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GROUND INSTRUCTOR
-INSTRUMENT-
EXAMINATION GUIDE

FEDERAL AVIATION AGENCY

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—INSTRUMENT—
EXAMINATION GUIDE

1965
Revised

FEDERAL AVIATION AGENCY

Flight Standards Service

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Preface

The Ground Instructor—Instrument—Examination Guide is one of a series of study aids issued by the Federal Aviation Agency to provide guidelines for airmen preparing for written examinations required for certification.

The examination guide points out the subject areas covered in the official examination for the instrument ground instructor rating and offers an outline for study. It suggests to the applicant the phases of aeronautical knowledge in which he should be well informed. It lists study materials and tells how to obtain them. A sample examination together with the correct answers is also presented.

Issued as FAA Advisory Circular No. 143-2, this revised edition of the guide supersedes the Ground Instructor—Instrument—Examination Guide dated 1962.

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GROUND INSTRUCTOR—INSTRUMENT—EXAMINATION GUIDE

Introduction

This examination guide has been prepared by the Flight Standards Service of the Federal Aviation Agency (FAA) to assist applicants in studying for the Ground Instructor—Instrument—written examination. It outlines the scope of aeronautical knowledge covered in the examination for the instrument ground instructor rating and suggests the subject areas in which the applicant should be well informed. The guide is not offered as a quick and easy way to gain the knowledge necessary for passing the written examination but as an aid for the student to follow a systematic plan of study. There is no substitute for diligent study to gain knowledge and understanding in so diversified a subject as aviation ground instruction.

The purpose of this guide is to help the student plan his study by providing an outline of the material upon which his efforts should be concentrated and to help him judge his ability to work out, quickly and accurately, problems like those which he will encounter in the examination.

Requirements for Certificates and Ratings

Eligibility requirements for ground instructor certificates are outlined in Part 143 of Federal Aviation Regulations. Ratings are as follows:

Ground Instructor—Basic: Qualifies the holder to instruct in a basic pilot ground school.

Ground Instructor—Advanced: Qualifies the holder to instruct in a basic or advanced pilot ground school.

Ground Instructor—Instrument: Qualifies the holder for ground instruction in an instrument flying school, and for the operation of instrument procedures training devices.

Applicants who do not hold a ground instructor certificate must take both a written examination on "Fundamentals of Instructing," and a written examination for the rating desired. Holders of a ground instructor certificate, with one or more ratings, are not required to retake the Fundamentals of Instructing examination to obtain additional ratings. An applicant who has certified that he holds a currently effective teacher certificate issued by a State, county, or city authorizing him to instruct in a junior or senior high school, or that he is regularly employed as an instructor in an accredited college or university, shall be relieved of taking the written examination on the "Fundamentals of Instructing."

The Examination

The scope of the examination includes aeronautical knowledge areas in which the instrument ground instructor should be prepared to teach. Approximately 5 hours are required to complete the examination.

Test items place emphasis on knowledge of air traffic and communications procedures, navigation procedures, operating principles of air navigation radio aids, and instrument flight techniques. A simulated cross-country flight presents a realistic progression of problems from flight planning to arrival at destination. The applicant plans the flight, using the information provided, and then applies his knowledge

of regulations, preflight and inflight calculations, current operating procedures, weather, navigation aids, and navigation procedures. The official examination booklets include appropriate planning materials similar to those that appear in the Appendix of this guide.

Test items are of the objective, multiple-choice type like those shown in the sample examination in this Examination Guide. The applicant marks his answers on a special answer sheet. Directions for taking the examination and for marking the answers should be read carefully and understood by the applicant before he begins the examination. Incomplete or erroneous personal information on the scoring sheet may delay the scoring process.

All answer sheets graded below passing (70%) are hand checked for verification before the results are mailed to the applicant on Form FAA–578A. An applicant who receives a failing grade MUST present this form for reexamination.

An applicant may retake an examination after 30 days, or sooner by presenting a statement from an appropriately rated ground instructor, certifying that (a) the applicant has been given 5 hours of additional instruction and (b) is now deemed competent to pass the examination.

Taking the Examination

The examination may be taken at Flight Standards District Offices of the Federal Aviation Agency and at other designated places.

Bear in mind the following points while taking the examination:

1. Test items should be answered in accordance with the latest regulations and procedures.
2. Read every question thoroughly. Comments received from examination applicants indicate that unsatisfactory performance on the written examination is frequently the result of failure to read carefully rather than lack of knowledge. Do not try to solve the problem before understanding the question.
3. Do not consider a complicated problem a "trick" question; each question has a specific objective. There are no trick questions.
4. There is only one correct and complete answer for each item.
5. Do not waste too much time on problems that stump you. Go on to the questions that you can answer readily, then return to the difficult items.
6. For a computer problem, select the answer closest to your own solution. If you have solved the problem correctly, your answer will be closer to the correct answer than to any of the other choices. The correct answer is an average of solutions obtained by using several types of computers.

Reference Materials

Persons studying for the Ground Instructor—Instrument—Examination will find the publications listed in this section most helpful. The list identifies material essential to preparing for the examination but does not include all material available in the subject areas. Text books and reference materials are available from commercial publishers; and many public and institutional libraries offer study materials in both the teaching and the aeronautical subject areas.

It is the responsibility of each applicant to obtain study material appropriate to his need.

Airman's Information Manual—(Annual subscription, $15)—A publication for use by all pilots, containing essential information for planning and conducting VFR and IFR flight operations. The manual is prepared in five sections, revised periodically, to provide up-to-date flight information.

Air Traffic Control Procedures, AT P 7110.1B—($2 for basic manual with supplements as issued). An FAA publication prescribing procedures and standard phraseology to be used by personnel of all facilities providing air traffic control service. Although written for the air

traffic controller, the text is excellent for study by others who need to be familiar with air traffic control procedures.

Daily Weather Map—(5¢ each). Issued daily by the U.S. Weather Bureau. For study purposes, request the Sunday issue carrying the legend and explanations on the back.

Federal Aviation Regulations:

	Cents
Part 1, Definitions and Abbreviations	25
Part 61, Certification: Pilots and Instructors	30
Part 91, General Operating and Flight Rules	30
Part 95, IFR Altitudes	20
Part 97, Standard Instrument Approach Procedures	20
Part 135, ATCO Small Aircraft	30

Flight Instructor's Handbook, AC 61-16—(60¢). This handbook has been prepared by the Flight Standards Service of the Federal Aviation Agency for the information and guidance of pilots preparing to apply for flight instructor certificates, and for use as a reference by certificated flight instructors.

Charts

Instrument Approach Procedure Charts (available for Range, ADF, VOR, VOR/DME, and ILS Approach)—(10¢ per airport set). Individual charts give detailed information on procedure for specific airports.

Enroute Charts: Low-Altitude and *High-Altitude*—(30¢ each). These charts provide the necessary aeronautical information for enroute instrument navigation.

Low-Altitude Area Charts—(10¢ each). These charts supplement the Enroute Charts by providing departure, arrival, and holding procedures at principal airports.

Air Navigation, Vol. I, Air Force Manual 51-40—($3). This manual provides information on all phases of air navigation.

Aviation Weather, AC-00-6—($2.25). Provides a background for understanding the meteorological principles important to aviation. This publication describes how weather conditions affect flying and explains how knowledge of the weather can be used for safer and more efficient flight.

How To Obtain Study Materials

The study materials listed, except the charts, may be obtained by remitting check or money order to:

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

Charts may be procured at local airports or by sending a check or money order to:

Coast and Geodetic Survey
Environmental Science Services Administration
U.S. Department of Commerce
Washington, D.C. 20235

Domestic prices are given; for foreign delivery, add 25 percent.

786-745 O—65—2

Study Outline

This study outline indicates the areas of aeronautical knowledge which pertain to the examination. 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.

I. Rules and Requirements for Instrument Flight.
- A. *Aircraft* (*FAR 91*).
  1. Certificates, documents, inspections.
  2. Equipment required.
  3. Equipment accuracy checks.
- B. *Airmen* (*FAR 61*).
  1. Pilot certificates and ratings.
  2. Pilot logs and flight time requirements.
  3. Recency of experience.
- C. *Flight Rules* (*FAR 91*).
  1. General.
  2. General flight rules.
  3. Visual flight rules.
     a. Basic minimums; control areas, control zones, Continental Control Area, and outside controlled airspace.
     b. Special VFR.
     c. Cruising altitudes/flight levels.
     d. Maintenance.
  4. Instrument flight rules.
     a. Clearance and flight plan.
     b. Takeoff and landing.
     c. Minimum IFR altitudes.
     d. Cruising altitudes/flight levels.
     e. Courses to be flown.
     f. Radio communications.
     g. Malfunctions.

II. Interpretation of Flight Instruments.
- A. *Altimeter.*
  1. Altitude terms.
  2. Errors.
  3. Altimeter setting.
  4. Effect of changes in temperature and pressure.
- B. *Airspeed Indicator.*
  1. Limitation markings.
  2. Errors due to configuration, pitch attitude, and airspeed.
  3. Use of alternate static source.
- C. *Magnetic Compass.*
  1. Variation and Deviation.
  2. Acceleration and deceleration errors.
  3. Turning errors.
- D. *Gyroscopic Rate of Turn Indicator* (also called Turn and Bank, Turn and Slip, or Turn and Trim).
  1. Interpretation of needle and ball (2 minutes and 4 minutes).
  2. Relationship of TAS and angle of bank to rate of turn.
- E. *Gyro Instruments* (operating characteristics and limitations).
- F. *Determining Aircraft Attitude from Instrument Indications.*

III. Aids to Air Navigation (operating characteristics and limitations of ground and airborne equipment).
- A. *Ranges* (VOR and VORTAC).
- B. *Homing Facilities* (radio beacons, broadcast stations, and compass locators).
- C. *Primary Radar* (ASR, ARSR, and PAR).
- D. *Radar Beacon System* (SECONDARY RADAR).
- E. *DME* (Distance Measuring Equipment).
- F. *ILS* (Instrument Landing System).

IV. Operational Procedures and Techniques for Instrument Flight.
- A. *Fundamentals* (*Airman's Information Manual*—Section I).
  1. Good Operating Practices.
  2. Air Navigation Radio Aids.
  3. Radar.
  4. Airport, Air Navigation Lighting and Marking.

5. Radiotelephone Phraseology and Techniques.
6. Altimetry.
7. Weather.
8. Safety of Flight.
9. Medical Facts for Pilots.

B. *Air Traffic Control Operations and Procedures (Airman's Information Manual*—Section II).
1. Preflight (Flight Plan).
2. Departure.
   a. Communications.
   b. Light Signals.
   c. Clearance.
   d. Departure Control.
3. Enroute.
   a. Airways/Route Systems.
   b. Continental Control Area.
   c. Positive Control Area.
   d. Holding.
   e. Surveillance Radar.
   f. ATCRBS.
   g. Changeover Points.
   h. Directional Reporting.
   i. Communications.
   j. Compulsory Reports.
   k. Frequency Use Plan.
4. Arrival.
   a. Airport Advisory Service.
   b. Radar Traffic Information.
   c. Terminal Radar Service.
   d. Approach Control.
   e. Instrument Approach.
   f. Radar Monitoring of Instrument Approaches.
   g. Speed Adjustment.
5. Landing.
6. General.
7. Emergency Procedures.

C. *Enroute Navigation Procedures.*
1. Dead reckoning.
2. VOR navigation.
   a. Orientation and homing.
   b. Intercepting radials.
   c. Position fixing.
   d. Airway navigation.
3. ADF Navigation.
   a. Determining magnetic bearings.
   b. Intercepting magnetic bearings.
   c. Determining relative bearings.
   d. Wingtip time/distance calculations.
   e. Tracking.

D. *Weather in Flight.*
1. Weather flying.
   a. Icing.
   b. Turbulence.
2. Obtaining weather information in flight.
   a. Transcribed Automatic Weather Broadcasts.
   b. Scheduled weather broadcasts.
   c. Special requests for weather information.
3. Reporting unusual or unforecast weather.

E. *Instrument Approach Procedures* (includes complete understanding and application of Instrument Approach Charts).
1. ILS.
   a. Front course.
   b. Back course.
2. VOR.
3. VOR/DME.
4. ADF.
5. Surveillance Radar.

V. Flight Planning.

A. *Airman's Information Manual*—Sections III, IIIA and IV. Applicants should know how to find and use the flight data contained in these sections.

B. *Charts* (read and interpret all features and symbols).
1. Enroute Low-Altitude Chart.
2. Low-Altitude Area Chart.
   a. Departure.
   b. Arrival.
3. Standard Instrument Departure (SID).
4. Instrument Approach (A/L) Chart.

C. *Weather.*
1. Elements of weather.
   a. Wind (pressure gradient, general circulation, surface friction, etc.).
   b. Air masses (general characteristics).
   c. Pressure systems and associated weather.
   d. Cloud types and characteristics.
   e. Frontal systems and characteristic weather.
   f. Factors affecting visibility.
   g. Thunderstorms.

h. Turbulence.
i. Carburetor and structural icing.

2. Weather maps.
   a. Surface Weather Map (general interpretation, including identification and location of fronts).
   b. Surface Weather Depiction Chart.
   c. Pressure Charts, 500 and 700 mb.
3. Weather Reports and Forecasts (read and interpret).
   a. Hourly Surface Reports.
   b. Area Forecasts.
   c. Terminal Forecasts.
   d. Winds Aloft Forecasts.
   e. Radar Reports.
   f. Weather Advisories (Advisories to Light Aircraft and SIGMETS).

D. *Aircraft Performance* (at maximum gross or lighter specified weights).
1. Takeoff distance.
   a. Density altitude (field elev. and temp.).
   b. Wind component.
   c. Runway condition.
   d. Humidity.
2. Climb performance.
   a. Maximum rate at specified altitudes.
   b. Best airspeed at specified density altitudes (rate/angle).
3. Approach (appropriate IAS for specified weights and configurations—concerns conversion of CAS for static error).

E. *Weight and Balance*
1. Calculation of gross weight and location of C.G.
2. Determining useful load and allowable fuel load.
3. Effect on aircraft performance.

F. *Flight Logs.*
1. Preparation of preflight flight log for IFR flight (IFR Charts, Aircraft Flight Manual data, appropriate weather information and Airman's Information Manual excerpts are furnished with FAA examinations).
2. Required Calculations include:
   a. Conversion of directions; true, magnetic, compass.
   b. True airspeed from CAS (TIAS) and density altitude.
   c. Wind correction angle.
   d. Time, speed, and distance.
   e. Groundspeed.
   f. Required rate of climbs/descents.
   g. Fuel consumption.
   h. Determining actual wind direction and velocity in flight.

VI. Air Taxi and Commercial Operators of Small Aircraft, FAR Part 135:
A. Subpart C—Operating Rules.
B. Subpart D—Pilot Qualifications.
C. Subpart E—Aircraft Equipment.

VII. Instrument Instructing Techniques.
A. Effective use of Instrument Procedure Trainers.
B. Effective use of Training Aids.

Sample Examination

The following test items are typical of those in the official FAA written examination. Answers to these test items appear at the end of the examination.

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

1. VORs and VORTACs are classified as H, L, and T. If a VOR of the T classification is used for navigation at altitudes above 12,000 feet, undependable navigation signals may be received because—

1—Transmitter signal strength is less than that of the H or L ranges.
2—Course azimuth is not accurate above 12,000 feet.
3—Signals from another range may interfere.
4—Atmospheric conditions affect the signal.

2. During flight in instrument conditions, in a nonradar environment, the pilot is dependent upon the information received from his radio navigation equipment for course guidance. Because of this fact, a pilot must know the capability and limitations of his equipment. With many present-day Nav/Com systems, unreliable course guidance information will be obtained during which of the following situations?

1—During an ILS back course approach.
2—During reception of voice transmissions.
3—When using the Nav/Com transmitter.
4—When making an ILS front course approach with OBS set at some value other than the front course inbound bearing.

3. Which of the following statements pertaining to the ILS are true?

A. False glide slope courses may be encountered above or below the normal glide slope.
B. Normal glide slope elevation is 2.5° to 3°.
C. Compass locators are required components of an ILS.
D. Removal of the coded identification is an indication that maintenance has taken over the facility.
E. Communication transmissions may be received on the localizer frequency.

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

4. You should be able to provide your students with basic information about radar. To each of the radar terms below (A, B, C, and D), match the appropriate explanatory remark (W, X, Y, and Z).

A. Primary radar.
B. Secondary (beacon) radar.
C. Surveillance radar.
D. Precision radar.

* * * * *

W. Provides radar target information through 360° azimuth.
X. Provides radar target information in a selected area of 20° azimuth and 7° elevation.
Y. Depends entirely on reflected radio pulse energy.
Z. Requires the use of an airborne transponder.

1—A–Y, B–Z, C–X, D–W.
2—A–X, B–W, C–Z, D–Y.
3—A–Y, B–Z, C–W, D–X.
4—A–W, B–X, C–Y, D–Z.

5. You are instructing a student in timed climbing turns. During a turn to the left the needle shows the correct rate of turn, but the

ball is to the right of center. In this situation, the student should—

1—Apply or increase right rudder pressure and shallow out the bank.

2—Shallow out the bank to center the ball.

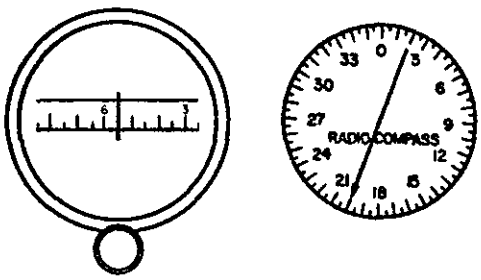
3—Apply or increase right rudder pressure and increase the bank.

4—Add right rudder trim until the ball is centered and maintain the same bank.

6. During a period in the synthetic trainer, you issue the following clearance to your student:

ATC CLEARS FASTWIN ONE TWO XRAY TO THE BRAVO RADIO BEACON. TRACK INBOUND ON A MAGNETIC COURSE OF 265°.

With magnetic heading and ADF indications as shown in the illustration below, which of the following responses outlines an accepted procedure in compliance with this clearance?



1—Turn right to magnetic heading 205°. When the relative bearing approaches 060°, turn to magnetic heading 265°.

2—Turn left immediately to magnetic heading 205°. When the relative bearing approaches 300°, turn to magnetic heading 265°.

3—Turn left to magnetic heading 205°. When the relative bearing approaches 060°, turn to magnetic heading 265°.

4—Turn left immediately to establish a relative bearing of 0° and then compute an interception heading.

7. Most sensitive altimeters possess a setting scale error. This error should be determined in order that corrective measures can be established before flight in instrument conditions. Assume the following conditions exist prior to flight:

a. Current local altimeter setting—29.95″ Hg.

b. Field elevation—420 feet.

c. The aircraft altimeter when set at current altimeter setting, indicates 470 feet.

d. The aircraft altimeter when set at field elevation, indicates 29.90″ Hg.

The proper corrective action in this situation would be to set the altimeter at—

1—29.95″ Hg and subtract 50 feet from all indicated altitudes.

2—29.95″ Hg and add 50 feet to all indicated altitudes.

3—Field elevation and add 0.05″ Hg to all subsequent altimeter settings.

4—Field elevation and subtract 0.05″ Hg from all subsequent altimeter settings.

8. The word "unattended," in the recorded voice identification of a VOR range, means that—

1—The range is not monitored.

2—The range is monitored solely through the use of automatic equipment.

3—The VOR range is remotely controlled by an FSS.

4—No two way air-ground communications facility is associated with the VOR range.

9. You advise your students that in the event of inflight failure of the gyroheading indicator, the magnetic compass may be the only source of heading information. With reference to the magnetic compass, which of the following statements is true? (Assume 15° to 18° bank and a TAS of 220 knots or less.)

1—The lead required to roll out of a turn on a heading of south is the same as the lead that is required to roll out of a turn on a heading of north.

2—The amount of turning error in a magnetic compass is determined by the latitude at which the turn is being made.

3—Acceleration error on headings of north and south is the same as the acceleration error on headings of east and west.

4—The amount of lead required to roll out of a turn on a heading of 030° is the same as that required to roll out of a turn on a heading of 060°.

10. Select from the list below, the correct statements pertaining to a properly calibrated turn and bank instrument.

A. Higher than normal vacuum on a suction driven turn and bank causes the deflection of the turn needle to be greater than normal.

B. To maintain a standard rate of turn, the degree of bank must be held constant regardless of airspeed change.

C. The ball indicates whether the aircraft has the correct angle of bank for its rate of turn.

D. To maintain a standard rate turn, the angle of bank must be increased if the aircraft is accelerated.

E. The turn needle operates on the gyroscopic principle of rigidity in space.

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

11. Most suction driven artificial horizons in general aviation aircraft can be "spilled" in steep turns, climbs, or descents. You would be correct in advising a student that uncaging a horizon of this type in a coordinated climbing turn to the right will—

1—Temporarily reduce the amount of pitch or bank change required to spill the instrument in a descent or a turn to the left.

2—Not change the aircraft attitude at which the instrument will spill.

3—Temporarily reduce the amount of pitch or bank change required to spill the instrument in a descent or a turn to the right.

4—Temporarily reduce the amount of pitch or bank change required to spill the instrument in a climb or a turn to the right.

12. If this IFR flight is to be made with a VFR CONDITIONS ON TOP clearance, select from the list below those statements that would apply.

A. Only Visual Flight Rules apply.

B. Flight must be conducted 3,000 feet or more above the surface and at the appropriate VFR altitude for direction of flight.

C. Only Instrument Flight Rules apply.

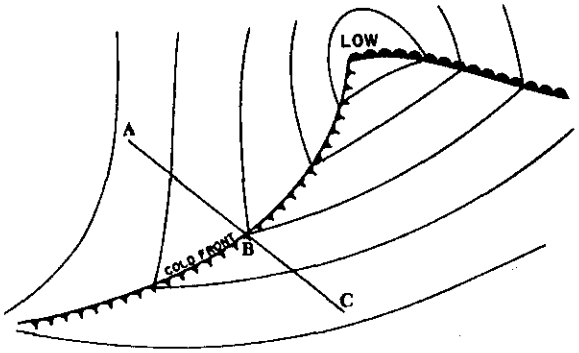
D. Both Visual and Instrument Flight Rules apply.

E. May be approved for daytime operation only.

F. May not be approved for holding.

G. No separation is provided by ATC.

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



Refer to the above diagram in answering Test Item 13.

13. A flight is made from A to C at an altitude of 4,000 feet above ground level. In order to maintain the desired ground track, the pilot would have to correct heading to the (refer to the surface diagram above)—

1—Left upon noting a decrease in outside air temperature at some point between B and C.

2—Right upon noting a decrease in outside air temperature at some point between A and B.

3—Right upon noting an increase in outside air temperature at some point between A and B.

4—Left upon noting an increase in outside air temperature at some point between B and C.

The test items which follow are based on the planning and execution of an IFR training flight. They cover some of the elements of preflight and inflight procedures for which your students should be well prepared.

Use RNO winds from RNO to SAC, and use SFO winds from SAC to SFO.

786-745 O—65——3

Aircraft Data and Flight Conditions

The route for this flight is: Municipal Airport, Reno, Nev., via Sparks Five Departure, Verdi Transition, V854, Oakland (OAK) VORTAC Direct LOM of San Francisco (SFO) ILS.

The route to the alternate is: SFO direct OAK VORTAC V6 Sacramento (SAC). Assume departure 1420 P.

Note that the distance shown on the FLIGHT LOG from takeoff to Sparks radiobeacon is based on circling the airport for the required 1,000 feet of altitude.

The mileage from Sparks radiobeacon to Verdi Intersection is shown on the RNO SID Chart, and the mileage from Verdi to Truckee is shown on the Enroute Chart.

The Appendix of this guide contains the data required for flight planning. The FLIGHT LOG (Figure 1 in the Appendix) shows major check points, requested altitudes, magnetic courses, and magnetic variation. (You may wish to remove this page from the booklet to complete your calculations.) Aircraft data, weather information, and charts may be found in the Appendix, Figures 2 through 15.

14. The computed flight time from takeoff to the SFO LOM is—

1—1 hour and 6 minutes.
2—1 hour and 12 minutes.
3—1 hour and 16 minutes.
4—1 hour and 22 minutes.

15. The fuel requirement for this IFR flight is approximately—

1—90 gallons.
2—94 gallons.
3—99 gallons.
4—105 gallons.

During the preflight planning you pose the following weight and balance problem. (Refer to aircraft data, Figures 2, 3, and 4 in the Appendix.)

	Pounds	*Moment/1000*
Empty weight		
Oil 7.5 lb./gal		
5 passengers in seats 1, 2, 3, 4, 5 (170 lb. each).		
Pilot and 1 passenger in Copilot seat (170 lb. each).		
Fuel main tanks (max. consistent with t/o gross weight).		
Baggage	150	

16. Under the loading conditions specified previously, the resultant C.G. moment is approximately—

1—1,187 thousand pound inches.
2—1,186 hundred pound inches.
3—1,227 thousand pound inches.
4—1,169 thousand pound inches.

17. You plan to request 12,000 feet for this flight. Which constant pressure chart would you check to determine the wind flow affecting your operation?

1—850 millibar chart.
2—700 millibar chart.
3—500 millibar chart.
4—400 millibar chart.

18. Which of the following statements correctly interprets portions of the 1845Z SFO Area Forecast? (Refer to Figure 15 in the Appendix)

1—Freezing level is expected to be 10,000 feet over central California.
2—Scattered rain showers are expected north of the front.
3—Occasional severe turbulence is predicted over mountain areas in northern California.
4—Showers and cloudiness are expected to intensify over central California by Thursday morning.

19. Which of the following conditions is forecast by the FT1 issued at 1645Z? (Refer to Figure 14 in the Appendix.)

1—RNO—pronounced wind shift associated with weak frontal passage.
2—SFO—weak frontal passage at 1700P.
3—SAC—ceiling 14,000 feet scattered after 1300P.
4—OAK—increasing cloudiness and lowering ceilings after frontal passage.

20. According to the forecasts, there is a possibility of structural icing during this flight. With reference to icing, you would be correct in pointing out to your students that clear ice formation is usually associated with temperatures at freezing or below in—

1—A stable air mass containing very small water droplets.
2—Stratus clouds.
3—Ice clouds.
4—Convective type clouds.

21. Assume you will cross the airport at the minimum specified altitude and will make good an average ground speed of 110 knots during the climb to SPARKS. To cross SPARKS initially at 9,000 feet, your aircraft must climb at a rate nearest to: (Refer to SID Chart, Figure 8, and RNO Approach Chart, Figure 12 in the Appendix.)

1—800 feet per minute.
2—700 feet per minute.
3—600 feet per minute.
4—500 feet per minute.

22. Based on the climb requirement established in Test Item 21 (assuming RNO pressure altitude of 5000 feet and temperature reported in the 2200Z SA) the aircraft is (see Figures 6 and 7)—

1—Capable of meeting the requirement in both single and multiengine configuration.
2—Capable of meeting the requirement in multiengine configuration only.
3—Not capable of meeting the requirement.
4—Capable of meeting the requirement in single engine configuration to a pressure altitude of 7500 feet.

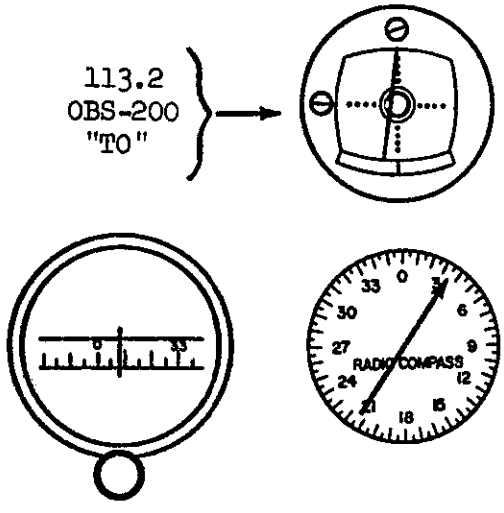
23. Though not required to do so by regulations, the competent instrument pilot should make a sensitivity check on his VOR navigation receivers at the same time he makes the required accuracy check. With respect to an accuracy and sensitivity check utilizing a VOT, which of the following is correct? (Nonautomatic indicating type receiver)—

OBS set at	*To/from*	*CDI*	*Recommended sensitivity*
1—0° (±4°).....	From..	Centered...	10° OBS change to produce R or L full scale CDI deflection.
2—0° (±6°).....	To.....	Centered...	5° OBS change to produce R or L full scale CDI deflection.
3—180° (±4°)....	From..	Centered...	5° OBS change to produce R or L full scale CDI deflection.
4—180° (±6°)....	To.....	Centered...	10° OBS change to produce R or L full scale CDI deflection.

When flight planning is complete and the student is ready for takeoff on runway 16, RNO Tower issues the following clearance:

ATC CLEARS N8712X TO THE OAKLAND VORTAC VIA VICTOR 854, MAINTAIN ONE TWO THOUSAND. SPARKS FIVE DEPARTURE, VERDI TRANSITION. DEPART SPARKS RADIOBEACON AT ONE TWO THOUSAND.

24. During the climb to Sparks Intersection, heading, ADF, and VOR indications are as shown below:



The student should know from these indications that he is to the—

1—Left of course, approaching the 020 radial of LTA.
2—Left of course, and has passed the 020 radial of LTA.
3—Right of course, approaching the 020 radial of LTA.
4—Right of course, and has passed the 020 radial of LTA.

25. After leaving SPARKS Intersection, RNO Approach Control transmits the following instructions: 8712XRAY, CONTACT OAKLAND CENTER 127 POINT 5 NOW. If the student is unable to contact OAKLAND Center on 127.5, he is expected to follow a prescribed procedure to reestablish communications with ATC. From the list below, select the correct order of procedures.

A. Contact any FSS on 126.7, 122.1, or 135.9 mc.
B. Recontact the transferring facility.
C. Contact Oakland Center on the Area Discrete frequency.
D. Contact any facility on the International Emergency frequency 121.5 mc.

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

26. Assume the student arrives at SPARKS RBN at 8,500 feet on a compass heading of 327°. To comply with the SPARKS Five SID he—

1—May proceed on the Verdi transition without holding.
2—Should enter a holding pattern utilizing a teardrop entry and climb to 10,500 feet before proceeding to Verdi.
3—Should enter a holding pattern utilizing a parallel or teardrop entry and climb to 9000 feet before proceeding to Verdi.
4—Should enter a holding pattern utilizing a teardrop entry and climb to 12,000 feet before proceeding to Verdi.

27. You would be correct in advising the student that the climb to the assigned altitude should be made—

1—As rapidly as practicable to 12,000 feet.
2—At any rate to 12,000 feet.
3—As rapidly as practicable to 11,000 feet then at 500 feet per minute to 12,000 feet.
4—At a maximum rate of 1,000 feet per minute to 12,000 feet.

28. You advise the student that it is a good procedure to determine actual winds at cruising altitude in order that he will be able to give more accurate estimates to ATC. Assume the following:

Time over Verdi Intersection—2242Z.
Time over Signal Intersection—2254Z.
True Airspeed—197 knots.
Compass heading to maintain course on this leg—243°.
(See Figure 3 in the Appendix for compass deviation.)

The student should determine the wind to be approximately—

1—298° at 22 knots.
2—216° at 23 knots.
3—243° at 23 knots.
4—202° at 21 knots.

29. After passing the Sacramento VORTAC the student makes a position report to Oakland Center. Which of the following represents the proper reporting procedure for this flight? (Assume initial contact has been made.)

1—FASTWIN ONE TWO XRAY SACRAMENTO ONE FOUR, BAY POINT TWO SIX OAKLAND.
2—FASTWIN ONE TWO XRAY SACRAMENTO ONE FOUR, IFR RENO TO SAN FRANCISCO.
3—FASTWIN ONE TWO XRAY SACRAMENTO ONE FOUR, EIGHT THOUSAND, BAY POINT TWO SIX, OAKLAND.
4—FASTWIN ONE TWO XRAY SACRAMENTO ONE FOUR, EIGHT THOUSAND, IFR, SAN FRANCISCO.

30. To avoid excessive radar vectors in establishing approach sequence, the student may be requested to make airspeed adjustments. Which of the following statements is correct?

1—The main purpose of speed adjustment procedures is to reduce speeds of all arriving aricraft.
2—All requests for speed adjustments are expressed in terms of knots, predicated on TAS.
3—When approach clearance is received, the pilot is expected to effect his own speed adjustments.
4—The pilot is required to accept the speed adjustments assigned his flight.

31. If SFO is below landing minimums on arrival, how long may the student hold before proceeding to the alternate? (Assume arrival at calculated ETA.)

1—20 minutes.
2—36 minutes.
3—1 hour and 03 minutes.
4—45 minutes.

32. You advise the student that he is to plan for an ILS approach at San Francisco International Airport. Which of the following statements are icorrect with regard to the aircraft used for this simulated flight? (See Appendix, Figure 13.)

A. The minimum altitude in the holding pattern at the LOM is 1,700 feet.
B. The distance from the LOM to the threshold of runway 28R is 5.7 miles.
C. The time from the LOM to the LMM at a groundspeed of 90 knots is 2 minutes and 4 seconds.
D. Landing minimum for R28L is 410 feet MSL.
E. When approaching from OAK VORTAC contact Approach Control on 119.3 mc.

F. Visual Approach (Glide) Slope Indicator available for runway 19L only.

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

33. A pilot making an ILS approach uses the visual display of his glide slope and localizer receiver to keep his aircraft within the prescribed approach zone. With reference to the glide slope indicator, what is the recommended maximum allowable "fly up" indication from the middle marker inbound to the landing area?

1—One-quarter scale.
2—Zero.
3—One-half scale.
4—Three-quarter scale.

34. If weather conditions are below VFR minimums on arrival at SFO, the ILS approach will be monitored by Precision Approach Radar (PAR) and advisories will be furnished. The advisories will include—

A. Passing the final approach fix.
B. Distance above or below the prescribed glide path if aircraft elevation exceeds the "safety zone."
C. Distance right or left of the prescribed final approach course if aircraft azimuth exceeds the "safety zone."
D. Any situation which, in the judgment of the controller, is likely to affect the safety of the flight.

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

35. One of the newer landing aids is the Visual Approach Slope Indicator (VASI) which provides a visual glide path within the approach zone. The lights at the 600-foot mark from the threshold are known as the downwind bars, and the lights at the 1,300-foot mark are known as the upwind bars. When approaching on the proper glide slope, the pilot will see—

1—The upwind lights red and the downwind lights white.
2—Both upwind and downwind lights white.
3—Both upwind and downwind lights pink.
4—The upwind lights white and the downwind lights red.

Answers to Sample Examination Items

Item	Answer number	Item	Answer number
1	3	19	2
2	3	20	4
3	2	21	3
4	3	22	2
5	3	23	1
6	1	24	2
7	4	25	4
8	4	26	4
9	2	27	3
10	3	28	1
11	1	29	3
12	4	30	3
13	3	31	2
14	3	32	2
15	2	33	2
16	1	34	4
17	2	35	1
18	1		

Analysis of Answers to Sample Examination Items

Answer

3 The H, L, and T Classifications are not related to transmitter power. Since the frequency of an L VOR is not protected above 12,000 feet, another VOR on the same frequency may be close enough to produce signal interference which would result in undependable or inadequate indication in the aircraft.

3 Since many Nav/Com transceivers utilize part of the receiver circuitry when the transmitter is operating, unreliable CDI indication may be obtained while transmitting.

2 A. All false courses are encountered *above* the normal glide slope.
B. Reference *Airman's Information Manual.*
C. Reference FAR 91.117(i). A compass locator may be used, but it is not a required component.
D. Reference *Airman's Information Manual.*
E. Reference *Airman's Information Manual.*

3 Reference *Airman's Information Manual.*

3 To coordinate the skidding turn, the student should apply or increase right rudder pressure and increase the bank to maintain correct rate of turn.

1 The aircraft is east-northeast of the station, on a magnetic bearing of 255° to the station. An accepted procedure is to turn right (the shortest distance) to magnetic heading 205° (60° less than the desired track inbound), then turn to magnetic heading 265° when the relative bearing approaches 60°.

Item Answer

7 4 The altimeter has a .05″ Hg scale error and indicates 50 feet too high. The altimeter should be set to field elevation and the difference between the current altimeter setting and the Kollsman scale should be applied to all subsequent altimeter settings (—.05″ Hg in this case).

8 4 If no air/ground communications facility is associated with the omnirange, "(name) UNATTENDED VOR (VORTAC)" will be heard.

9 2 Under the airspeed and bank conditions stated in this item, the amount of turn error is predictable. Turn error is approximately equal to the latitude at which you are flying.

10 3 A. Correct as stated.
B. The angle of bank required to maintain a standard rate of turn varies directly with TAS.
C. Correct as stated.
D. Correct as stated.
E. The turn needle utilizes the principle of precession for its indications.

11 1 If an attitude indicator is uncaged in any attitude other than straight and level flight, the horizon bar will temporarily remain at that position. If the aircraft in this test item were returned to level flight after uncaging, the artificial horizon would indicate a descent and a left turn. As a result, the amount of pitch or bank change from straight and level flight required to spill the instrument in a descending left turn will be reduced.

12 4 Reference Exam-O-Gram No. 6 in the Appendix.

Item	Answer	
13	3	The cold front at the surface is in advance of the cold front aloft. Therefore, warm air will be encountered at some point between A and B and the wind shift will produce a crosswind from the right.
14	3	201 miles, ground speeds ranging from 152 knots to 170 knots.
15	2	50.7 gal. to SFO, 13.3 gal. to alternate, 30.3 gal. reserve.
16	1	

	Pounds	*Moment/1000*
Empty weight	4,940	854.8
Oil 7.5 lb./gal	75	15.0
5 passengers in 1, 2, 3, 4, 5 (170 lb. each)	850	131.0
Pilot and 1 passenger in copilot seat (170 lb. each)	340	32.0
Fuel main tanks (maximum consistent with TOGW)	645	124.3
Baggage	150	30.0
	7,000	1,187.1

17	2	The 700 millibar chart represents approximately the 10,000 foot level.
18	1	Correct as stated.
19	2	Correct as stated.
20	4	Clear ice is most likely to form from the large droplets of water contained in convective type clouds.
21	3	Distance from the airport to Sparks radiobeacon is 11.2 miles (8.9 and 2.3 miles). 3,600 feet to climb in 6 minutes.
22	2	The aircraft is capable of climbing at a rate of slightly more than 350 fpm in single-engine configuration at a pressure altitude of 5,000 feet.
23	1	From full scale left to full scale right covers approximately 20° (10° R or L of center).
24	2	The magnetic bearing to Sparks radio beacon from the aircraft is 043. The pilot has selected the 200 OBS setting because he will track to Verdi on that course.
25	4	Reference *Airman's Information Manual*, "Frequency Utilization Plan."
26	4	The clearance requires that climb to assigned altitude be made in a standard holding pattern if altitude is not attained on initial arrival at Sparks. The type of entry is determined by the aircraft heading on arrival at the holding fix. (In this case, a teardrop entry would be recommended.)
27	3	Reference *Airman's Information Manual*. The climb should be made as rapidly as practicable to 1,000 feet below the assigned altitude, and then at the rate of 500 fpm.
28	1	The information needed to solve this problem is as follows: MC 239°+18° E VAR=TC—257° CH 243°+0°DEV+18° E VAR=TH—261° TAS 197 knots. GS 180 knots. The resultant wind is approximately 298° at 22 knots.
29	3	Reference *Airman's Information Manual*, Section I, "Radiotelephone Phraseology and Techniques."
30	3	Reference *Airman's Information Manual*, Section II, "Speed Adjustment of Arriving Aircraft."
31	2	Assuming arrival at calculated ETA, approximately 13.5 gallons of fuel in excess of required fuel will remain. At 40 gph this will be equivalent to approximately 20 minutes.
32	2	Reference SFO ILS Approach Chart.
33	2	Reference *Airman's Information Manual*, Section I, "Instrument Landing System."
34	4	Reference *Airman's Information* Manual, Section I, "Radar Controlled Approaches."
35	1	Reference *Airman's Information Manual*, Section I, "Visual Approach Slope Indicator (VASI)."

FEDERAL AVIATION AGENCY

FLIGHT LOG

CHECK POINTS FROM	CHECK POINTS TO	ROUTE / ALTITUDE	Mag. Crs. / Var.	FREQ. / CONTROLLING / RADIAL	TRUE AIR SPEED	WINDS ALOFT DIRECTION VELOCITY TEMPERATURE	DRIFT CORRECTION ANGLE	GROUND SPEED KNOTS	LEG DIST. / DIST. REMAINING	ETE / TOTAL TIME	ETA / ATA	FUEL USED / FUEL REMAINING	REPORTING FREQUENCIES
T.O.	Sparks	Climb	342 18E					110	16	9.0 9.0			
Sparks	Verdi	12000	200 18E										
Verdi	Signal	V854 12000	239 18E										
Signal	SAC	V854 12000	200 18E										
SAC	RIO	V854 8000	194 18E										
RIO	Bay Pt.	V854 8000	202 18E										
Bay Pt.	OAK	V854 8000	202 18E										
OAK	SFO OM	Direct	173 18E										
ALTERNATE													
SFO	SAC	V6 5000	022 18E										

REMARKS

NOTE:

(1) This log is provided to assist applicants in the orderly arrangement of flight planning data used in written examinations.

(2) The use of all or any part of this form is optional.

(3) Return this form to the monitor upon completing the examination.

FIGURE 1.—*Flight Log.*

Data on FASTWIN 8712X

The aircraft is a five- to seven-place twin-engine "Fastwin" typical of various light twins currently in use.

It is appropriately equipped for instrument flight and has the following radio installations:

One automatic direction finder (ADF).

Dual VHF receivers (both with frequency range 108.0–126.9 mc) with omni visual display of the three element type (course selector, course deviation indicator, and "TO-FROM" indicator) and instrument landing equipment (ILS—localizer and glide slope).

One marker beacon receiver.

Two 360 channel transceivers range (118.0–135.9 mc).

Empty Weight:

As equipped, 4,940 pounds.

Maximum Allowable Gross Weight:

7,000 pounds.

Oil Capacity:

10 gallons (5 gal./engine).

Usable Fuel:

Main 156 gallons.
Aux. 67 gallons (37.5 gal. in each of 2 aux.).

Fuel Consumption:

40 gal./hr. (20 gal/hr./engine).

Baggage Compartment:

See weight and balance information.

FIGURE 2.—*Aircraft data (Fastwin 8712X).*

Calibrated Airspeeds:

Best Climb	110 knots	Approach	100 knots
Cruise	165 knots	Stall	70 knots

Altitudes:

All flight altitudes will be in terms of MEAN SEA LEVEL (MSL) unless otherwise specified.

Radio Call:

Fastwin 8712X

De-Icing Equipment:

Aircraft is equipped with propeller anti-icing; wing, vertical and horizontal stabilizer de-icers.

Compass Correction Card:

FOR (MH)	0	30	60	90	120	150	180	210	240	270	300	330
STEER (CH)	1	30	58	90	122	153	179	210	240	272	300	330

Weight and Balance Data:

	Pounds	*Moment/1000*		*Pounds*	*Moment/1000*
Empty weight	4,940	854.8	Fuel—Mains	------	---------
Oil 7.5 lb./gal	75	15.0	Fuel—Auxiliary	------	---------
Passengers 170 lb. each	------	---------	Baggage	------	---------
Pilot and Copilot 170 lb. each	------	---------			

FIGURE 3.—*Flight data.*

PASSENGERS		
SEAT NO.	WEIGHT	MOMENT/1000
Co-P	170	16
4	170	22
5	170	22
1	170	29
2	170	29
3	170	29

FUEL		
GALS.	WEIGHT	MOMENT/1000
10	60	12
20	120	24
30	180	36
40	240	48
50	300	59
60	360	71
70	420	83
80	480	94
90	540	105
100	600	116
110	660	127
120	720	138
130	780	148
140	840	159
150	900	169
156	936	175

L & R OUTBOARD FUEL SYSTEM		
GALS.	WEIGHT	MOMENT/1000
10	60	11
20	120	21
30	180	32
40	240	43
50	300	53
60	360	64
67	402	72

BAGGAGE	
WEIGHT	MOMENT/1000
25	5
50	10
75	15
100	20
125	25
150	30
175	35
200	40
225	45

WEIGHTS AND MOMENTS TO DETERMINE ALLOWABLE LIMITS		
167.40 Min. To 174.40 Max. (Stay Within Min. and Max. Limits)		
	Minimum	Maximum
Weight	Moment/1000	Moment/1000
5500	921 ----	959
5550	929 ----	968
5600	937 ----	977
5650	946 ----	985
5700	954 ----	994
5750	963 ----	1003
5800	971 ----	1012
5850	979 ----	1020
5900	988 ----	1029
5950	996 ----	1038
6000	1004 ----	1046
6050	1013 ----	1055
6100	1021 ----	1064
6150	1030 ----	1073
6200	1038 ----	1081
6250	1046 ----	1090
6300	1055 ----	1099
6350	1063 ----	1107
6400	1071 ----	1116
6450	1080 ----	1125
6500	1088 ----	1134
6550	1096 ----	1142
6600	1105 ----	1151
6650	1113 ----	1160
6700	1122 ----	1168
6750	1130 ----	1177
6800	1138 ----	1186
6850	1147 ----	1195
6900	1155 ----	1203
6950	1163 ----	1212
7000	1172 ----	1221

FIGURE 4.—*Weight and moment data.*

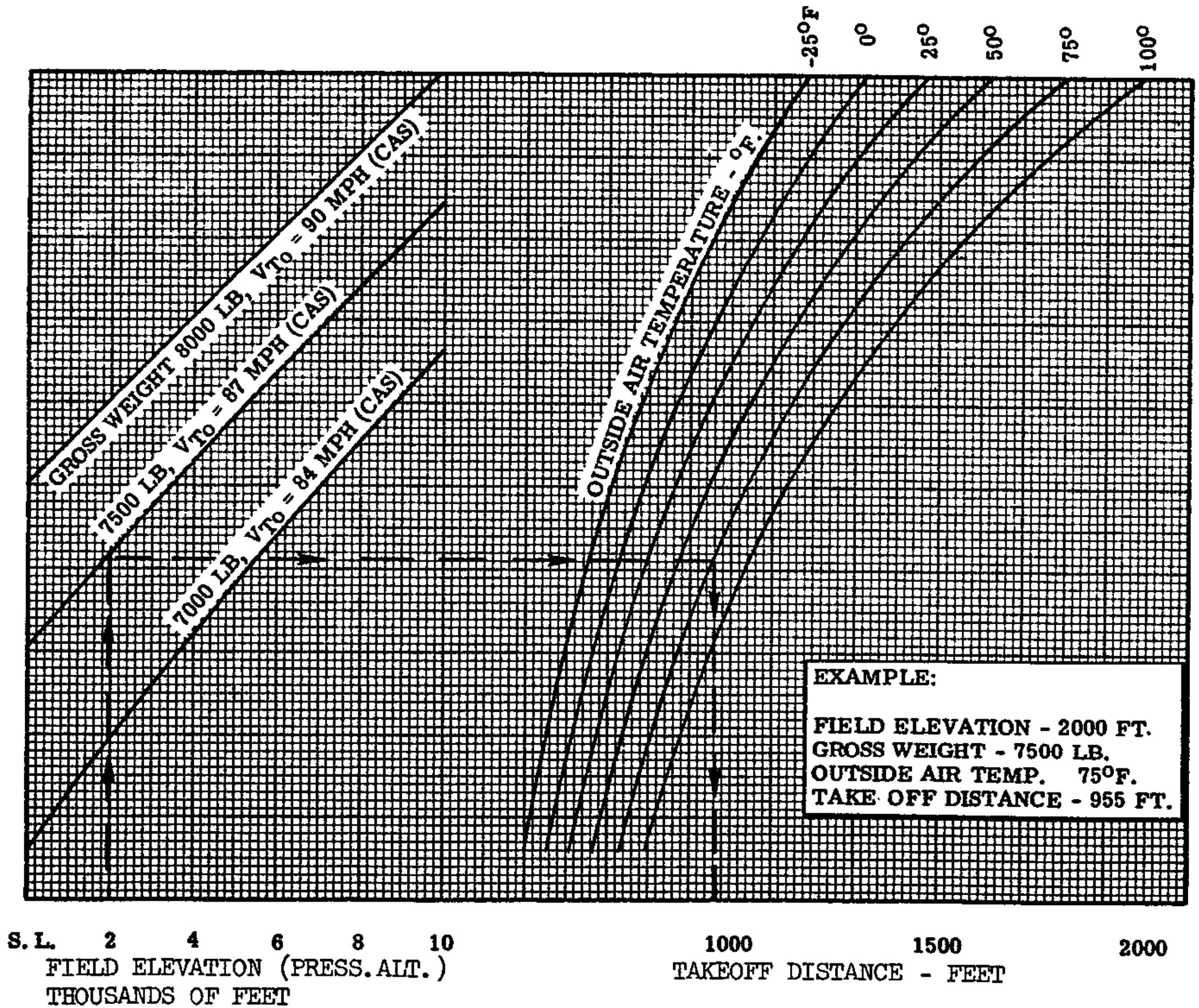


FIGURE 5.—*Short-field takeoff distances over 50-foot obstacle (20 m.p.h. headwind).*

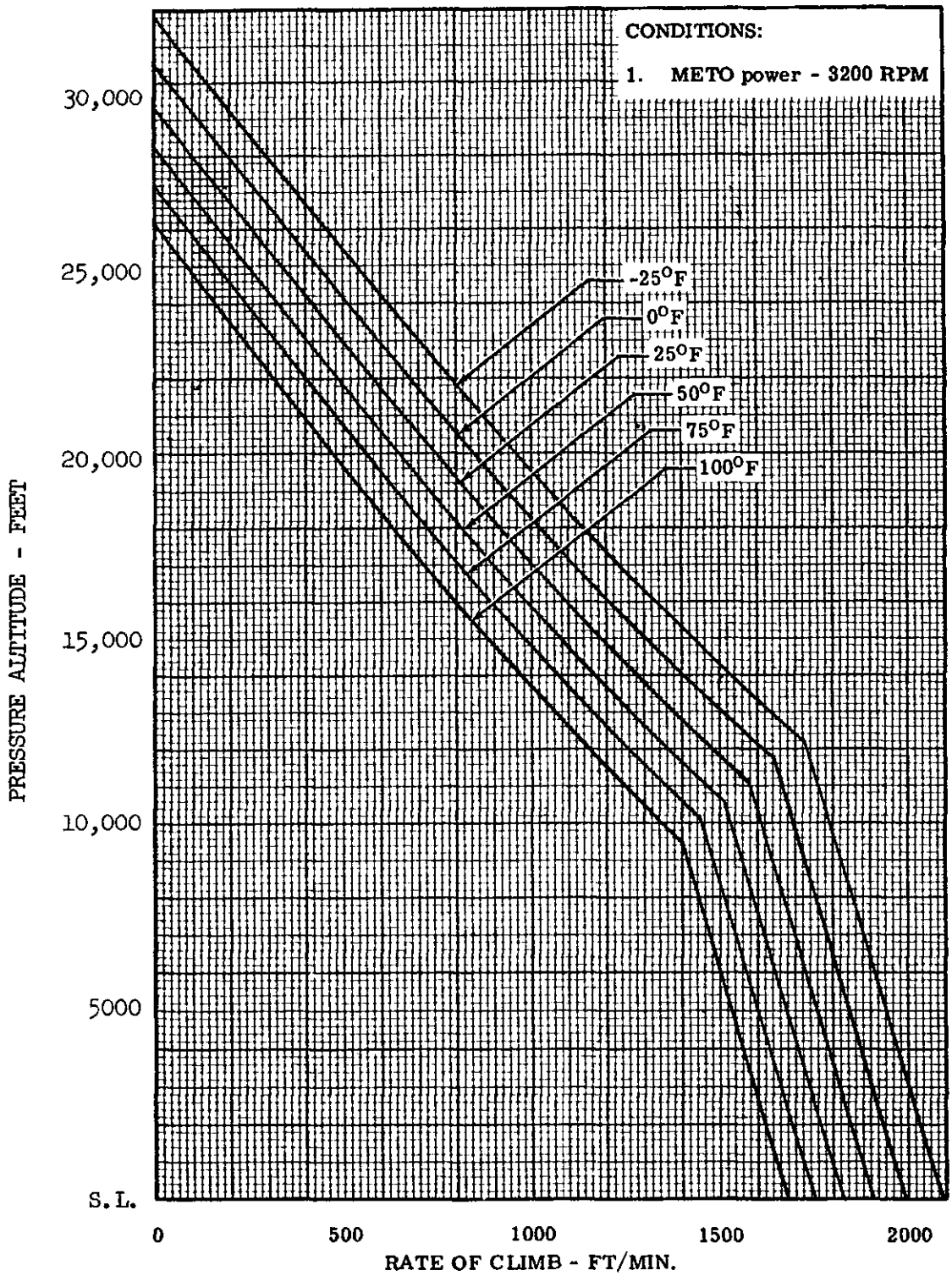


FIGURE 6.—*Rate of climb—7,000-pound gross weight.*

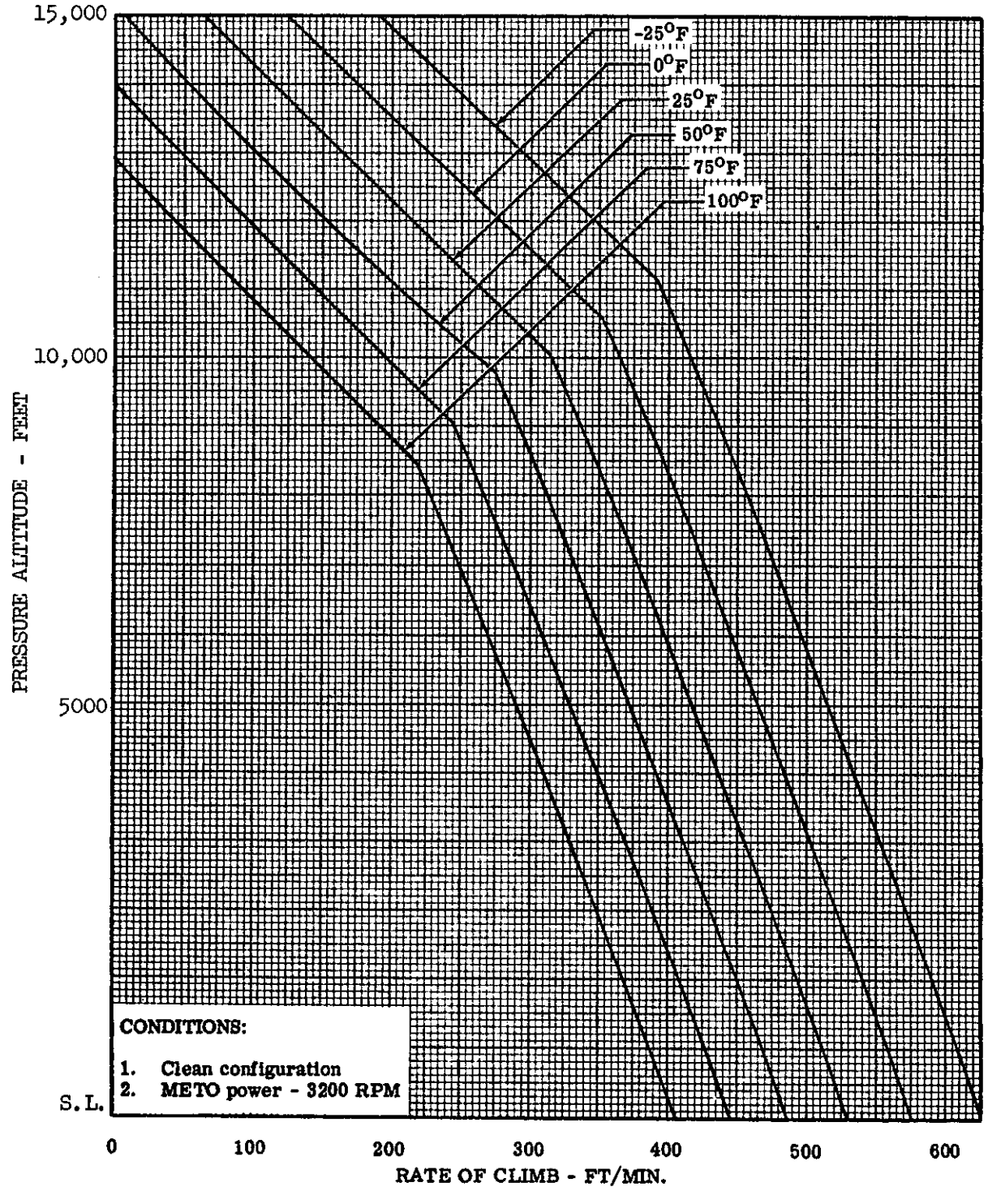


FIGURE 7.—*Single-engine rate of climb—7,000-pound gross weight.*

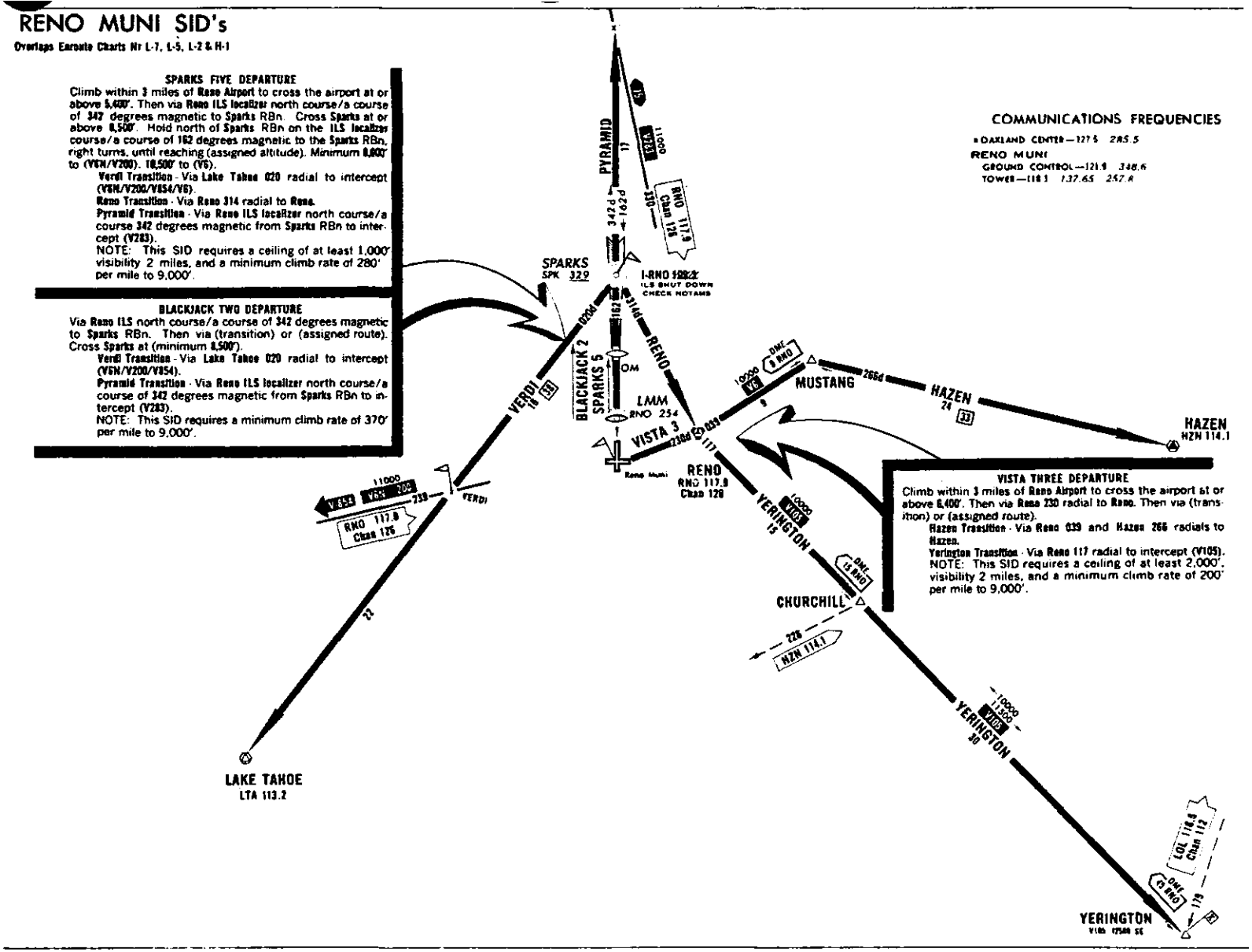


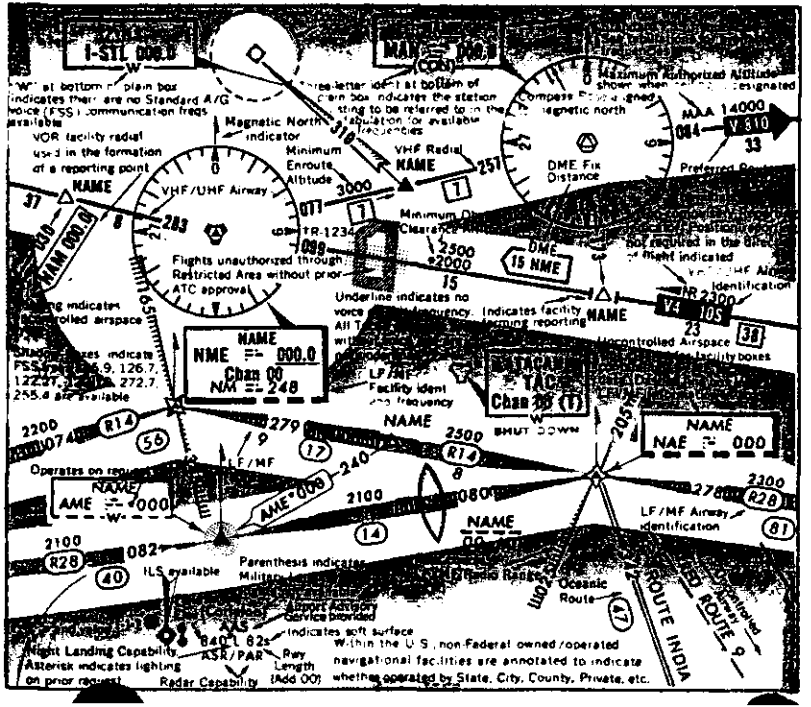
FIGURE 8.—*Reno Municipal SIDs.*

A/G VOICE (FSS) COMMUNICATIONS & AERODROME DATA

Enroute navigational facilities listed are those with voice capability, which do not monitor all standard A/G voice (FSS) communications frequencies. **Standard A/G voice (FSS) communications frequencies are:** 135.9 126.7 122.2T 122.1R *272.7 255.4* **and are indicated within the tabulation by a diamond ◆.** Emergency frequencies 121.5 and *243.0* are available at most facilities and are not tabulated. 3023.5R is available on request only at most facilities and is not tabulated. Frequencies not available are indicated by a cross-out—Example: ~~*272.7*~~. The three-letter ident shown in parenthesis after the name indicates the controlling facility. This three-letter ident is also shown in the bottom line of the controlled facility box on the chart, to provide association with the listing on the panel. The three-letter ident shown in parenthesis following a frequency, which is remoted (located) at that named controlled facility, identifies the controlling facility. When required for cross reference, three-letter idents are included alphabetically in the tabulation.

Aerodromes shown in blue have an approved civil or military instrument approach procedure published and/or a Federally operated tower. Aerodromes in brown are other selected aerodromes shown to meet special civil or military requirements. Civil aerodromes are listed under the location name; Air Force and Navy aerodromes alphabetically, and Army aerodromes by installation name. Aerodrome data consisting of the elevation, lighting, runway and radar information listed below is that omitted from the chart to improve legibility.
Aerodromes providing terminal control facilities with voice communications, consisting of the tower, approach control, departure control and ground control, are tabulated with the appropriate frequencies. Frequencies transmit and receive unless specified as: R - Receive only, T - Transmit only, X - On Request. Military frequencies are in italics. *Follows those tower frequencies also utilized for approach control. Emergency frequencies are indicated as: (V) - 121.5 (U) - *243.0* (E) - 121.5 & *243.0*. Ⓡ - Radar monitoring capability. Ⓐ - Aeronautical Phone Patch capability.
Chart panel location is indicated by letter to the right of date.
For additional communications and aerodrome data refer to appropriate supplemental publications.

FIGURE 9.—*A/G voice communications and aerodrome data.*



SACRAMENTO App and Dep Con from McClellan
Twr—119.5 126.2 122.5R *322.4 257.8* 260T (E)
Gnd Con—121.9

SAN FRANCISCO
SAN FRANCISCO INTNL
Ⓐ App Con—124.9 *317.6* (315°-134° Outbound) 119.3
338.2 (135°-314° Outbound) 111.2T 109.5T
Twr—120.5 126.2R* 122.7R *353.9* 348T (E)*
Gnd Con—*121.8* Ⓐ Dep Con—124.4 128.5 *307.2*

RENO (RNO) ~~*379.7*~~
App Con—119.2 117.9T *353.9* 254T
Twr—118.3 122.5R *137.65** *257.8* 278T (E)*
Gnd Con—121.9 *348.6*

AERODROMES
Land: Civil; Joint Military-Civil; Military; Heliport (H)
Sea
RADIO AIDS TO NAVIGATION
VHF OMNI RANGE (VOR)
TACAN
VORTAC
Terminal and Approach Facility (Shown in facility box)
LF/MF Range with simultaneous Voice Signal Capability (Solid tip in "N" Quadrant)
LF/MF Range without simultaneous Voice Signal Capability
Continuous line indicates "N" quadrant
Non-directional Radiobeacon or Marine Radiobeacon (LF/MF, UHF)
LOM or LMM Beacon
Consolan or Consol Station
Commercial Broadcast Station
Marker Beacons: Fan (FM), Bone (BM)
Off Airways
On Airways
Pilot to Forecaster Service (PFSV)
Weather Radar (WxR)
Combination WxR and PFSV
U.S. Weather Station with Voice Communication
Radar Beacon (Racon)

ALL BEARINGS AND RADIALS ARE MAGNETIC
ALL TIME IS GREENWICH MEAN TIME (GMT) EXCEPT AS NOTED

BLUE
YELLOW
BACK COURSE
ILS Localizer Course with ATC function
ILS Localizer Course without ATC function
OPERATIONAL NOTES
NOT COMM. SHUTDOWN
(Notes appear above or below facility box with affected freq or channel crosshatched)

AIRWAYS DATA
VHF/UHF — LF/MF
Compulsory Reporting Point (one or more directions)
Non-compulsory Reporting Point (all directions)
Mileage breakdown
Mileage between Compulsory Reporting Points and/or Facilities
Mileages between all reporting points and/or mileage breakdown points
Designates change in MEA and/or MOCA when other than facilities
Minimum Crossing Altitude (MCA)
Minimum Reception Altitude (MRA)
Mileage to Facility
VOR Changeover Points (Not shown at mid-point locations)
Mileage to Facility

AIRSPACE INFORMATION
Air Defense Identification Zone (ADIZ - CADIZ)
Air Route Traffic Control Center boundary (ARTCC)
Flight Information Region (FIR)
Oceanic Control Areas

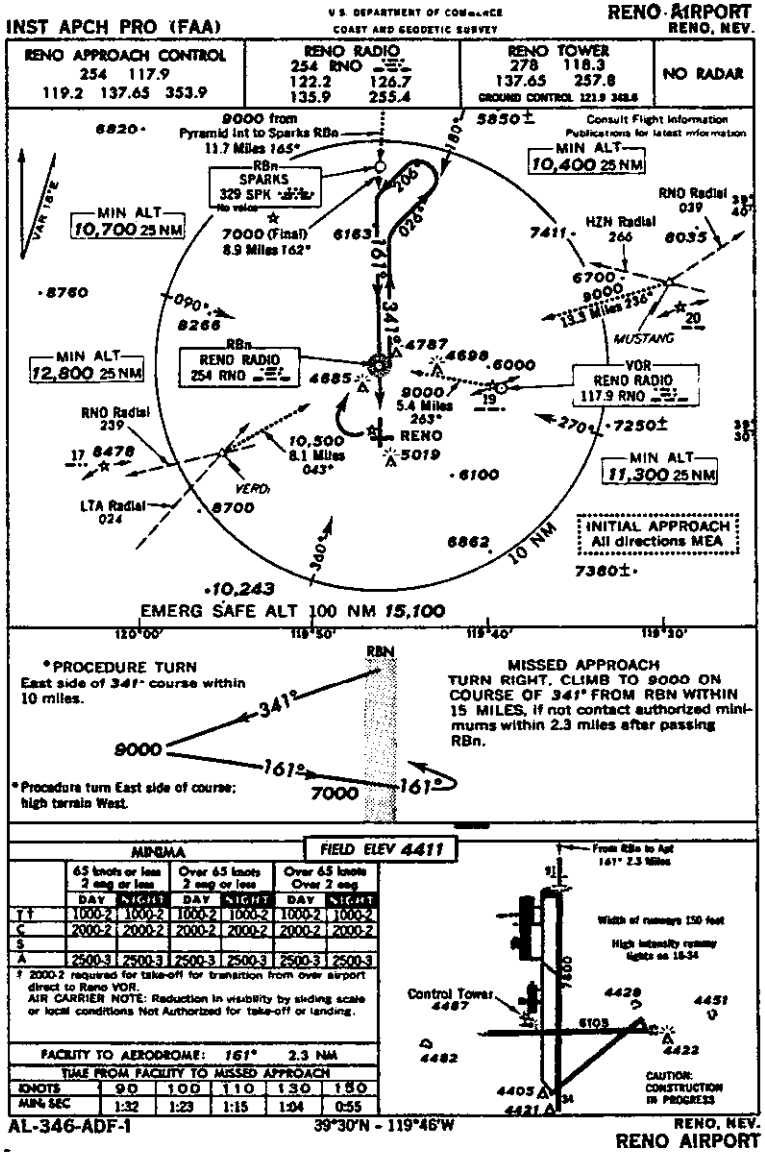
THE U.S. FEDERAL GOVERNMENT DISCLAIMS RESPONSIBILITY FOR NON-FEDERAL NAVIGATIONAL FACILITIES.

USAF Military Advisory Route
Unusable Airway Segment
Substitute Route Structure (Via or by-passing temporarily shutdown navigational aids)

NAVIGATION AND PROCEDURAL INFORMATION
Official Time Zone
International Boundary
Altimeter Setting Land Area Boundary
Boundary of Area Charts (Only the information required as in-flight data for transit through the area is depicted within this boundary.)

AIRSPACE RESERVATIONS
R 1234 W 1234 C 5 D 24 TO 10,000 McCHORD APPROACH CONTROL
C 16 Caution Area or Intensive Jet Training Area
† P 1234
Restricted Area
Warning Area
Danger Area (Canada)
Prohibited Area US

† Indicates information in tabulation "By NOTAM" indicates activation by NOTAM. Areas will include effective altitude when ceiling is less than 18,000 ft., or floor is above ground, operating time when other than continuous, and, controlling authority if it can be contacted by radio.
THE BASE OF THE CONTINENTAL CONTROL AREA IS 14,500 FT MSL EXCLUDING THE AIRSPACE LESS THAN 1,500 FT ABOVE THE TERRAIN AND CERTAIN PROHIBITED AND RESTRICTED AREAS.
ALL MILEAGES ARE NAUTICAL (EXCEPT AS NOTED)



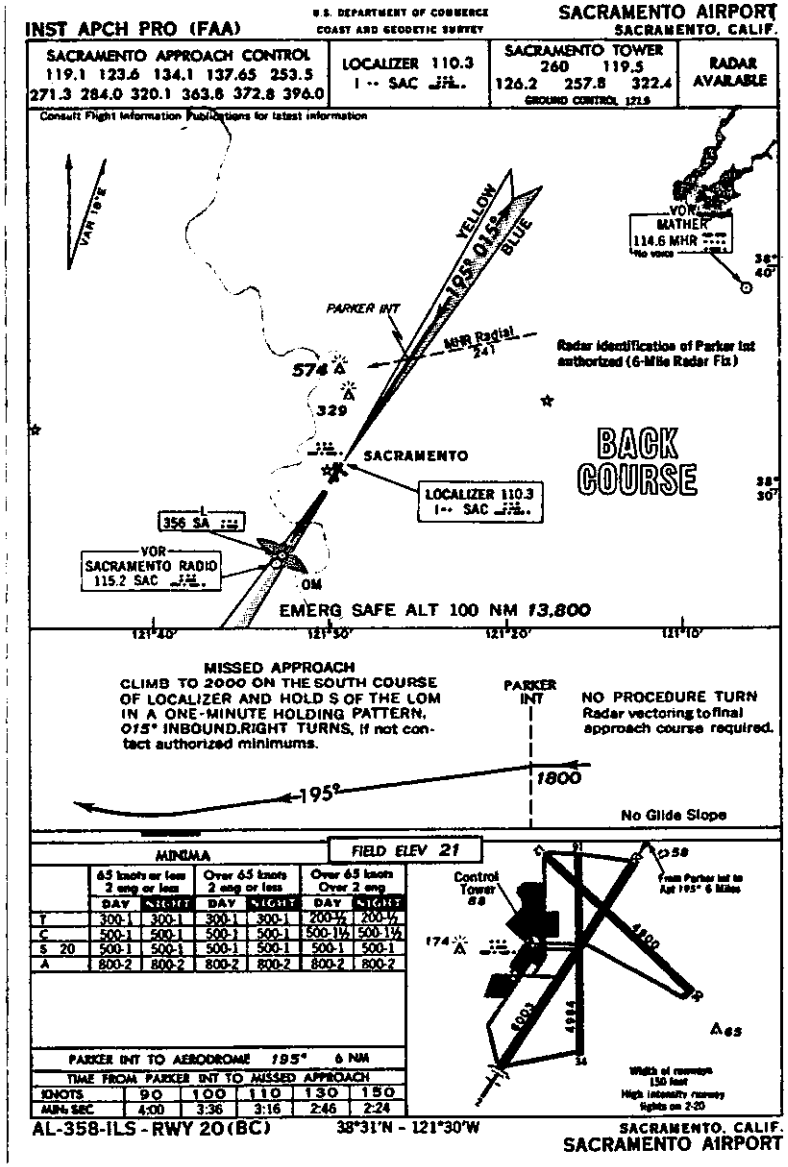
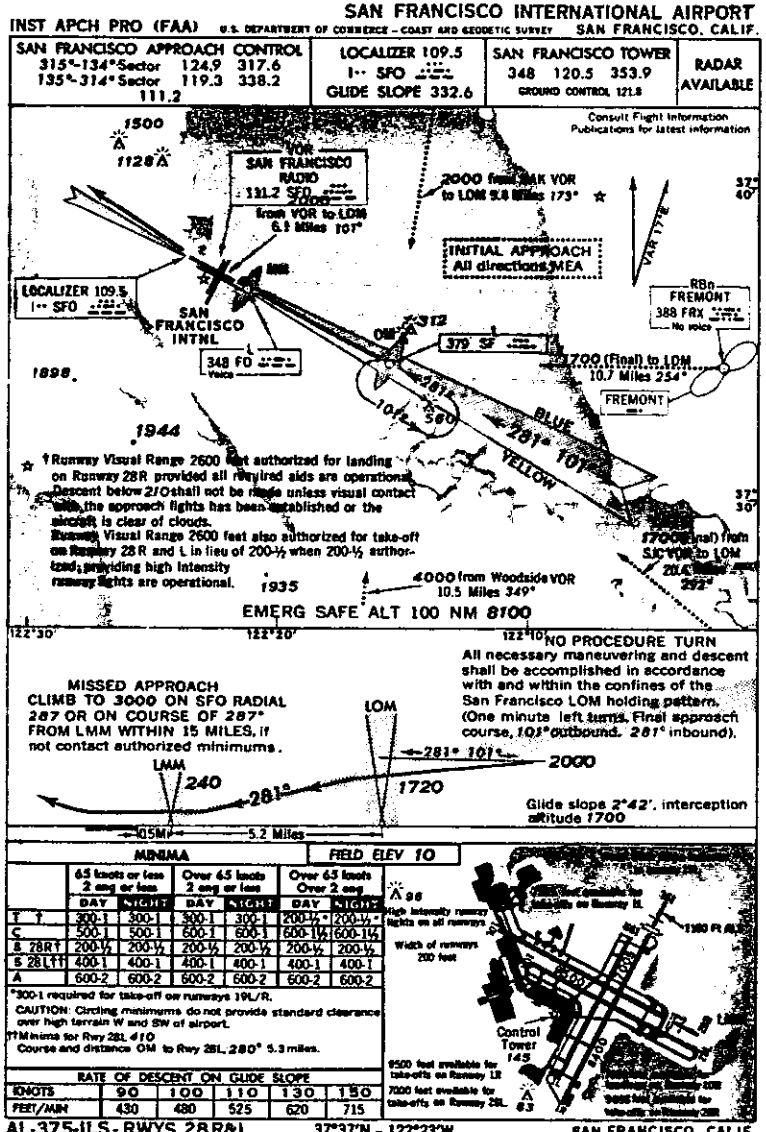


FIGURE 12.—*Instrument approach procedure charts.*



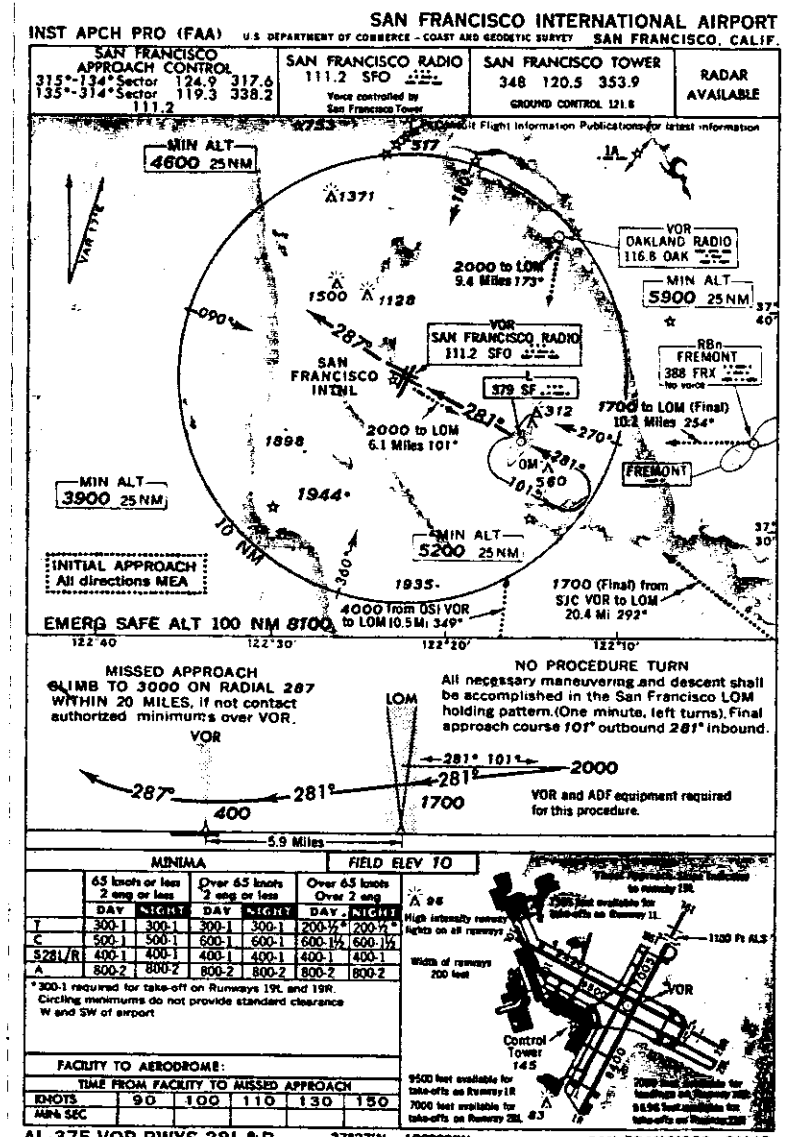


Figure 13.—*Instrument approach procedure charts—San Francisco.*

TERMINAL FORECAST

```
FT1 221645
17Z WED-05Z THU

SFO C15⊕7 2415. 1030P C18⊖ 2318G. 1300P 20⊖ 2418G
OCNLY C20⊖. 1700P WK FROPA 25⊖C14⊖⊖ 2920G. 2100P
25⊖80⊖C14⊖⊖ 3020G

RNO 14⊖⊖ 3015. 1200P 60⊖C14⊖⊖ 2820G. 1700P WK FROPA
C55⊖ 3025G. 2000P 50⊖C80⊖ 3318G FEW SW- VCNTY

SAC ○ 2115. 1300P 14⊖⊖ 2420G. 1800P WK FROPA 60⊖C12⊖⊖
2418. 0000P 45⊖C12⊖⊖ 3315. 0600P 45⊖C14⊖⊖ 3320G

OAK C15⊕8 2315. 1100P C18⊖ 2418G. 1300P 20⊖ 2418G
OCNLY C20⊖. 1700P WK FROPA 25⊖C14⊖⊖ 2918. 2200P
25⊖80⊖C14⊖⊖ 3015. 0800P 25⊖80⊖14⊖⊖ 3020G
```

WINDS ALOFT FORECAST

```
FD3 WBC 221755
18-24Z WED

LVI 3000 5000 FT 10000FT 15000FT 20000FT 25000FT

FAT 2418 2520+09 2730+03 2845-09 2760-16 2745-31
SFO 2520 2620+10 2625+05 2740-10 2760-17 3040-32
RNO              2640+01 2760-04 2950-14 2850-29
```

HOURLY SEQUENCE REPORTS

```
⌀34 SA342222⌀⌀
RBL 35⊖8⌀⊖3⌀ ⌀49/62/22/3⌀27G35/967/HVY CU OVR MTNS N AND SE
  →RBL ↘4/11
SAC /-⊖8 ⌀8⌀/67/46/2224G31/976/ACSL W FEW CU
RNO M7⌀⊖15⌀⊖35 ⌀⌀1/58/2⌀/2215+31/958BD ALQDS NOTAM FLWS SAC

035 SA352222⌀⌀
SFO M2⌀⊖/⊖15+ 135/56/45/2518G25/992→SFO ↘3/6
```

FIGURE 14.—*Terminal forecast*

AREA FORECAST

FA SFO 221845
11P-23P WED

NRN AND CNTRL CALIF CSTL WATERS WRN NEV

CLDS AND WX. WK COLD FRONT NEAR LAKEVIEW AND SWWD ACRS NRN CALIF WILL MOV TO NEAR AUSTIN-FRESNO LINE SWWD INTO PAC BY 23P. SFC LOW RPDLY DVLPG NERN NEV.

NRN CALIF ASL 50-70⊕-⊕ LYRS OVR MTNS NRN CALIF NEAR AND N OF FRONT AND SWD ALG SLOPES TO LAKE TAHOE AREA. WIDELY SCTD SNW OR RAIN CHGG TO SNW SHWRS NEAR AND N OF FRONT. CLDNS AND SHWRS SPRDG SWD OVR W SLOPES MOST OF SIERNEVS DURG AFTN AND EVE. A FEW SHWRS PRBL SACRAMENTO VLY IN AFTN AND EVE. ALSO A FEW SHRS CSTL SECS N OF SANTA ROSA MOSTLY NEAR FRONT. LWR ASL 10-20⊕-⊕ CST AND CSTL VLYS MOST OF NRN AND CNTRL CALIF BUT LCLY CLR MORE INLAND SECS CSTL VLYS AND BCMG OCNLY SCTD MOST CSTL VLYS ERY AFTN. CLDNS BCMG MOSTLY 20-30⊕ TO OCNLY BRKN CSTL SECS NRN CALIF LATE AFTN AND EVE AND LCLY N OF FRONT CNTRL CALIF CST BY 23P. HIR ASL 120-140⊕-⊕ LYRS DVLPG NRN CALIF AND SPRDG OVR MOST OF CNTRL CALIF AS ASL 140-160⊕-⊕ AFDK. SOME ASL 40-60⊕-⊕ IN SACRAMENTO VLY DURG AFTN MOSTLY IN SHWRS IN FOOTHILL AREAS. TOPS TO 230 MSL.

WRN NEV ASL 80-100⊕-⊕ WITH SCTD SNW SHWRS MTNS AND RAIN CHGG TO SNW SHWRS VLYS NEAR AND N OF FRONT NWRN NEV AREA SPRDG SWD OVR MTNS SWRN NEV DURG LATE AFTN AND EVE AS FRONT RCHS THOSE AREAS. HIR ASL 140-160⊕-⊕ LYRS NWRN NEV BCMG GEN SWRN NEV BY EVE. CLDNS BCMG OCNLY SCTD NWRN NEV VLYS A FEW HRS FLWG FROPA. TOPS TO 250 MSL. LCL BLWG DUST WRN NEV.

ICG. OCNL MDT ICG IN SHWRS ABV FRZG LVL. FRZG LVL 100 MSL CNTRL CALIF LWRG TO SFC-50 MSL NEAR OREG BRDR NEAR AND N OF FRONT.

TURBC. OCNL MDT TURBC OVR MTNS AND LCLY IN GUSTY W TO NW SFC WNDS NRN CALIF NWRN NEV SPRDG SWD OVR SWRN NEV SIERNEVS DURG AFTN AND EVE. PSBL BRF SVR TURBC IN STANDING WVS E SLOPES SPRDG SWD OVR CNTRL CALIF SWRN NEV BY 23P.

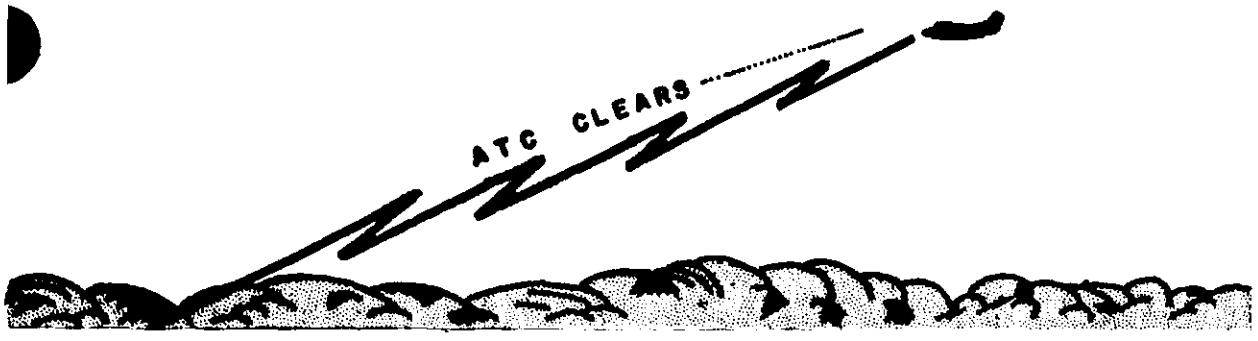
OTLK 23P WED-11P THU. SCTD SHWRS CONTG MTNS BUT CLDNS BCMG MOSTLY SCTD VLY SECS WRN NEV NRN AND CNTRL CALIF INCLG CSTL AREAS BY MRNG. SOME 40-60⊕-⊕ NEAR MTNS SAN JOAQUIN VLY AREA AFT MIDN.

FIGURE 15.—*Area forecast.*

FEDERAL AVIATION AGENCY

INSTRUMENT PILOT EXAM-O-GRAM * No. 6

VFR OPERATIONS on an INSTRUMENT FLIGHT PLAN



Analyses of answers to Instrument Pilot Written Examinations indicate that many applicants do not understand certain aspects of VFR and "VFR CONDITIONS ON TOP" operations while on IFR clearances. Applicants for the Instrument Rating should be able to answer the following questions relating to these operations. Answers and explanations follow.

* * * * * * * * * * * * * * * * * * *

1. Why request a "VFR CONDITIONS ON TOP" clearance?
2. When would a pilot request a clearance to "VFR CONDITIONS ON TOP"?
3. What restrictions apply to the pilot's choice of altitude while operating on an IFR clearance with provision to "MAINTAIN VFR CONDITIONS ON TOP"?
4. When can a "VFR CONDITIONS ON TOP" request be approved by ATC?
5. What separation from other aircraft is provided to a "VFR CONDITIONS ON TOP" flight?
6. What is the recommended position reporting procedure for "VFR CONDITIONS ON TOP" operation?
7. A pilot is flying on an IFR clearance, with an altitude assignment of "VFR CONDITIONS ON TOP". He anticipates that he will be unable to maintain flight in VFR conditions because of reduced visibility or increasing height of the tops. What should he do?
8. When may a pilot deviate from his route of flight while operating IFR with a "VFR CONDITIONS ON TOP" clearance?
9. Why would a pilot request a VFR climb or descent while on an IFR flight?
10. What are the procedures for radio communications failure during a "VFR CONDITIONS ON TOP" operation?

*Exam-O-Grams are non-directive in nature and are issued solely as an information service to individuals interested in Airman Written Examinations.

EXPLANATIONS (numbers correspond to questions):

1. In preparation for IFR flight above an overcast, or in an area of generally unlimited ceilings and visibility, pilots may request "VFR CONDITIONS ON TOP" to permit them to select an altitude, or altitudes of their choice, rather than specific ATC assigned altitudes. If during flight "in the clear" at a specific assigned altitude, turbulence or unfavorable ground speeds are encountered, or if icing in clouds ahead is expected, a "VFR CONDITIONS ON TOP" clearance may allow the pilot a greater choice of operating altitudes.

2. Departing instrument-rated pilots who wish an IFR clearance only to climb through a layer of overcast or reduced visibility, and then continue flight VFR, may request ATC clearance "TO VFR CONDITIONS ON TOP". - This request may be made through a Flight Service Station, by telephone to ATC, or by request to the Tower before taxiing out. The clearance, which authorizes IFR flight through the cloud layer, will contain a near-by clearance limit, routing, and a request to report reaching "VFR CONDITIONS ON TOP". When the pilot reaches "VFR CONDITIONS ON TOP" and desires to cancel the IFR portion of his flight, he should so state. This type of operation can be combined with a VFR Flight Plan to destination.

3. The pilot may fly at an altitude of his choice, provided the altitude is

   a. at or above the MEA, or MOCA if appropriate, and
   b. at least 1000 feet above the existing meteorological condition (cloud layer, smog, haze, etc.) if any, and
   c. at an altitude appropriate for the direction of flight (odd or even thousand, plus 500 feet) if operating at 3000 feet or more above the surface.

   Pilots should be especially alert for head-on traffic when climbing or descending on the airway centerline.

4. "VFR CONDITIONS ON TOP" may be approved by ATC when specifically requested by the pilot in flight provided pilot reports have not indicated that conditions are unsuitable.

4. (continued)

"VFR CONDITIONS ON TOP" may be approved by ATC when specifically requested by the pilot prior to departure, provided

a. pilot reports have not indicated that conditions are unsuitable, and
b. the pilot is advised of the height of the tops, or that height of tops is unreported, and
c. if height of the tops is unreported, alternate altitude provisions are included in the clearance.

EXCEPTIONS:

ATC will not approve "VFR CONDITIONS ON TOP" operations

a. to provide separation between aircraft holding at night, or
b. to aircraft operating in Positive Controlled Airspace.

5. No separation is provided. However, the pilot may expect to receive traffic information on known IFR traffic. Any time a pilot is flying "in the clear", whether at a specific assigned altitude or at an altitude assignment of "VFR CONDITIONS ON TOP", collision avoidance is the pilot's responsibility.

6. Regardless of the altitude being flown, pilots on IFR Flight Plans report those fixes designated as compulsory reporting points for all altitudes, and additional position reports as requested by ATC. A pilot operating on an IFR Flight Plan with an altitude assignment of "VFR CONDITIONS ON TOP" would report in the following manner:

SKYTWIN FOUR ONE ALPHA OVER OKLAHOMA CITY ONE EIGHT, VFR CONDITIONS ON TOP AT EIGHT THOUSAND FIVE HUNDRED, ESTIMATING SAYRE FOUR EIGHT, AMARILLO.

If position reports are made to a Flight Service Station for relay to the controlling facility (center or approach control), pilots should state that the flight is on an Instrument Flight Plan.

7. Pilots flying with a VFR restriction must not enter IFR weather conditions. In such situations, pilots must request a specific altitude assignment and maintain flight in VFR conditions until an appropriate amended clearance is obtained.

8. Remember that when flying on an IFR clearance with a VFR restriction, a pilot must comply with Instrument Flight Rules plus applicable Visual Flight Rules. A pilot operating "VFR CONDITIONS ON TOP" is expected to remain on the centerline of airways or routes described by his ATC clearance unless

   a. otherwise authorized by ATC, or
   b. maneuvering as necessary to clear the intended flight path, or
   c. the pilot exercises emergency authority.

9. If, at the start of an IFR flight, a pilot wishes to climb in VFR conditions, or if, while flying at a specific assigned altitude, he wishes to climb or descend in VFR conditions, he may request to do so (except in Positive Controlled Airspace). Sometimes such a procedure is considered a practical method of avoiding delay due to other traffic.

10. The procedures are the same as for operation at a specific assigned altitude. Pilot action in compliance with regulations is determined by existing weather conditions (VFR or IFR), as outlined in the Flight Information Manual.

References:

Airman's Information Manual, "Air Traffic Control Procedures."
FAR 91

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