 at 13	163
PRC-INW	027 at 13	141
INW-ABQ	080 at 10	140
ABQ-AMA	—	148
Alternate		
AMA-TCC	Light & Variable	150

28—(4) B08

Required fuel to AMA is approximately 356 lbs.; to alternate 48 lbs.; and reserve 56 lbs.

29—(2) B08

MC 61°−4° (drift correction) +3° (compass correction) =60°.

30—(2) B11

Item	*Weight/lbs.*	*Moment lb. in.*
Empty Weight	1,853	155,096
Oil	23	644
Fuel (6 lbs./gal.) (inboards)	336	30,240
Fuel (outboards)	156	14,820
Pilot and front passenger	350	29,680
Passenger (rear)	160	19,280
Baggage	222	31,524
	3,100	281,284

281,284 ÷ 3,100 = 90.7 inches aft datum

31—(1) C07

You are not in radar contact until so informed by ATC; a position report is required. Alternative (1) is the phraseology recommened in AIM.

32—(3) A08

The MRA printed on the chart is the necessary altitude to be assured of receiving an adequate signal from Peach Springs.

33—(2) E03

The ARTCC remoted sites are indicated on the Enroute Chart and the frequencies for each sector or site is found on the back fold of the chart (not the excerpt in this guide—see Figure 27).

34—(4) E03

Position reports are discontinued when you are advised that you are in radar contact.

35—(4) C05

The shadow box indicates the station has all the standard FSS frequencies and the frequency on top of the box is an additional frequency.

36—(3) C03

Although a pilot could navigate with the OBS set to 255 (illustration B), it is not recommended because the pilot would have to turn away from the needle to return to course. In this illustration, to have a TO in the window, the plane would be east of the VORTAC. The large arrowhead on the chart indicates DME can be used in determining the fix.

37—(3) D04

The minimum crossing altitude at ABQ for V12 going east is 10,700 feet. Since you were assigned 11,000 feet, you are above the MCA; however, since the MEA between ABQ and OTO is 12,000 feet, you should check with Albuquerque Center if you are not assigned a higher altitude.

38—(3) D04

Since there is no changeover point indicated on the chart between Otto and Anton Chico, the changeover point is halfway or 22 miles. The DME would be the best method of determining the distance; however, since OTO is not a VORTAC, the DME would have to be tuned to ACH.

39—(4) D04

Only the aerodromes shown in BLUE have an approved low altitude instrument approach procedure published. KSYX has a frequency of 1420 kHz.

40—(2) E03

Since you are still in Radar Contact, ARTCC wants only to confirm your altitude.

41—(4) E03

Since you were not given holding instructions ATC probably expects there will be no delay, but it is good practice to be ready to go into a holding pattern should you not receive further clearance.

42—(2) C03

Receiver A indicates that you are about 3° south of the airway and receiver B indicates you are about 3° west of Tower Intersection.

43—(3) D04

Since Tower is less than 22 nautical miles, you should have an acceptable signal at MOCA (5,900).

44—(1) E05

The transition course (110°) and MEA (5000) is given on the approach chart.

45—(4) E05

This information is found on the aerodrome sketch on the chart.

FLIGHT TIME ANALYSIS

CHECK POINTS FROM	CHECK POINTS TO	ROUTE CRUISE ALT./FLT. LEVEL	TRUE COURSE	AIRSPEED-KTS. IAS OR MACH NO.	AIRSPEED-KTS. TAS	WINDS ALOFT DIRECTION VELOCITY	DRIFT CORR ANGLE	GROUND SPEED	DISTANCE N.M.	TIME LEG	TIME TOTAL	FUEL CONSUMPTION LBS. LEG	FUEL CONSUMPTION LBS. TOTAL	MISC.
GCN Airport	Bishop Lake	- - - - -	- - -	- - -	- - -	- - - - - -	- - -	- - -	- - -	15	15	40*		*Includes taxi - runup
Bishop Lake	PRC	V78 11,000			150	**								
PRC	INW	V12 11,000			150	**								
INW	ABQ	V12 11,000			150	#								
ABQ	AMA	V12 11,000			150	181° @ 11								
AMA	Airport	- - - - -	- - -	- - -	- - -	- - - - - -	- - -	- - -	- - -	09		12		

ALTERNATE DATA

AMA	TCC	V12 6,000			150	Use AMA Wind Fig.			96		

FUEL SUMMARY

	TIME	LBS./GALS.
ENROUTE		
ALTERNATE		
RESERVE		
EXTRA		
TOTAL		

**Use PRC winds for 9,000 and 12,000 and interpolate for 11,000 (Fig. 19).
Determine the wind for ABQ at 11,000 then use an average of the PRC and ABQ winds.

NOTE: Except where given, use 75 lbs./hr. for fuel burn.

FIGURE 1.—Flight time analysis.

418-720 O - 72 - 3

AIRPORT DIRECTORY

ARIZONA

§ GRAND CANYON, GRAND CANYON NATIONAL PARK (GCN) 7 S IFR FSS: Prescott (LC 638-2943)
6605 H68 (S-75, T-110, TT-180) BL4 F12, 18 U-1

ARIZONA—CONTINUED

§ PRESCOTT, MUNI 7 NE IFR FSS: Prescott on Fld
5042 H68 (2) (S-40, T-60, TT-100) BL4 S5 F12, 18, 30 U-2
VHF/DF: Ctc FSS
Remarks: Heavy acft taxi on rnwy.

AIRPORT/FACILITY DIRECTORY

LOCATION

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

ELEVATION

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

RUNWAYS

The runway surface length, and weight bearing capacity are listed for the longest instrument runway or sealane, or the longest active landing portion of the runway or strip, given to the nearest hundred feet, using 70 feet as the division point, i.e., 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-).

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

LIGHTING

B: Rotating 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).

L: Field Lighting. 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 (radio call). L by itself indicates temporary lighting, such as flares, smudge pots, lanterns.

1—Portable runway lights (electrical)
2—Airport Boundary
3—Runway Floods
4—Low Intensity Runway
5—Medium Intensity Runway
6—High Intensity Runway
7—Instrument Approach (neon)
7A—Medium Intensity Approach Lights (MALS)
7B—Medium Intensity Approach Light System with Rails. (MALSR)
8A, B, or C—High Intensity Instrument Approach (ALS)
9—Sequence Flashing Lights (SFL)
10—Visual Approach Slope Indicator (VASI)
11—Runway end identifier lights (threshold strobe) (REIL)
12—Short approach light systems (SALS)
13—Runway alignment lights (RAIL)
14—Runway centerline
15—Touchdown zone

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

SERVICING

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.

FIGURE 2.—Airport directory (Grand Canyon) and Airport/facility directory.

FUEL

(Fuel data includes each grade available.)

Code	Grade
F12	80/87
F15	91/98
F18	100/130
F22	115/145
F30	Kerosene, freeze point −40°F
F34	Kerosene, freeze point −58°F
F40	Wide-cut gasoline, freeze point −60°F
F45	Wide-cut gasoline without icing inhibitor, freeze point −60°F

OXYGEN

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

OTHER

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

ACE—Airport of Entry.

FSS—The name of the associated FSS is shown in all instances. When the FSS is located on the named airport, "on fld" is shown following the FSS name. When the FSS can be called through the local telephone exchange, (Foreign Exchange) at the cost of a local call, it is indicated by "(LC)" (local call) with the phone number immediately following the name of the FSS, i.e., "FSS: WICHITA (LC481-5967)." When an Interphone line exists between the field and the FSS, it is indicated by "(DL)" (direct line) immediately following the name of the FSS, i.e., "FSS: OTTO (DL)."

IFR—Airport with approved FAA Standard Instrument Approach Procedure.

RVV—Runway Visibility Values, applicable runway provided.

RVR—Runway Visual Range, applicable runway provided.

VASI—Visual Approach Slope Indicator, applicable runway provided.

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.

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.

FLIGHT SERVICE STATIONS

Flight Service Stations are listed alphabetically by state in the Airport/Facility Directory RCO's and LRCO's where available shown at the facility site following the three letter identifier. If located at other than a facility site, they are listed alphabetically.

Flight Service Stations (FSS) and Combined Station/Tower (CS/T) provide information on airport conditions, radio aids and other facilities, and process flight plans. CS/T personnel are not certificated pilot weather briefers; however, they provide factual data from weather reports and forecasts. Airport Advisory Service is provided at the pilot's request on 123.6 by FSSs located at airports where there are no control towers in operation. (See Part 1 ARRIVALS.)

In addition, they provide an aviation weather briefing service. Flight and weather briefing services are also provided by calling the telephone numbers listed in the Chapter entitled "FSS-CS/T Information and Weather Bureau Telephone Numbers", located in Part 2 Airport Directory.

Civil communication frequencies used in the flight service station air/ground system are now operated simplex on 122.0, 122.2, 122.3, 122.6, 123.6 and emergency 121.5 plus 122.1 and 122.6 receive only as follows:

a. 122.0 is assigned at selected FSSs as a weather channel for both general aviation and air carriers.

b. 123.6 is designated as an airport advisory channel at all FSSs which provide this service at nontower locations. 123.6 is still in commission at some FSSs collocated with towers for the purpose of providing part-time Airport Advisory Service.

c. Some FSS's use 123.65 or certain 50 KHz channels in the 122–123 MHz band (such as 122.05). Pilots using the FSS A/G system should refer to this directory or appropriate charts to determine frequencies available at the FSS or remoted facility through which they wish to communicate.

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

COMMUNICATIONS

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

When operating at an airport where the control tower is operated by the U.S. Government, two-way radio communication is required unless otherwise authorized by the tower. (When the tower is operated by someone other than the U.S. Government, two-way radio 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, UF. Emergency frequency 121.5 is available at all TOWER, APPROACH CONTROL and RADAR facilities, unless indicated as not available in remarks.

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

COMMUNICATIONS REMARKS

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

FIGURE 3.—Airport/facility directory continued.

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

TOWER

Pre-Taxi Clearance Procedure
Clearance Delivery (CLRNC DEL).
Approach Control (APP CON) Radar and Non-Radar.
Departure Control (DEP CON) Radar and Non-Radar.
VFR Advisory Service (VFR ADV) Non-Radar.
Radar Advisory Service for VFR Acft (Stage I).
Radar Advisory and Sequencing Service for VFR Acft (Stage II).
Radar Sequencing and Separation Service for VFR Acft (TCA).
Surveillance Radar Approach (ASR).
Precision Radar Approach (PAR).
Ground Control (GND CON).
VHF Direction Finding (VHF/DF).

RADIO NAVIGATION AIDS

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

AUTOMATIC TERMINAL INFORMATION SERVICE (ATIS)

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

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).
Island, Mountain and Lake Reporting Service.
VHF Direction Finding (DF).

UNICOM

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

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

NOTE.—UNICOM used for communications must be licensed by the Federal Communication Commission in order to be listed in this publication.

RADIO CLASS DESIGNATIONS

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

Normal Usable Altitudes and Radius Distances

Class	Altitudes	Distance (miles)
T	12,000' and below	25
L	Below 18,000'	40
H	Below 18,000'	40
H	14,500' — 17,999'	100*
H	18,000' — FL 450	130
H	Above FL 450	100

*Applicable only within the contiguous 48 States.

H=High L=Low T=Terminal

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

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

AB ——— Automatic Weather Broadcast (also shown with * following frequency).
B ——— Scheduled Broadcast Station (broadcasts weather at 15 minutes after the hour.
DME ——— UHF standard (TACAN compatible) distance measuring equipment.
H ——— Non-directional radio beacon (homing), power 50 watts to less than 2,000 watts.
HH ——— Non-directional radio beacon (homing), power 2,000 watts or more.
H-SAB ——— Non-directional radio beacons providing automatic transcribed weather service.
ILS ——— Instrument Landing System (voice, where available, on localizer channal).
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.

FIGURE 4.—Airport/facility directory continued.

AIRPORT/FACILITY DIRECTORY

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.
5. Daylight Saving Time—where time is expressed in Zulu (i.e., 2200Z) adjustment must be made to conform to local time usage.

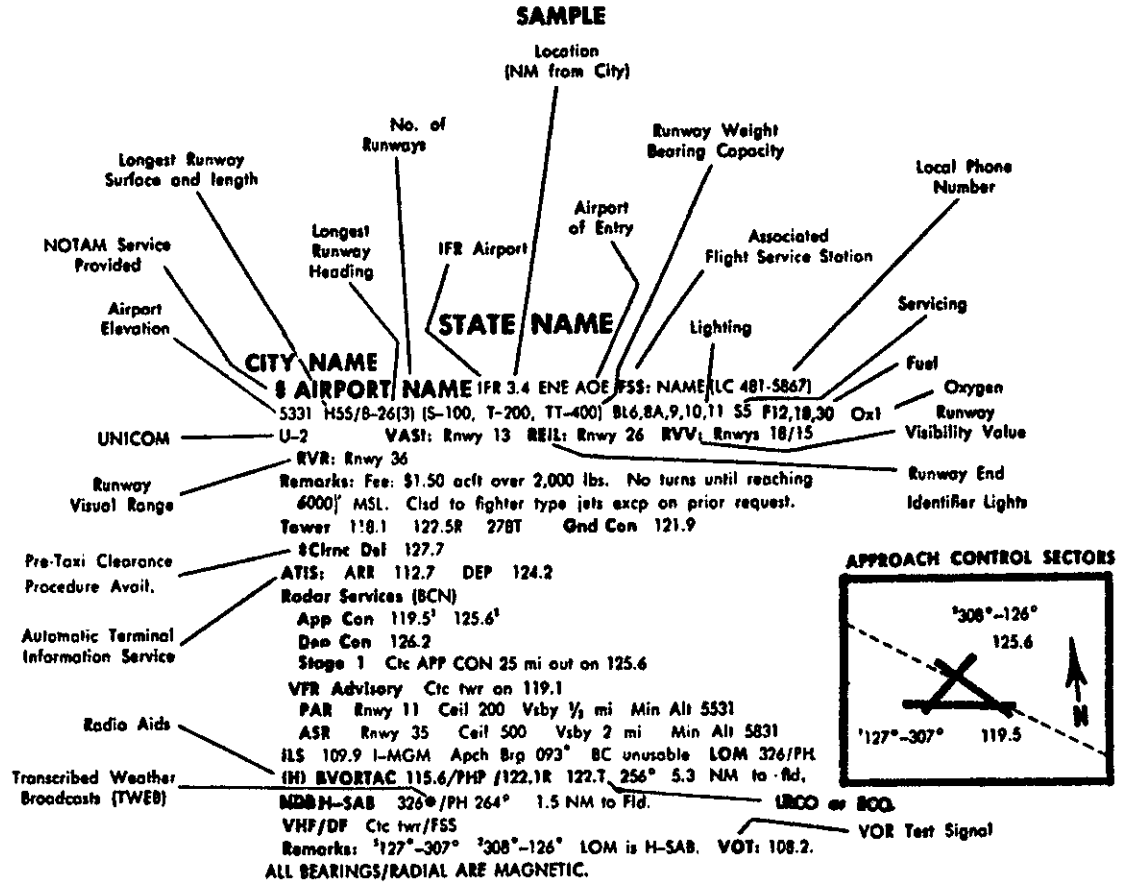


FIGURE 5.—Airport/facility directory continued.

ARIZONA

FLAGSTAFF (L) BVOR 108.2/FLG/122.3R PSS: PRESCOTT
Remarks: No wea bcst avbl 2200-0400 lcl time.

GRAND CANYON (L) BVOR 109.0/GCN/122.1R PSS: PRESCOTT
Remarks: No wea bcst avbl 2200-0400 lcl time.

PRESCOTT PSS 121.5 122.1R 122.2 122.6 123.6 DF
Remarks: No wea bcst avbl 2200-0400 lcl time.

PRESCOTT (H) BVORTAC 114.1/PRC PSS: PRESCOTT

WINSLOW (H) BVORTAC[1] 112.6/INW/121.5 122.1R 122.2T 122.6 123.6
PSS: PRESCOTT
NDB HW 266/INW
Remarks: [1]No wea bcst avbl 2200-0400 lcl time.

NEW MEXICO

ALBUQUERQUE PSS 121.5 122.1R 122.3 122.6

§ALBUQUERQUE-SUNPORT/KIRTLAND AFB *IFR* 3 SE
PSS: ALBUQUERQUE on Fld
5352 H128/8-26[4] (S-158, T-200, TT-400) BL5,6,8A,9,10
55 F12-18,34 Ox1,2,3,4 U-2 VASI: Rnwy 8 RVR: Rnwy 35
Remarks: Tkofs rnwy 3 prohibited except for emgcy conditions on fld. Tkofs rnwy 35 limited to convention acft no larger than DC-3; others may request rnwy 35 tkofs from ABQ Twr. J-bar and A-gear rnwys 8-26.
Albuquerque Tower 118.3 122.5R 119.2 Gnd Con 121.9
Clrnc Del 119.2
ATIS: 110.3
Radar Services: (BCN)
Albuquerque App Con 124.4 134.1 123.9 121.1 122.5R 113.2T
Albuquerque Dep Con 123.9
Stage I Ctc App Con 121.1
ASR
ILS 110.3 I-ABQ Apch Brg 350° LOM: 278/AB
Albuquerque (H)BVORTAC 113.2/ABQ 077° 9.6 NM to fld.
Albuquerque NDB SABH 230[H]/ABQ 355° 2.6NM to fld.
Remarks: VOT unreliable all areas of Sunport except runup areas for rnwy 8. VOT: 111.0.

TEXAS

AMARILLO PSS 121.5 122.1R 122.3 122.6 123.65

§ AMARILLO AIR TERMINAL *IFR* 8E PSS: AMARILLO on Fld
3605 H135/3-21[2] (S-100, T-200, TT-400) BL5,6,8A,9,10
55 F12,18,22,30,40 Ox2,4 U2 VASI: Rnwy 3, 21 RVR: Rnwy 3
Remarks: Rgt tfc rnwy 3. Rectangular tfc ptn 5100' MSL. Overhead tfc ptn 5400' MSL. Rnwy 13-31 lmtd to 33,000 lbs GWT except two-engine acft authorized use of rnwy when crosswinds preclude use of rnwy 3-21.
Tower 118.3 122.5R Gnd Con 121.9
Radar Services: (BCN)
App Con 121.1 124.8 122.5R 117.2T
Dep Con 119.5
Stage I Ctc App Con 124.8
ASR
ILS 110.3 I-AMA Apch Brg 035° LOM: 251/AM
(H) BVORTAC 117.2/AMA 210° 4.5 NM to fld.
NDB H-SAB 251[H]/AM 035° 5NM to fld.
Remarks: LOM is AM NDB.

§ LUBBOCK REGIONAL *IFR* 4NE CS/T: LUBBOCK on Fld
3269 H85/17R-35L[5] (S-90, T-150, TT-250) BL5,6,8A,9
55 F12,15,18,22,30 Ox1,2,3,4 U2 RVV: Rnwy 17R
Remarks: Rnwy 35L threshold displaced 900' N. Clsd to tactical mil jet acft. Rgt tfc rnwys 8R, 17R, 26R, 35R. Rnwy 8R-26L restricted to single engine acft. E 1500' of rnwy to rnwy 26R not visible to twr. Sfc areas rnwy 17L-35R, parallel twwy & E ramp not visible from ctl twr. Acft are requested to report when clear of rnwy 17L-35R after lndg.
Tower 119.9[2] 118.8[3] 122.5R Gnd Con 121.9
Radar Services: (BCN)
App Con 118.1 125.8 ;12.9T 109.5T 110.8T
Dep Con 119.3
Stage I Ctc App Con 118.1
ASR
ILS 109.5 I-LBB Apch Brg 169° LOM: 219/LB
(L)BVORTAC 110.8/LBB 112° 5.2 NM to Rnwy 12
Remarks: [2]17L-35R, 8R-26L. [3]17R-35L, 8L-26R. ILS BC marker Bcn "Globe" emits steady tone.

Part 3-A—NOTICES TO AIRMEN

ARIZONA

CATALINA MOUNTAINS SPECIAL NOTICE: Controlled firing area for Lunar Laser Operations is established Catalina Mountains, except for the airspace between azimuth 305°T and 055°T Laser Firing area includes the airspace within an inverted cone with its apex at 32°24'50"N, 110°43'30"W aprxly 18NM from Tucson VORTAC on radial 008°. The cone begins at 8400' MSL and expands to a radius of 1NM at 10,000' MSL 2NM at 12,000' MSL 2.5NM at 17,000' MSL 5NM at 26,000' MSL 10NM at 43,000' MSL 15NM at 50,000' MSL and 27NM at 100,000' MSL. All acft not on IFR clearance should avoid this area. Contact Tucson FSS for hrs of operation. (8-69)

NEW MEXICO

SPECIAL NOTICE: Beginning on June 1 thru Nov 30 limited high-speed VFR daylt operns in Boeing B-52 acft accompanied by two chase acft will be conducted as follows: Altitude 5,000' MSL, within 2 NM either side of a true course of 277°, beginning at lat 32°31'N, long 106°W, and terminating at the eastern boundary of Restricted Area R5107B. Current operational status may be determined by calling RNM or ELP FSS.

CARLSBAD RDO: VOR "CNM" shutdown. Tmpry HW facility on 248 KHz replacing VOR at same site and same ident til aprxly Feb 1971. (9-70)

CLOVIS, MUNI ARPT: First 1000' rnwy 3 clsd. (8-70)

CORONA RDO: VOR "CNX" shutdown. Tmpry NDB-HW "CNX" 287 KHz comsnd at VOR site. (2-70)

SOCORRO MUNI ARPT: A 7000' long, hazard mrkd steel cable is suspended across Sawmill Canyon on the SE side of South Baldy Peak aprxly 14 nmi WSW of arpt UFN.

TEXAS

§LUBBOCK, WEST TEXAS AIR TRML ARPT: Arpt name changed to Lubbock Regional.

LUBBOCK, REGIONAL ARPT: Rnwy 8L-26R extended to 8,000' W 550' clsd except tkof rnwy 8L. Rnwys 17R-35L clsd due constr. ILS G/S shutdown UFN. Lclzr will be shutdown Oct 12-Oct 16. Terminal turbojet wind component restrictions lndg rnwy 8L-26R when wet, zero tail wind to a 10 knot crosswind.

FIGURE 6.—Airport/facility directory continued, and Notices to Airmen.

AIRCRAFT DATA
HIFLIER 7232U

The aircraft is a 4-place single-engine airplane typical of single engine aircraft currently in use. It is appropriately equipped for instrument flying and has the following radio installations:

Radio Communications and Navigation Equipment:

VHF Communications (Dual - 90 and 360 channel transceivers)
VOR/ LOC (Dual - one glide slope)
ADF
Marker beacon receiver
DME

FUEL CAPACITY - 90 gals. (86 usable)

Inboard tanks - 60 gals. (56 gals. usable)
Outboard tanks - 30 gals.

OIL CAPACITY:

3 gals.

CALIBRATED AIRSPEEDS:

Climb - 110 knots
Cruise - 150 knots
Approach - 87 knots
Stall (V_{SO}) - 67 knots

DE-ICING EQUIPMENT:

None

COMPASS CORRECTION CARD:

FOR (MH)	0	30	60	90	120	150	180	210	240	270	300	330
STEER (CH)	002	31	63	91	118	147	179	211	238	272	304	332

EMPTY WEIGHT:

As equipped 1853 lbs.
(4 gals. unusable fuel included)

MAXIMUM GROSS WEIGHT:

3100 lbs.

FIGURE 7.—Aircraft data from owner's handbook.

MAXIMUM LANDING GROSS WEIGHT:

2,945 lbs.

BAGGAGE COMPARTMENT:

250 lbs.

WEIGHT AND BALANCE DATA:

ITEM	WEIGHT	ARM INCHES	MOMENT LB. IN.
Empty weight	1,853	83.7	155,096
Oil 3 gals.	23	28.0	644
Fuel (inboards)		90.0	
Fuel (outboards)		95.0	
Pilot and passenger	350	84.8	29,680
Passenger(s) rear		120.5	
Baggage		142.0	

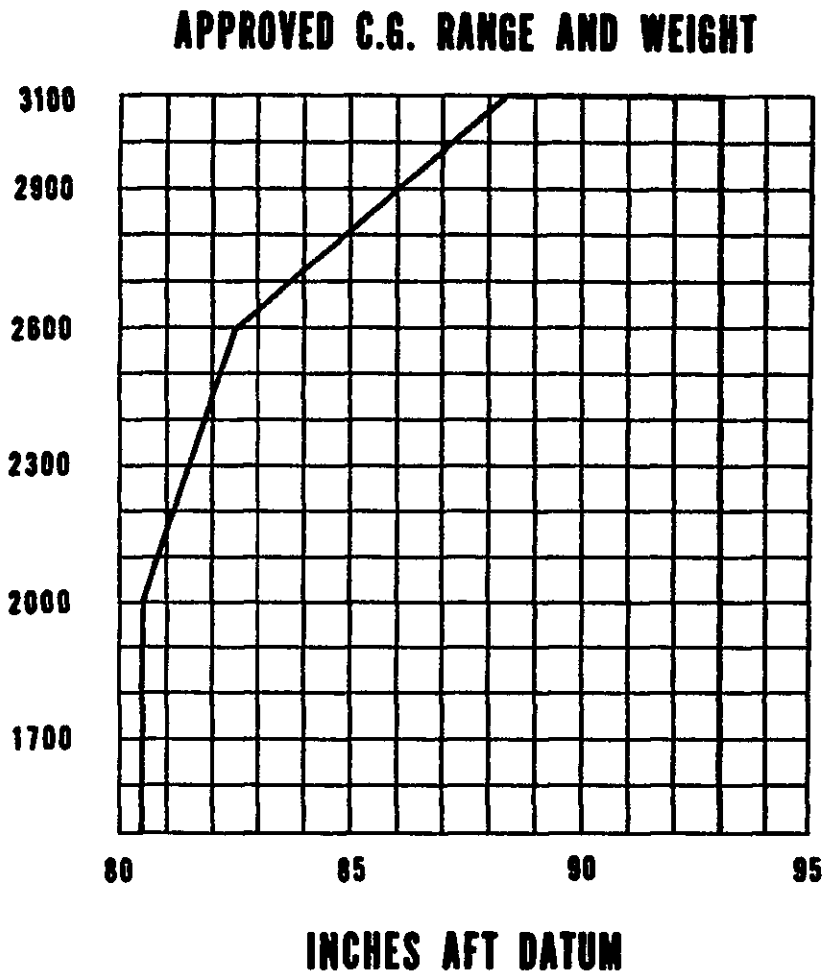


FIGURE 8.—Weight and balance data.

Power Setting Table — 260 HP Engine

Press. Alt Feet	Std Alt Temp °F	143 HP – 55% Rated RPM AND MAN. PRESS. 2100	2200	2300	2400	169 HP – 65% Rated RPM AND MAN. PRESS. 2100	2200	2300	2400	195 HP – 75% Rated RPM AND MAN. PRESS. 2200	2300	2400	2500	Press. Alt Feet
SL	59	22.3	21.5	20.7	19.8	25.3	24.1	23.2	22.2	26.9	25.8	24.8	24.0	SL
1,000	55	22.1	21.3	20.5	19.6	25.1	23.9	22.9	22.0	26.6	25.5	24.5	23.7	1,000
2,000	52	21.9	21.0	20.3	19.4	24.8	23.6	22.7	21.8	26.3	25.3	24.3	23.5	2,000
3,000	48	21.7	20.8	20.0	19.2	24.5	23.4	22.5	21.6	26.0	25.0	24.0	23.2	3,000
4,000	45	21.4	20.6	19.8	19.0	24.2	23.1	22.2	21.4	25.7	24.7	23.8	22.9	4,000
5,000	41	21.2	20.3	19.6	18.8	24.0	22.9	22.0	21.1	25.4	24.4	23.5	22.7	5,000
6,000	38	21.0	20.1	19.4	18.6	23.7	22.6	21.7	20.9	–	24.1	23.3	22.4	6,000
7,000	34	20.7	19.9	19.1	18.4	23.5	22.4	21.5	20.7	–	–	23.0	22.2	7,000
8,000	31	20.5	19.6	18.9	18.2	–	22.1	21.2	20.5	–	–	–	21.9	8,000
9,000	27	20.3	19.4	18.7	18.0	–	21.9	21.0	20.3					9,000
10,000	23	20.0	19.2	18.5	17.7	–	–	20.7	20.0					10,000
11,000	19	19.8	18.9	18.2	17.5	–	–	–	19.8					11,000
12,000	16	19.6	18.7	18.0	17.3									12,000
13,000	12	–	18.5	17.8	17.1									13,000
14,000	9	–	–	17.5	16.9									14,000
15,000	5	–	–	17.3	16.7									15,000

To maintain constant power, correct manifold pressure approximately 0.17" Hg for each 10° F variation in carburetor air temperature from standard altitude temperature. Add manifold pressure for air temperatures above standard; subtract for temperatures below standard.

FIGURE 9.—Power setting table.

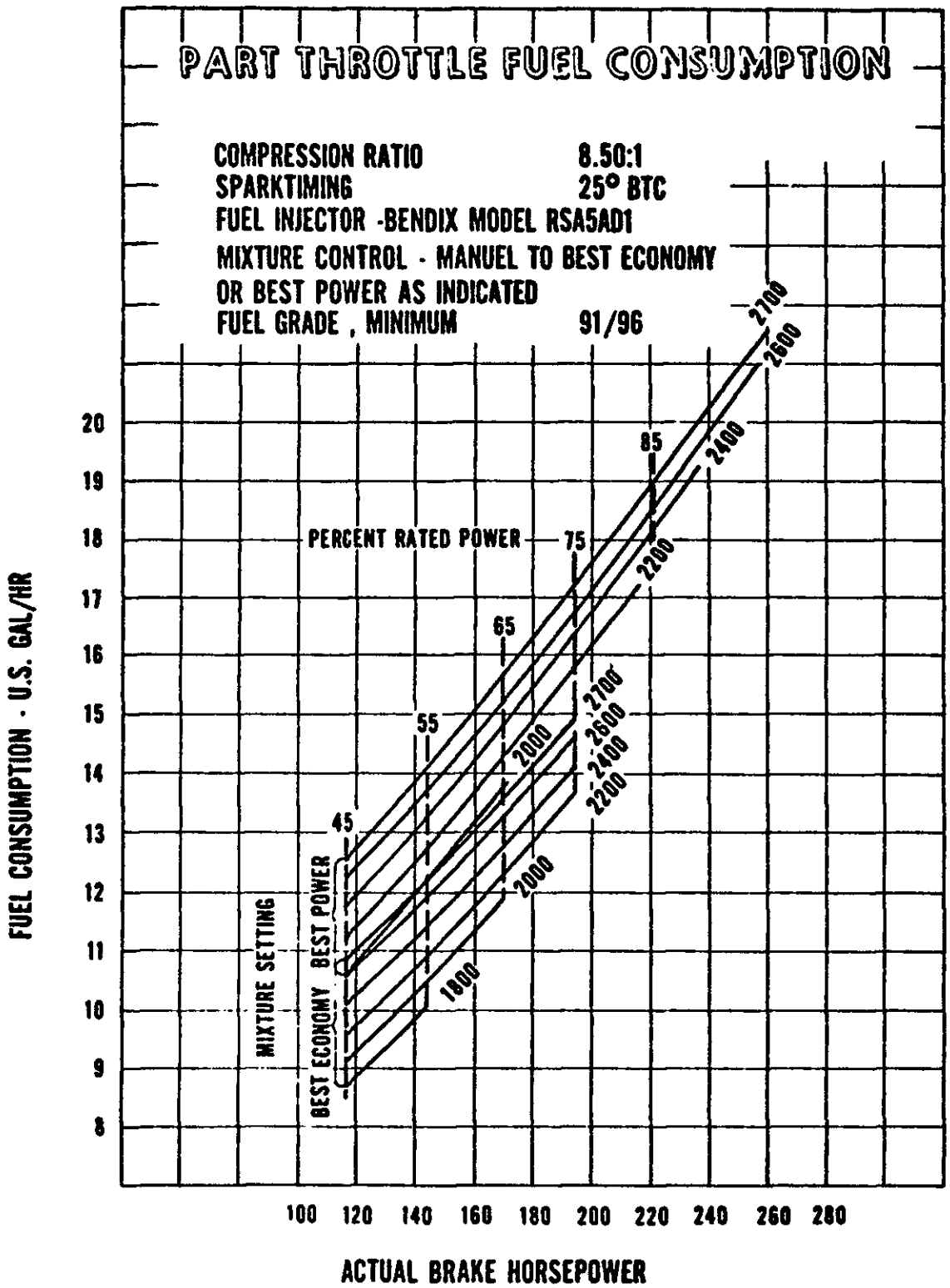


FIGURE 10.—Part throttle fuel consumption.

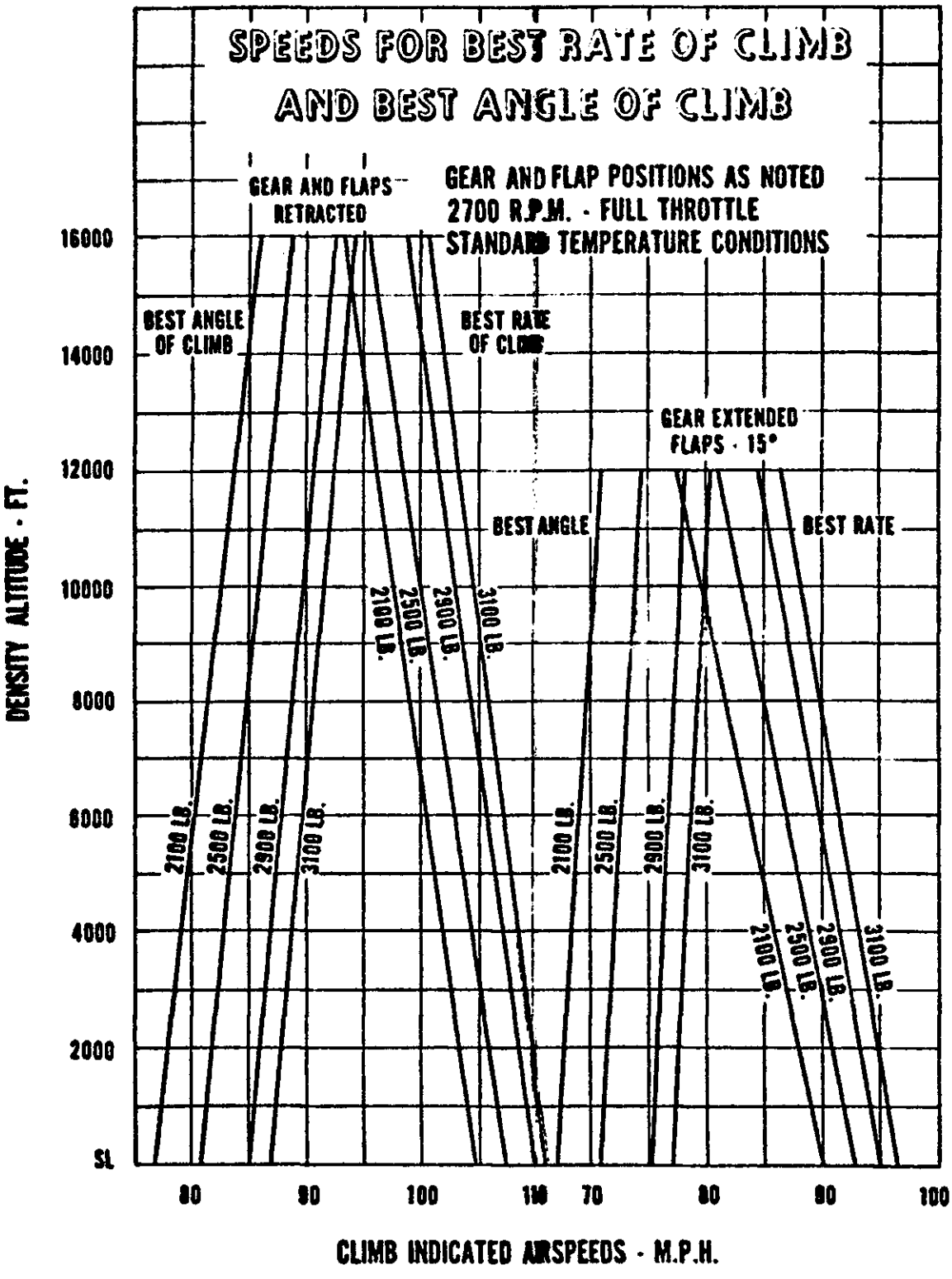


FIGURE 11.—Speeds for best rate of climb and best angle of climb.

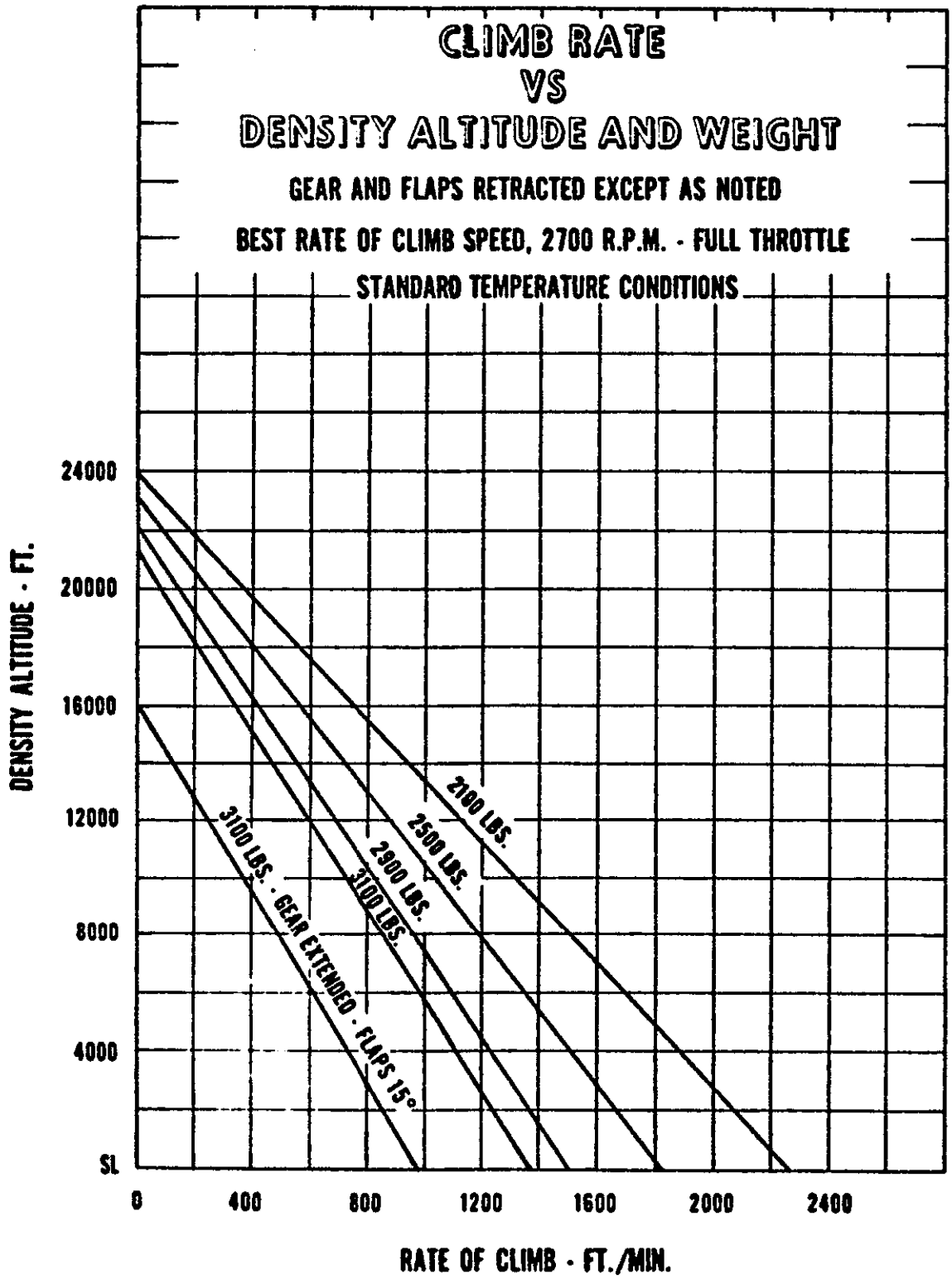


FIGURE 12.—Climb rate vs. density altitude and weight.

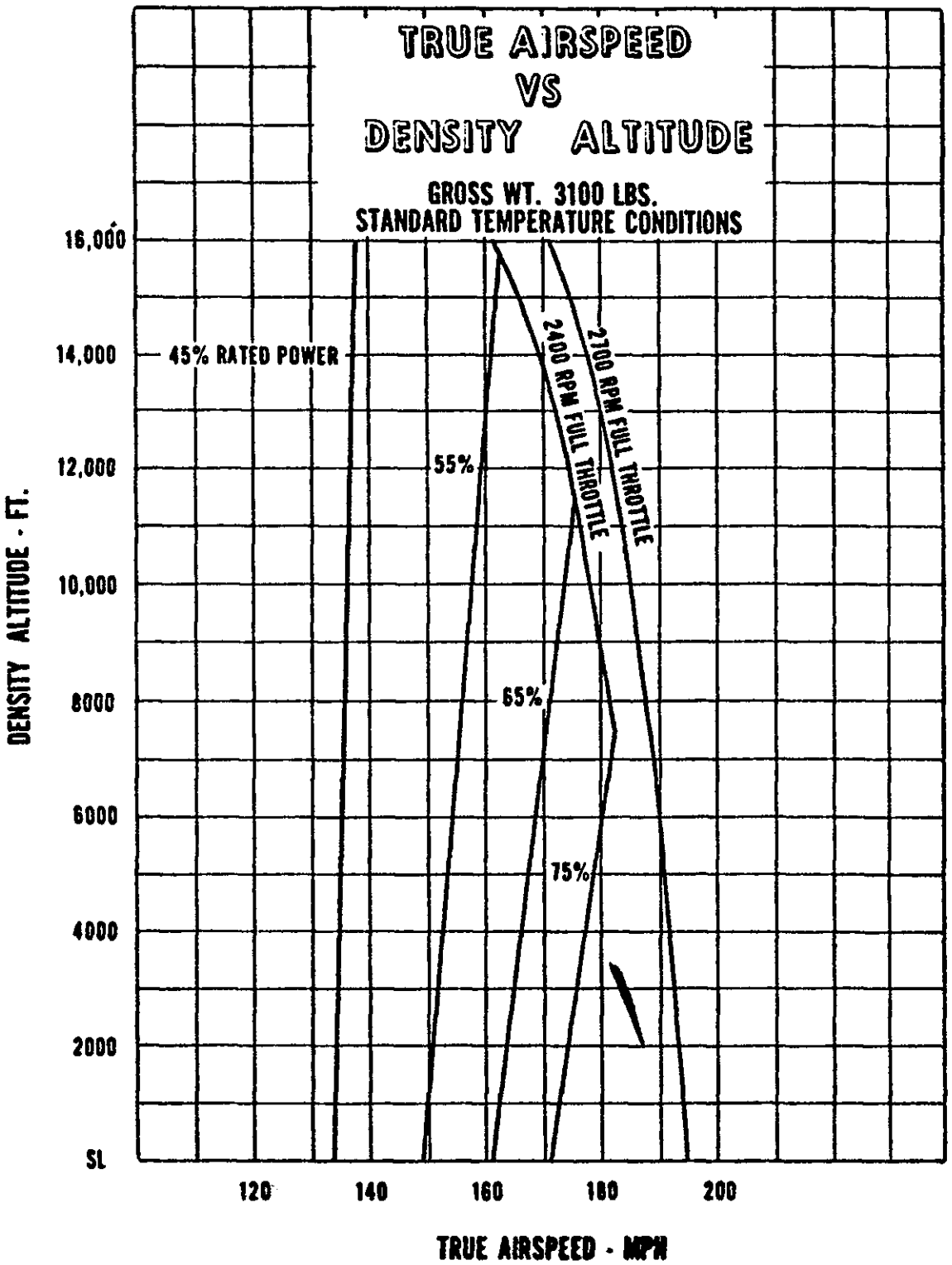


FIGURE 13.—True airspeed vs. density altitude.

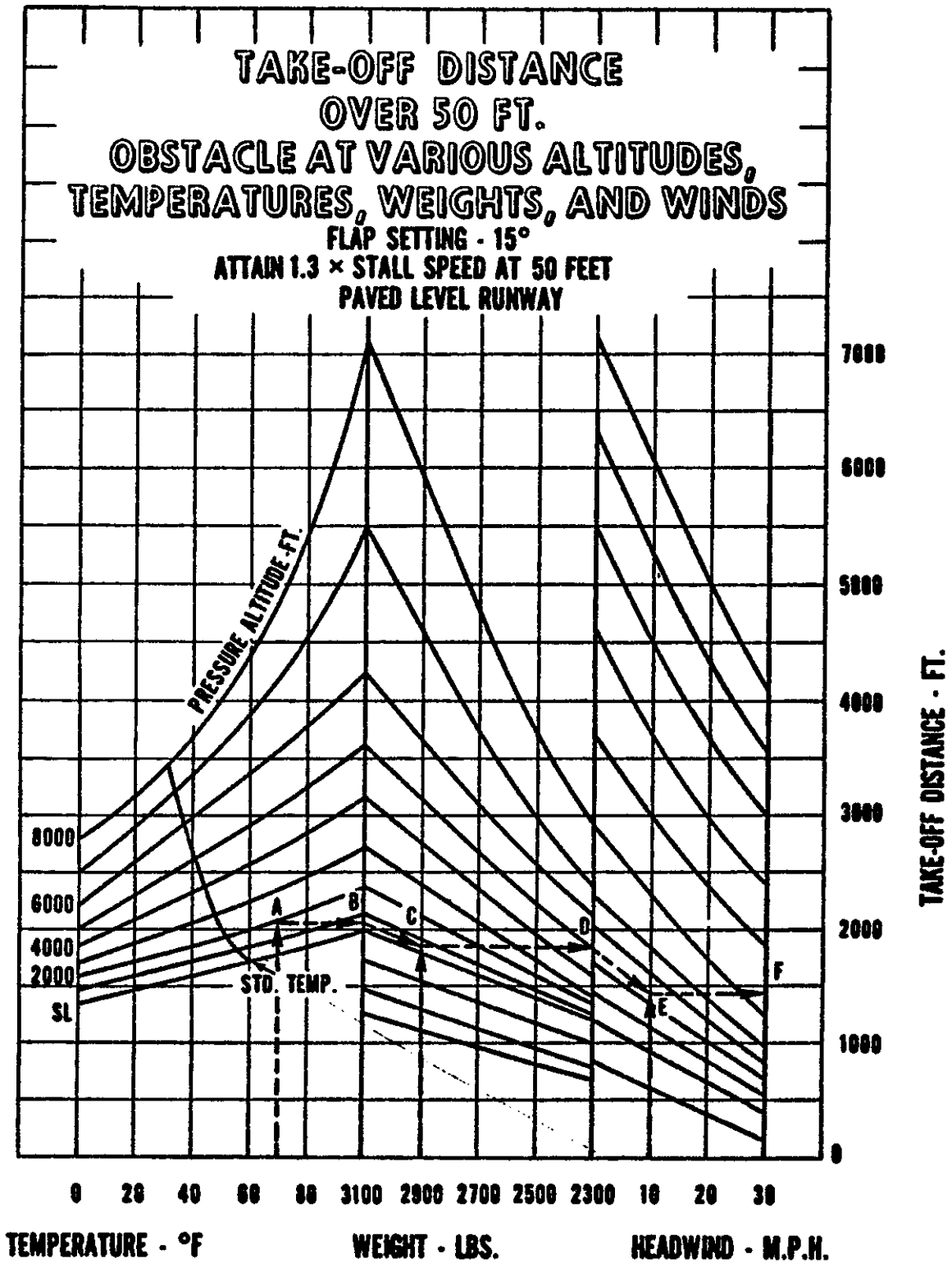
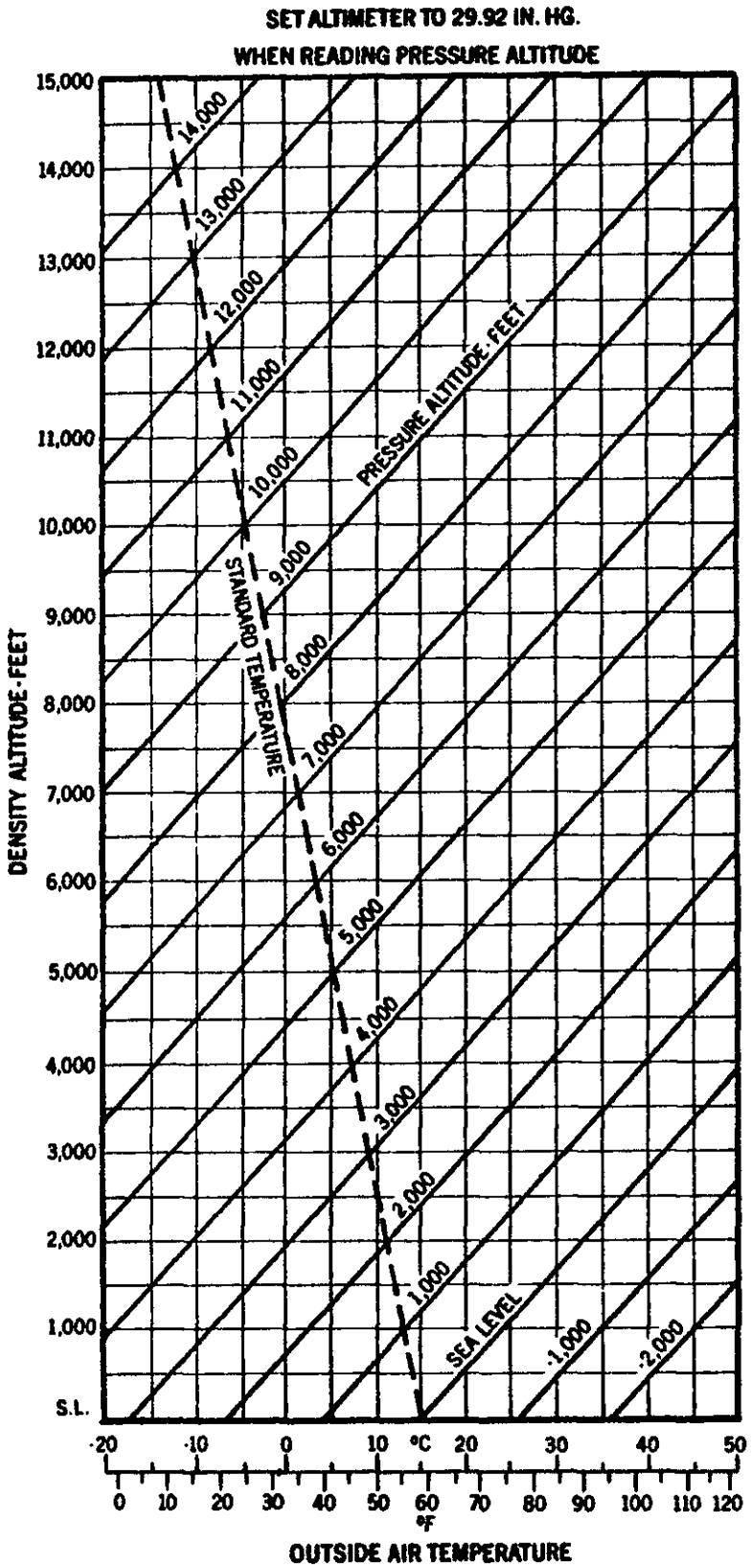


FIGURE 14.—Takeoff distance over 50-foot obstacle.



Pressure Altitude
from
Altimeter Setting
(See sample problem below)

ALTIMETER SETTING IN. HG.	ALTITUDE ADDITION FOR OBTAINING PRESSURE ALTITUDE
28.0	1,825
28.1	1,725
28.2	1,630
28.3	1,535
28.4	1,435
28.5	1,340
28.6	1,245
28.7	1,150
28.8	1,050
28.9	955
29.0	865
29.1	770
29.2	675
29.3	580
29.4	485
29.5	390
29.6	300
29.7	205
29.8	110
29.9	20
29.92	0
30.0	- 75
30.1	-165
30.2	-255
30.3	-350
30.4	-440
30.5	-530
30.6	-620
30.7	-710
30.8	-805
30.9	-895
31.0	-965

Example

Given:

Alt. Setting 30.73
Field Elev. (FE) 1250 ft.

30.70 } 3 } 10 -710
30.73 } 95
30.80 -805

95 x 3/10 = 28.5
710 + 28.5 = 739
Pres. Alt. = FE + Cor.
1250 + (-739) = 511 ft.

FIGURE 15.—Pressure altitude density chart.

THE WEATHER DEPICTION CHART

TOTAL SKY COVER

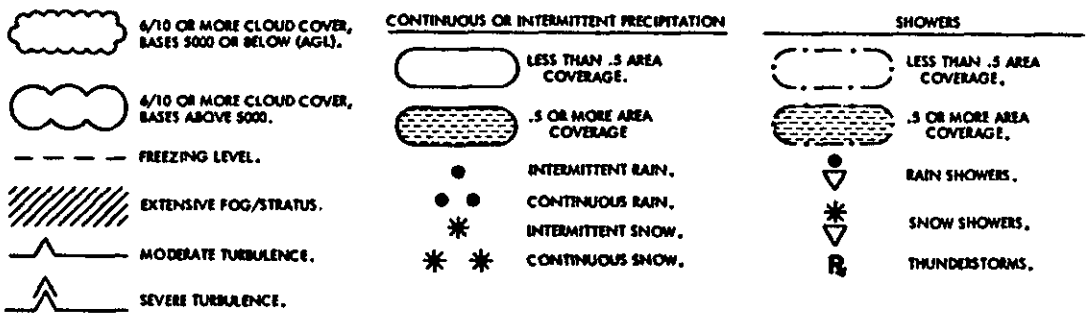
- Clear
- Scattered
- Broken, or thin broken
- Overcast, with breaks
- Overcast
- Obscured

WEATHER AND OBSTRUCTIONS TO VISION

T	- Thunderstorm	H	- Haze
R	- Rain	K	- Smoke
L	- Drizzle	F	- Fog
ZR	- Freezing Rain	GF	- Ground Fog
ZL	- Freezing Drizzle	BD	- Blowing Dust
S	- Snow	BN	- Blowing Sand
IP	- Ice Pellets	BS	- Blowing Snow
W	- Shower		

Figures below the circle are cloud heights in hundreds of feet - either the ceiling; or, if there is no ceiling, the height of the lowest scattered. Figures and symbols to left of circle are visibility and weather or obstructions to vision.

LOW LEVEL PROG CHART



RADAR SUMMARY CHART

NAFAX RADAR CHART LEGEND

DESCRIPTION OF SYMBOLS

Area of echoes — Line of echoes

Over .9 coverage — .1 to .5 coverage

.5 to .9 coverage — less than .1 coverage

strong or very strong cells identified by one station — strong or very strong cell identified by two or more stations

INTENSITY TENDENCY OF ECHO (Follows solidus (/))

\+ Increasing
\- Decreasing
NC No Change

ARTCC ECHO REPORTS

SYMBOLS

Actual echo boundary copied from ARTCC scopes

Line of echoes -- possible squall line

DESCRIPTION OF SYMBOLS

R	Rain	IP	Ice Pellets
RW	Rain Showers	L	Drizzle
S	Snow	ZR	Freezing Rain
SW	Snow Showers	ZL	Freezing Drizzle
		T	Thunderstorm

INTENSITY OF RADAR ECHO (Follows Weather Symbol)

\- - Very Light — \- Light
No Sign Indicates moderate — U Unknown
\+ Strong — \+ + Very Strong

MOTION OF ECHOES

VV Cell Movement-speed in kts
Area or line movement (10 kts/barb)

AVIATION SEVERE WEATHER

Dashed lines define area of severe weather forecast. Boxes entered by RADU only.

FIGURE 16.—Weather chart symbols.

```
Ø29 SA292315ØØ
MAF S M5⊙11⊕11/2RF 2Ø8/54/52/Ø316/Ø22/CIG RGD/ 212 162/→MAF 9/8
HYM VOR/DME OTS
LBB M4⊕7 242/49/46/Ø516G24/Ø29/CIG RGD RE4Ø/ 1Ø8 1611→LBB↘9/6

Ø3Ø SA3Ø2315ØØ
SAF 2⊙E45⊙12Ø⊙3Ø 46/45/Ø2Ø7/Ø36/MTNS TOPS OBSCD ALQDS/ 5Ø5
ABQ E7Ø⊙25Ø⊙6Ø 239/49/4Ø/1Ø16/Ø32/CLDS TPG MTNS NE-SE 31Ø 15Ø1
LVS E2Ø⊕3Ø 263/43/34/Ø31Ø/Ø41/ MTNS SW-NW-N OBSCD
RTN AMOS / 38/ 35/Ø2Ø6/Ø45/ØØØ/
TCC S 8⊙E1Ø⊙15⊕8R- 293/45/43/Ø4Ø8/Ø41/ 214→TCC 9/9 DME OTS 143Ø
    -193Ø
DHT 25⊙E35⊙1ØØ⊕12 29Ø/46/4Ø/Ø1Ø8/Ø41/ 3Ø8
AMA M5V⊕3R--F 277/44/39/Ø314/Ø36/CIG 4V6 RB5Ø/ 11Ø 16//

Ø33 SA3323215ØØ
PRC O65 195/53/27/15Ø5/Ø22/ 11Ø→PRC↘9/22
FLG O15+ 216/45/21/Ø414/Ø31 11Ø 1Ø4Ø
INW O6Ø 215/53/27/28Ø6/Ø27/ 1Ø8 1Ø31
ZUN E2Ø⊙15+ 22Ø/49/41/1ØØ7/Ø3Ø
GNT 1Ø⊙E3Ø⊕2ØGW-- 44/4Ø/17Ø7/Ø33/MTNS OBSCD ALQDS BINOVC RE47

Ø29 SA292316ØØ
LBB C5⊕5F 245/49/47/Ø515/Ø3Ø CIG RGD

Ø3Ø SA3Ø2316ØØ
SAF E45⊙12Ø⊕2Ø 47/42/35Ø7/Ø39/MTN TPS OBSCD ALQDS
ABQ 5Ø⊙E7Ø⊙25Ø⊕5ØRW-- 242/48/41/Ø912G2Ø/Ø33/CLDS TPG MTNS NE-SE
    VSBY LWR S RBØ8
LVS E2Ø⊕3ØRW-- 274/42/35/Ø4Ø7/Ø44/ RB4Ø CIG AND VSBY LWR S-SW
    MTNS OBSCD SW-NW
RTN AMOS / 38/ 35/Ø5Ø4/Ø46
TCC 8⊙E1Ø⊕8R- 295/45/43/Ø6Ø8/Ø42/CIG RGD→TCC 9/9 DME OTS 143Ø-193Ø
AMA M5⊕4R-F 282/44/4Ø/Ø314/Ø37/ CIG RGD R-OCNL R--

Ø33 SA3323216ØØ
PRC O65 194/62/23/Ø3Ø5/Ø23→PRC↘9/22
INW 3Ø⊙6Ø 216/58/36/36Ø5/Ø28
ZUN E2Ø⊙15+ 22Ø/49/4Ø/1ØØ6/Ø31/ ADD DATA 15ØØZ 214
GNT 8⊙E3Ø⊕2ØRW-- 45/42 17Ø6/Ø33/MTNS OBSCD ALQDS BINOVC RE47
```

FIGURE 17.—Aviation weather reports (SA).

```
FT1 231640
16Z THU-Ø5Z FRI
LBB C6⊕5R-F Ø515 VRBL C3⊕1R-F SLGT CHC TRW..
TCC 1ØⓄC15Ⓞ6R-. 2ØZ 15ⓄC25Ⓞ OCNL C1ØⓄ2R-F..
AMA C6⊕4R-F Ø412 VRBL C2X1/2RF CHC TRW..
```

FIGURE 18.—Terminal forecast (FT).

```
FDUS2 KWBC 22Ø545
BASED ON 23 ØØØØZ DATA

VALID 23 18ØØZ FOR USE 15ØØ-21ØØZ. TEMPS NEG ABV 24ØØØ

FT 3ØØØ  6ØØØ   9ØØØ   12ØØØ   18ØØØ   24ØØØ   3ØØØØ   34ØØØ   39ØØØ

AMA      99ØØ 2314+Ø5 2314-Ø1 2319-15 2341-25 236738 237746 238Ø55
ABQ           1ØØ8+Ø7 1506+ØØ 2618-15 2436-26 235941 236449 235254
PRC           Ø412+Ø7 Ø213+Ø1 3519-12 3421-26 332842 323449 323153
```

FIGURE 19.—Wind aloft forecasts (FD).

```
GSW UA 231520

SJT IN AND OUT CLDS 1ØØ ⊕16Ø MDT R LGT CHOP.
AUS-LBB TOPS ⊕2ØØ.
LBB CLBG WBND IN CLDS 9Ø.
AMA ⊕7Ø TOPS RAGGED.

ABQ UA 231525

OTO-LVS LNDG LVS IFR 9Ø⊕
ABQ-ROW LGT MDT RIME ICG FL21Ø DC9
ABQ-FMN LYRS TO 11Ø
ABQ-7ØSE FMN GOOD VFR
O/OTO SOLID IFR 11Ø OAT OC NO ICG NO TURB PA3Ø
```

FIGURE 20.—Pilot weather reports (UA).

FA ABQ 231240
13Z THU-01Z FRI

ARIZ NEW MEX

HGTS ASL UNLESS NOTED

SYNOPSIS. CDFNT SRN BDR ARIZ MOVG INTO MEX. UPPER CLZD LOW W-CNTRL NEW MEX DRFTG SEWD. UPSLP FLOW NEW MEX E OF THE CONDVD. SFC HI ERN COLO.

AIRMET. LOW CLDS AND VSBYS ERN NEW MEX IN RAIN AND FOG IMPVG NRN SECS THIS AFTN. A FEW TSTMS SERN NEW MEX. MTNS OBSCD. MDT ICGICIP. STG WNDS AND MDT TURBC MTNS PASSES ALG RIOGD VLY.

ERN NEW MEX. GENLY 2⊖C4-8⊖V⊕1-4R-L-F WITH TOPS OCNLY MERGING LYRS THRU 20⊖ LWRG NRN SECS THIS AFTN. MTNS OBSCD. A FEW TSTMS MAINLY SRN SECS. CONDS IMPVG TO C10⊕2-5R-F SRN SECS BY AFTN AND TO C15-25⊖V⊕7 NRN SECS.

WRN NEW MEX. GENLY 120⊖170⊖V⊕ WITH SCTD C25-50⊖V⊕RW- AND A FEW TRW- SRN SECS OCNLY OBSCG THE MTNS. CONDS IMPVG FM THE NW TO 170⊖250⊖ BY 00Z.

ARIZ CLR.

ICG. MDT ICGICIP. FRZLVL 80-100 NRN BDRS TO 120 SRN BDRS.

TURBC. SVR IN TSTMS. MDT MTNS PASSES ALG THE RIOGD VLY DMSHG THIS AFTN. CHC FOR LGT MDT CAT 250-400 NEW MEX AHD OF UPPER LOW.

OTLK 01Z-19Z FRI. CLRG FROM THE N ERN NEW MEX BY 12Z. ELSW CLR.

FIGURE 21.—Area forecast (FA).

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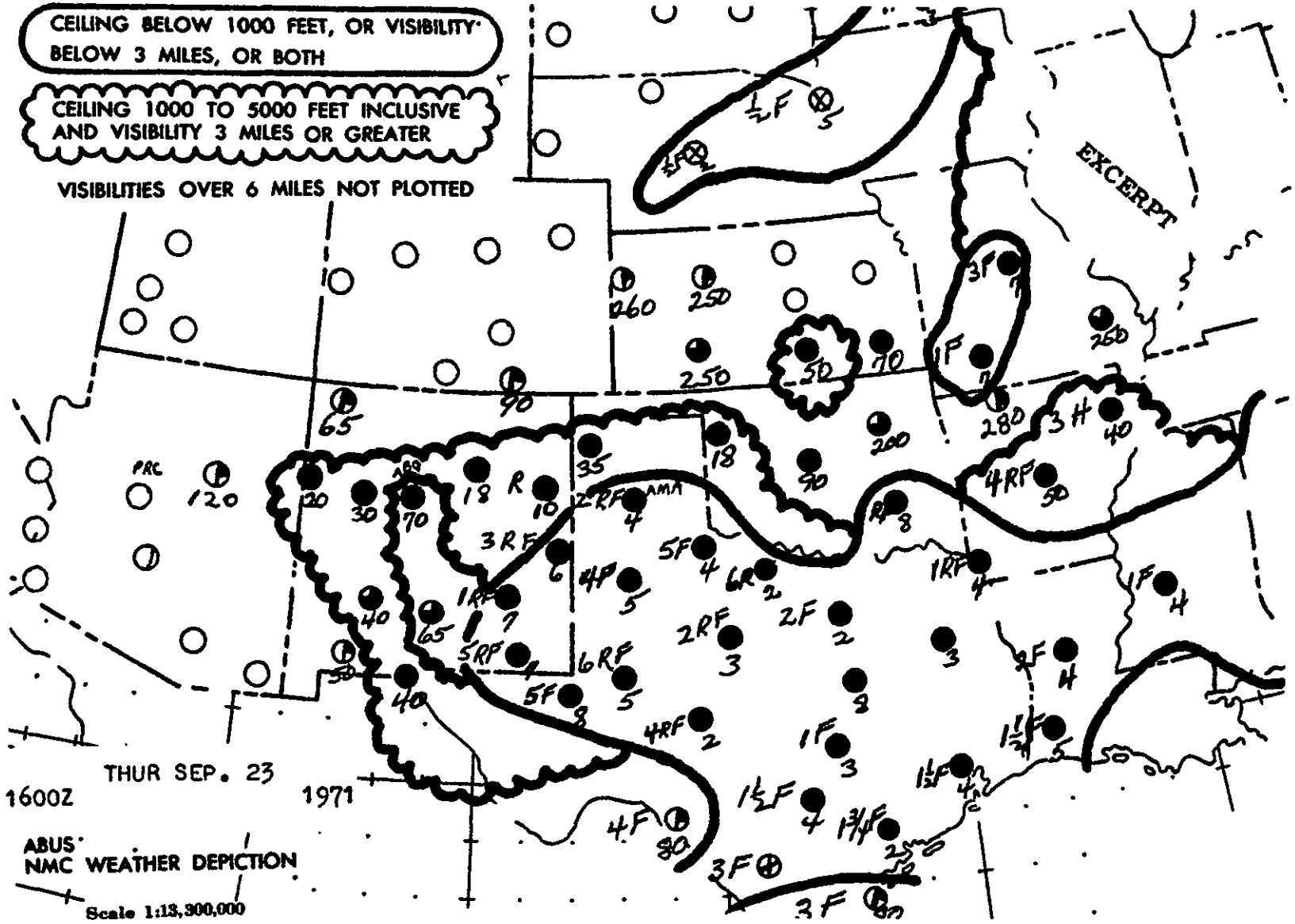


FIGURE 22.—Weather depiction chart.

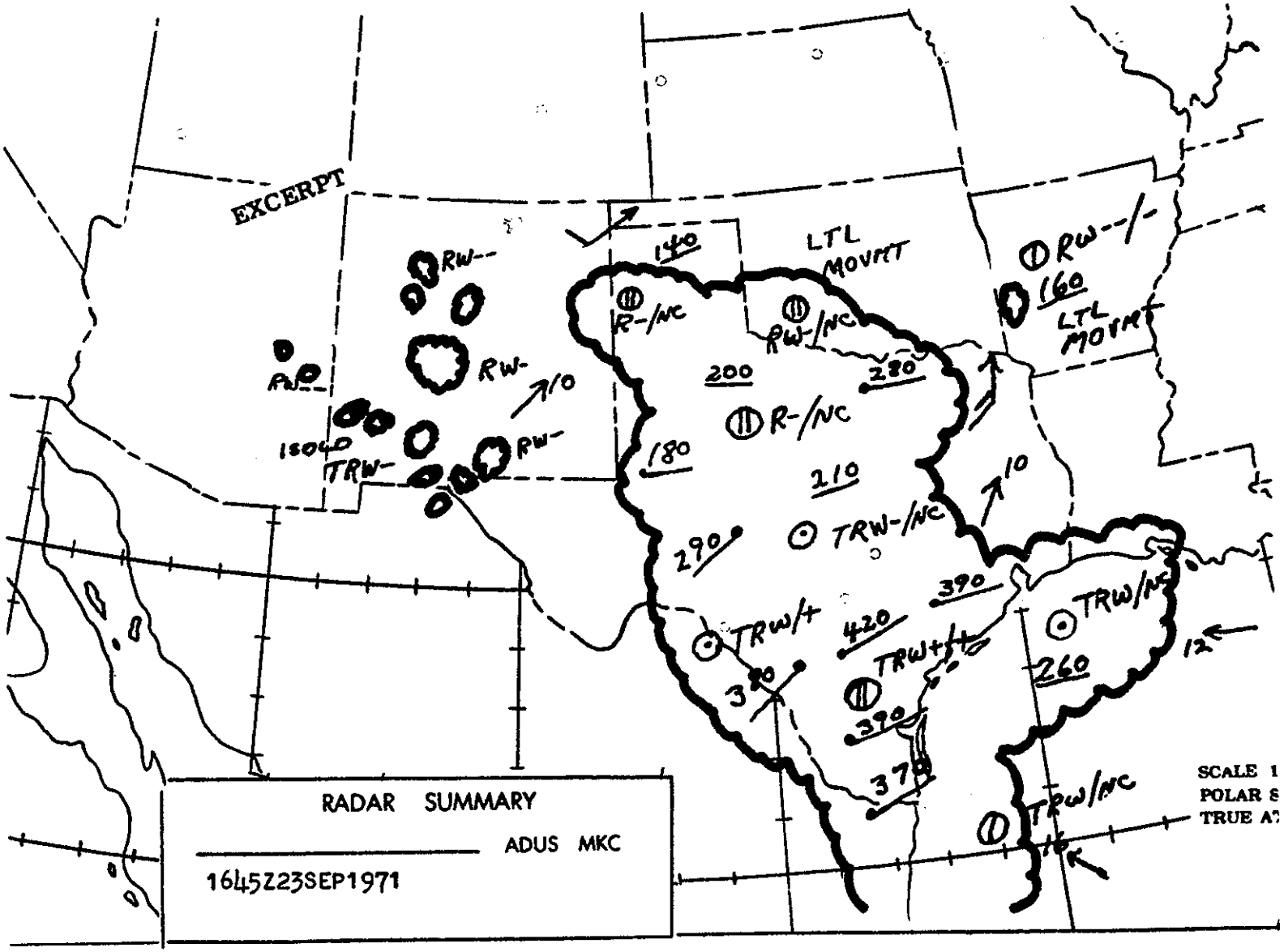


FIGURE 23.—Radar summary chart.

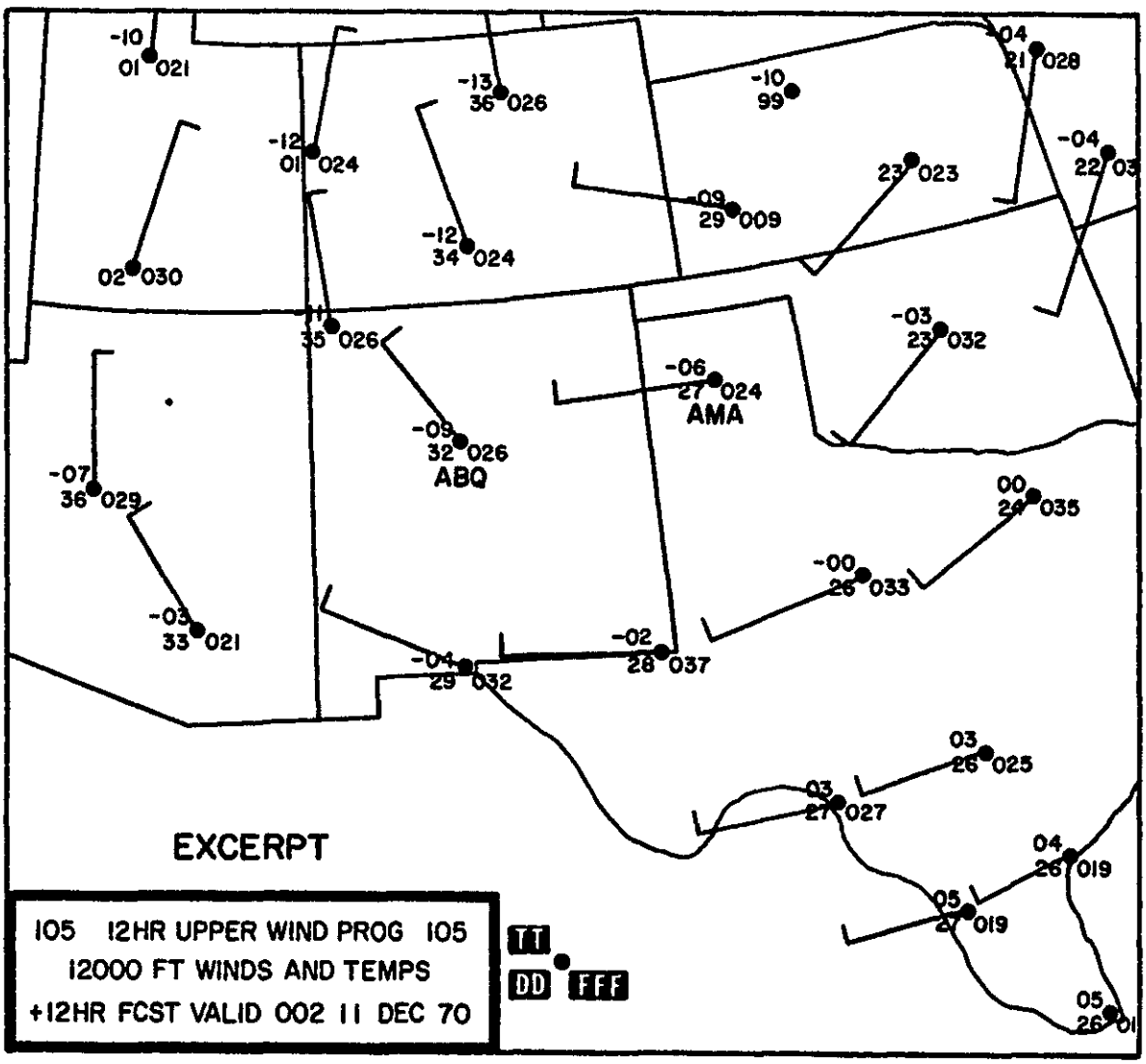
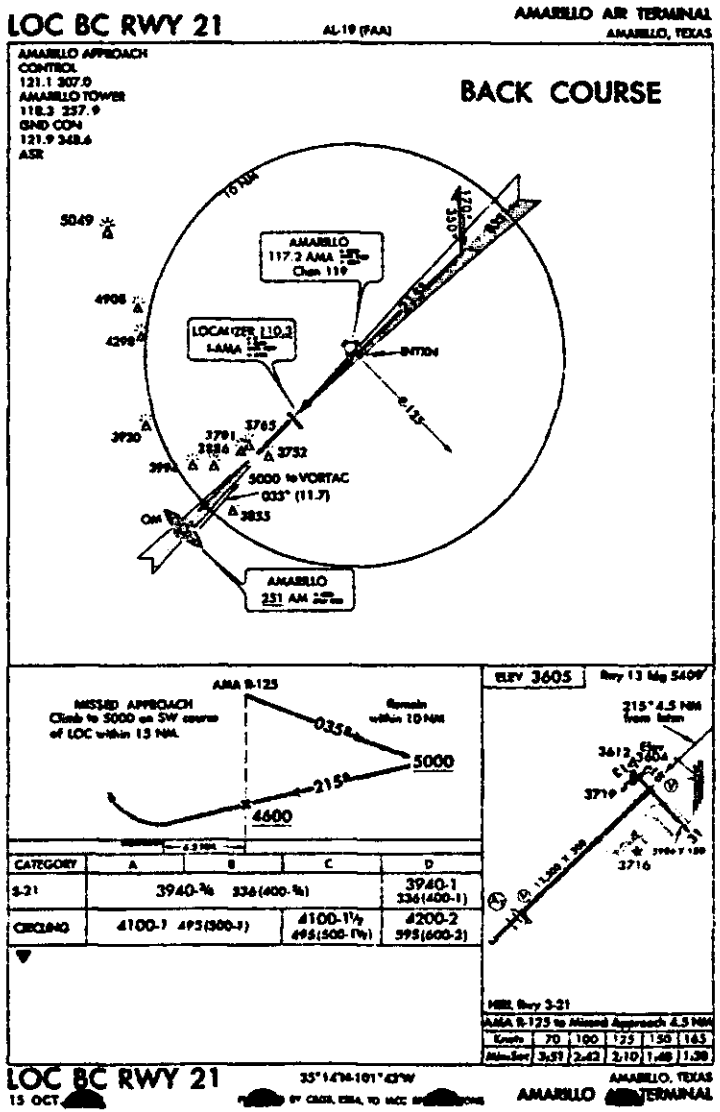


FIGURE 24.—12-hour upper wind prog.



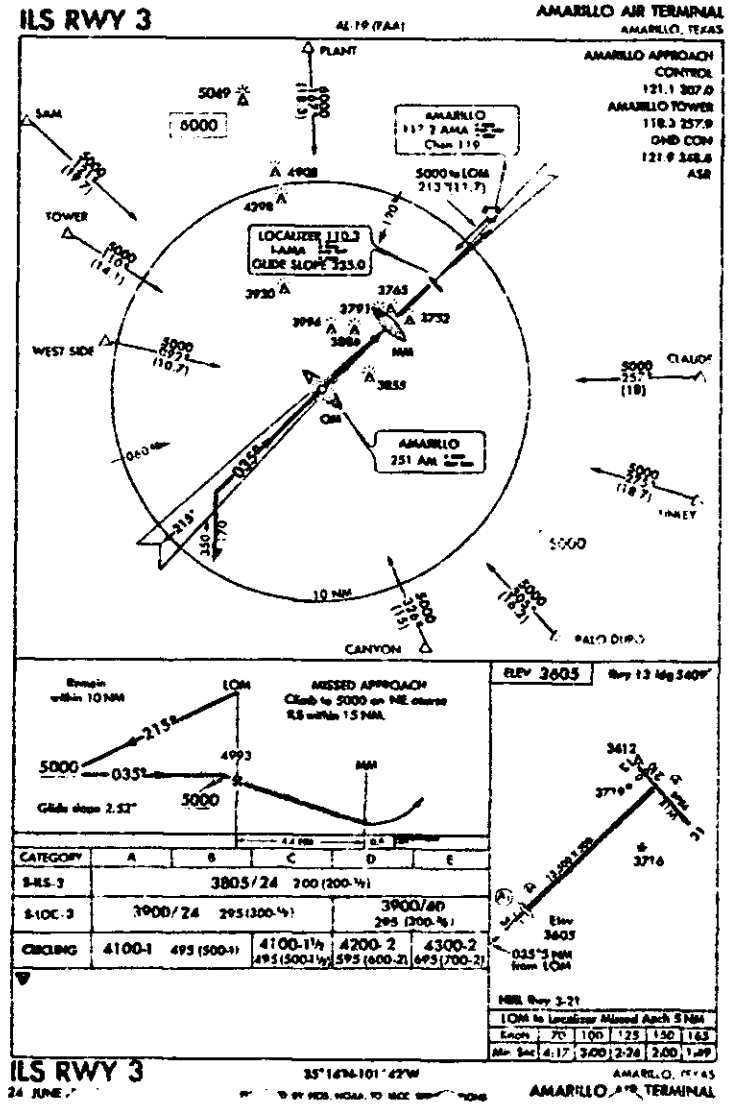


FIGURE 25.—Instrument Approach Procedure Charts for Amarillo air terminal.

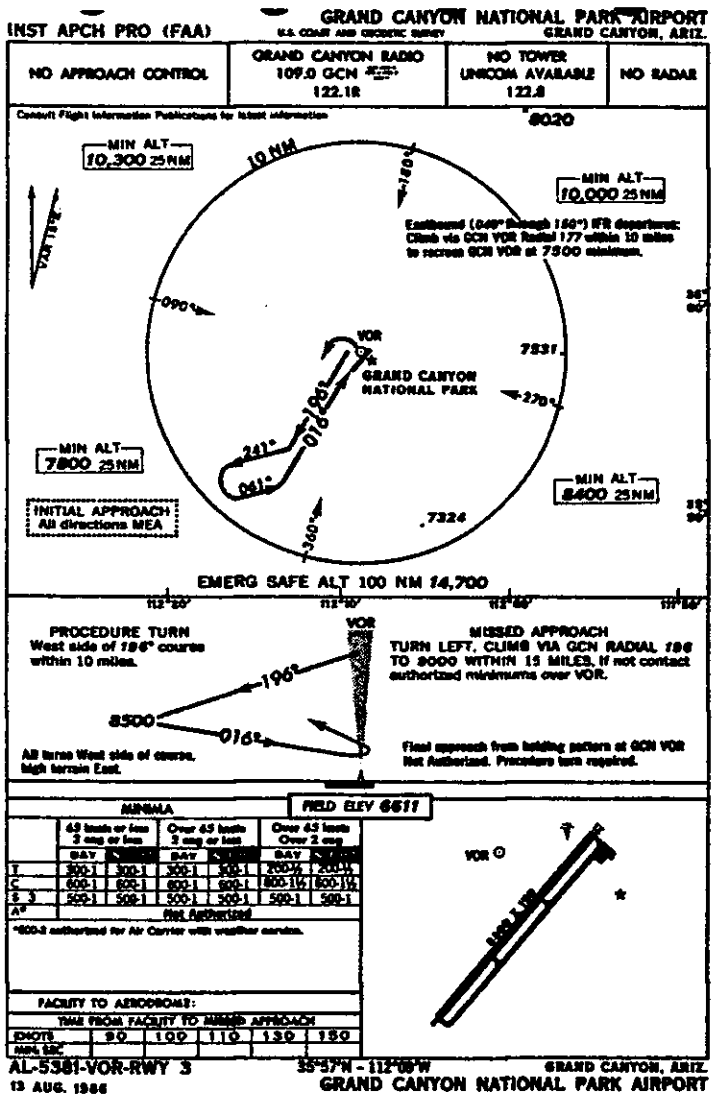


FIGURE 26.—Instrument Approach Procedure Charts for Grand Canyon.

EXCERPT--Enroute Low Altitude Chart

AIR ROUTE TRAFFIC CONTROL CENTER / REMOTE CONTROL FREQUENCIES

ALBUQUERQUE CENTER

125.2
Amarillo 132.3 127.2
Animas 127.95
El Paso 127.1 126.0
Globe 125.4 124.5
Humboldt Mountain 119.8
Otto 124.7
Sandia Mt 124.7
Seligman 126.9
Truth or Consequences 126.4
Tucson 127.95
Tucumcari 125.9
Winslow 126.9
Zuni 125.2

DENVER CENTER

Winslow 126.1

FORT WORTH CENTER

Lubbock 128.45 127.7
Midland 133.1 128.7 128.0

LOS ANGELES CENTER

133.8 126.0
Bakersfield 134.85 127.1
Baldwin Hills 132.85 128.8
Barstow 132.5 132.3 128.4 123.9
Julian 133.4 132.55 123.9
Ontario 128.2
Pebble Peak 132.6 128.4 125.8
San Luis Obispo 125.0
Santa Barbara 134.4 125.0 119.0
Seligman 128.4 123.9
Yuma 133.4

FIGURE 27.—Air route traffic control center/remote control frequencies.

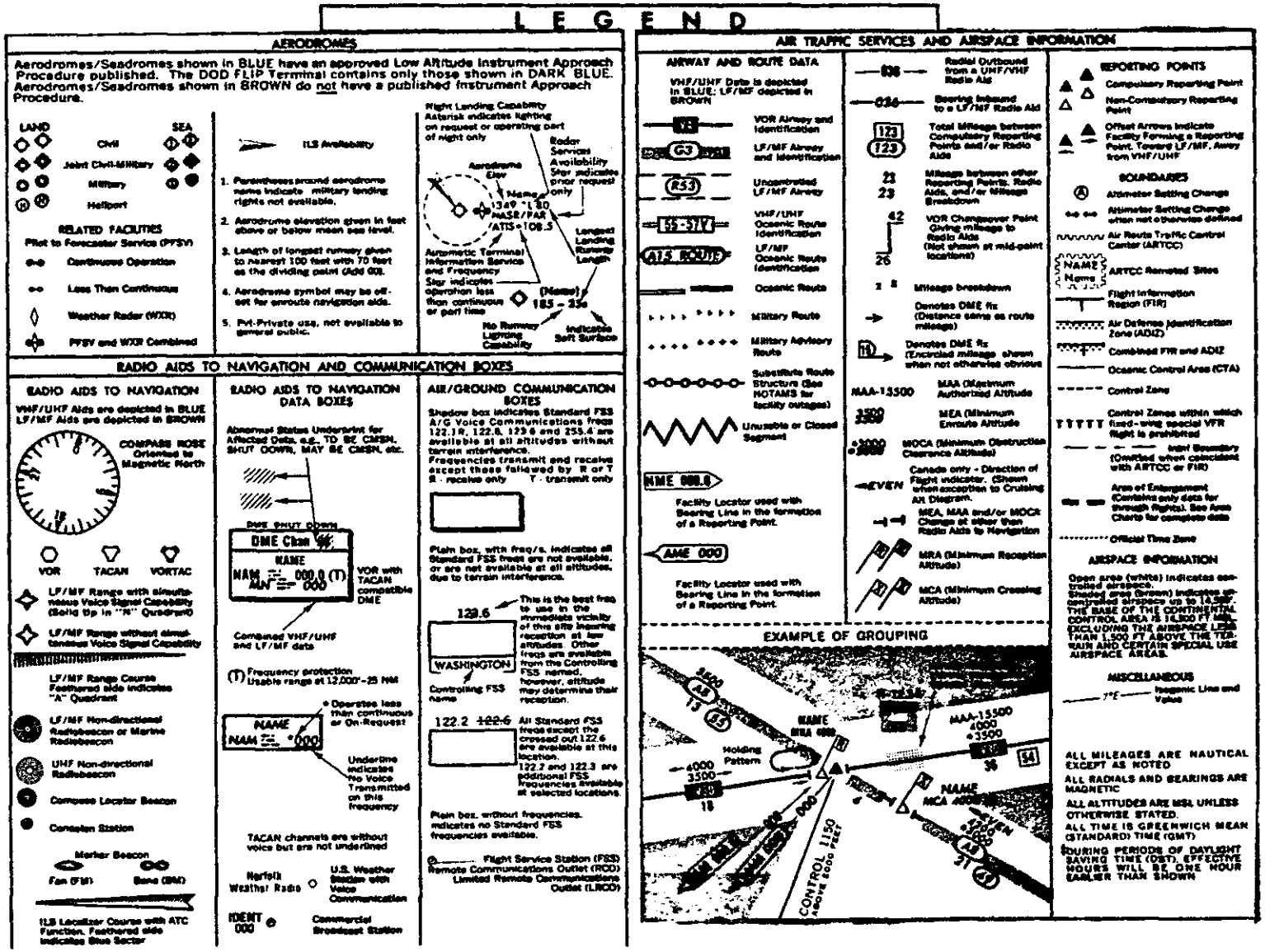


FIGURE 28.—Low altitude enroute chart legend.