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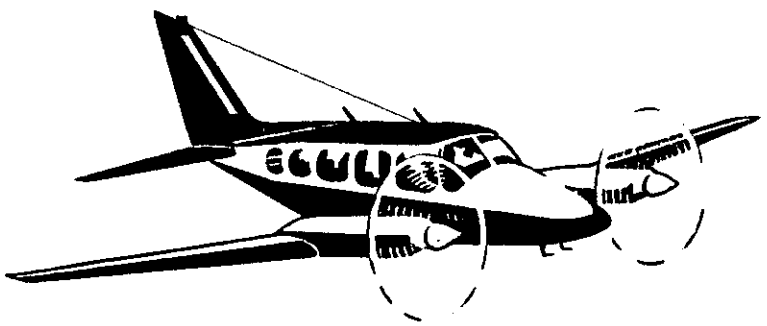
AC 61-8B

HQ-650

INSTRUMENT RATING
(AIRPLANE)

Written Test Guide



DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

INSTRUMENT RATING (Airplane) WRITTEN TEST GUIDE

Revised 1969

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DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

Preface

The *Instrument Rating (Airplane) Written Test 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 61-8A, *Instrument Pilot Written Test Guide*, dated 1966, and is issued as AC 61-8B.

Contents

Appendix

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 guide 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 Weather Bureau facility 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.

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 61-17A.

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.

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 *must* present the Form 8060–37 when he appears for retesting. The test may be retaken after 30 days, or sooner, upon presentation of a statement from an appropriately rated flight or ground instructor certifying that (a) the applicant has been given 5 hours additional instruction, and (b) he is now deemed competent to pass the test.

RECOMMENDED STUDY MATERIALS

The following list of publications and materials is provided for the benefit of people who wish to prepare for the written test. Textbooks and other reference materials are also available from many commercial publishers. It is the responsibility of each applicant to obtain study materials appropriate to his needs. References listed were available at the time this publication went to press.

Airman's Information Manual

This publication presents, in three Parts, information necessary for the planning and conduct of flights in the U.S. airway system. Besides providing frequently updated airport and navaid data, the *Airman's Information Manual* (AIM) includes instructional and procedural information, and is designed for use in the cockpit. Each part is available as a separate annual subscription at the prices shown below.

Part 1, *Basic Flight Manual and ATC Procedures.* (Issued quarterly. Catalog No. TD 4.12: pt. 1/.) $4.00

Part 2, *Airport Directory.* (Issued semiannually. Catalog No. TD 4.12: pt. 2/) $4.00

Part 3, *Operational Data and Notices to Airmen.* (Operational data issued every 28 days; Notices to Airmen issued every 14 days. Catalog No. TD 4.12: pt. 3/.) $20.00

Federal Aviation Regulations

Volume I (Part 1), *Definitions and Abbreviations.* (Catalog No. TD 4.6:1) $1.50

Part 61, *Certification: Pilots and Flight Instructors.* (Catalog No. TD 4.6:61) .. $1.25

Volume VI (Part 91), *General Operating and Flight Rules.* (Catalog No. TD 4.6:91) $5.50

Advisory Circulars

Aviation Weather, AC 00-6 ($4.00 Catalog No. FAA 5.8/2:W 37). Provides a background for understanding the meteorological principles important to aviation. This publication shows how weather conditions affect flying and how weather knowledge can be used for safer and more efficient flight.

Instrument Flying Handbook, AC 61-27A ($2.50 (Catalog No. TD 4.408: In 7/3). A basic text for instrument pilots. It deals, in logical sequence, with training considerations, aerodynamic factors, physiological factors, flight instruments and their use, air navigation aids, communications, the air traffic system, and flight planning.

Civil Use of U.S. Government Instrument Approach Procedure Charts, AC 90-1A (Free). Clarifies the symbols and abbreviations used on Instrument Approach Procedure Charts.

Exam-O-Gram

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).

Charts

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

Enroute Charts (35¢ each). These charts provide the necessary aeronautical information for enroute instrument navigation. They are available for low altitude or high altitude operations.

Area Charts (35¢ per set). These charts supplement the Enroute Charts by providing an enlargement of certain high density areas.

How to Obtain Study Materials

The study materials listed, except Exam-O-Grams, charts, and AC 90–1A, may be obtained by forwarding a request and check for money order to:

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

Advisory circular (AC 90–1A) is available free from:

Department of Transportation
Distribution Unit, TAD–484.3
Washington, D.C. 20590

Single copies of Exam-O-Grams may be obtained free and names may be added to the mailing list by writing to:

FAA Aeronautical Center
Operations Branch, AC–240
P.O. Box 25082
Oklahoma City, Oklahoma 73125

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

Environmental Science Service Administration
U.S. Coast and Geodetic Survey
Rockville, Maryland 20852

Domestic prices are given, but they are subject to change. For foreign delivery, check prices before ordering.

IMPORTANT NOTICE

The Federal Aviation Administration is reissuing the Federal Aviation Regulations (FAR) in a volume system to be sold on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The purchase of a FAR volume will establish your subscription service with the Superintendent of Documents for automatic receipt of changes to the volume as issued by FAA.

The volume structure is:

Volume	*FAR Part*
I	1
II	11, 13, 15, 21, 37, 39, 45, 47, 49, 183, 185, 187, 189
III	23, 25
IV	27, 29, 31, 33, 35
V	43, 145, 149
VI	91, 93, 99, 101, 103, 105
VII	121, 123, 127, 129
VIII	133, 135, 137
IX	61, 63, 65, 67, 141, 143, 147
X	151, 153, 155, 159, 165, 167
XI	71, 73, 75, 77, 95, 97, 157, 169, 171

As each volume is issued, an availability notification providing price and an order form will be issued and distributed by the Superintendent of Documents. However, until all FAR Parts are grouped in their respective volumes and the volumes are available for sale from the Superintendent of Documents, the present system of obtaining individual FAR Parts and revision service to them will remain in effect.

AERONAUTICAL KNOWLEDGE STUDY OUTLINE

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

Flight Planning and Aircraft Performance

A01. Estimated time enroute (ETE) or ETA
A02. Fuel requirements — pounds/gallons (FAR 91.23)
A03. Fuel — additional permissible/holding capability
A04. Airspeeds—IAS, CAS, EAS, TAS
A05. Groundspeed
A06. Wind or Drift correction angle
A07. Headings—true, magnetic, compass
A08. Load—maximum permissible
A09. Takeoff weight limitations
A10. Landing weight limitations
A11. Airport/Facility Directory and Legend (AIM)
A12. Notices to Airmen/Restrictions to Nav-Aids (AIM)
A13. Preferred routes (AIM)
A14. Flight Plan (FAR 91.83 and AIM)
A15. Density altitude—determination and use of
A16. Performance charts—use of
A17. C.G./weight—effect on performance and stability
A18. C.G.—determining moment/index units—distance from datum—determining if within limits
A19. Off course and return to course computation

Aviation Weather and Preflight Weather Briefing (Aviation Weather—AC 00-6)

B01. Wind—pressure gradient, general circulation, surface friction, etc.
B02. Air masses—general characteristics
B03. Pressure systems and associated weather
B04. Cloud types and characteristics
B05. Frontal systems and associated weather
B06. Stability
B07. Icing—types, effects, conditions for formation, prevention and disposal
B08. Freezing rain
B09. Frost
B10. Fog
B11. Factors affecting visibility
B12. Turbulence
B13. Flight through turbulence
B14. Thunderstorms — characteristics, avoidance, etc.
B15. In-flight weather information (also AIM)
B16. Interpretation—SA, FA, FT, FD
B17. Interpretation of Charts—Surface Analysis, Weather Depiction, Significant Weather Prog., Radar Summary, Constant Pressure Analysis, Observed Stability & Freezing Level, Winds Aloft Observations, 12-hour Upper Wind Prog.
B18. PIREPS

Interpretation and Use of Flight Instruments (Instrument Flying Handbook, AC 61-27A)

C01. Effect of Alternate Static Pressure Source on flight instruments

AIRSPEED INDICATOR—
C02. Limitation markings
C03. Errors due to aircraft configuration—attitude
C04. Relationships between IAS, CAS, EAS, and TAS
C05. Mach number

ALTIMETER—
C06. Altimeter setting
C07. Altitude terms—density, pressure, indicated, absolute, true
C08. Effects of changes in temperature and pressure
C09. Errors—failure to reset, mechanical

C10. Altimeter indications

MAGNETIC COMPASS—

C11. Proper use of magnetic compass

C12. Error—acceleration, bank, deviation

DIRECTIONAL INDICATOR—

C13. Limits

C14. Operating characteristics/types

C15. Setting by use of magnetic compass

ATTITUDE INDICATOR—

C16. Limits

C17. Operating characteristics/types

TURN INDICATORS—

C18. Interpretation

C19. Angle of bank—rate of turn/radius of turn

C20. TAS—rate of turn/radius of turn

C21. Calibration

VERTICLE SPEED INDICATOR—

C22. Calibration

C23. Characteristics and use

ATTITUDE FLYING—

C24. Interpreting attitude/performance from instruments

Air Navigation

Facilities (AIM Part I)

D01. Radio Beacons/Locators

D02. ILS

D03. RADAR

D04. Lighting systems

D05. VOR/VORTAC

CHART INTERPRETATION—

D06. Enroute Low/High Altitude — terms, symbols

D07. Low Altitude Area

D08. Standard Instrument Departures (SID)

D09. Approach and Landing (A/L)

D10. STARS

PROCEDURES—

D11. ADF—Orientation, tracking, time/distance

D12. VOR—Orientation, tracking, time/distance

D13. Contact and visual approaches

D14. ILS (AIM)

D15. RADAR—vectors, transitions, handoffs, traffic information (AIM)

D16. RADAR—transponder (AIM)

D17. RADAR—approaches (AIM)

D18. VASI—approaches (AIM)

D19. Speed adjustments (AIM)

D20. Emergencies (AIM)

D21. Determination of wind while in flight

D22. DME (AIM)

D23. Determining rate of climb to meet clearance

Regulations

FAR 91

E01. Responsibility and authority of the pilot-in-command (91.3)

E02. Preflight action (91.5)

E03. Portable electronic devices (91.19)

E04. Flight instructions: Simulated instrument flight (91.21)

E05. Fuel requirements for flight in IFR conditions (91.23)

E06. VOR equipment check for IFR operations (91.25)

E07. Required Certificates and Limitations (61.27–91.31)

E08. Instrument and equipment requirements (91.33)

E09. Aircraft speed (91.70)

E10. Compliance with ATC clearances and instructions (91.75)

E11. Altimeter settings (91.81)

E12. Flight plan: Alternate requirements (91.83)

E13. Positive control areas and route segments (91.97)

E14. Jet advisory areas (91.99)

E15. Basic VFR weather minimums (91.105)

E16. ATC clearance and flight plan required (91.115)

E17. Takeoff and landing under IFR: General (91.116)

E18. Limitations on use of instrument approach procedures (91.117)

E19. Minimum altitudes for IFR operations (91.119)

E20. IFR cruising altitude for flight level (91.121)

E21. Course to be flown (91.123)

E22. IFR, radio communications — reports (91.125 and 91.129)

E23. IFR operations; two-way radio communications failure (91.127)

E24. Inspections (91.169)

E25. Altimeter system tests and inspections (91.170)

FAR 61

E26. Ratings/certificates (61.3, 61.35, and 61.43)
E27. Pilot log (61.39)
E28. Recency of experience (61.47)
E29. Change of address (61.51)

ATC Procedures and Other Items (AIM & Instrument Flying Handbook)

F01. Aeronautical terms (glossary)
F02. Clearances—delivery, taxi, takeoff, enroute and amended
F03. Communications—departure, enroute, and arrival
F04. Radio telephone phraseology and techniques.
F05. Holding
F06. Climb/descents
F07. Detouring thunderstorms
F08. Emergencies
F09. Medical Facts
F10. VFR operations on IFR flight plan
F11. Services of FSS—Airport without tower
F12. SIDS
F13. SCATANA
F14. ADIZ
F15. ATIS
F16. Wake turbulence
F17. Physiological factors
F18. Aerodynamic factors

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 Kansas City Municipal Airport, Kansas City, Missouri, to Lambert-St. Louis Airport, St. Louis, Missouri, to be made on the morning of February 7. You will be flying a single-engine aircraft owned by your company and two members of the firm will accompany you. A partially completed flight plan is shown below.

NOTE: The sample 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.

FEDERAL AVIATION AGENCY

FLIGHT PLAN

Form Approved.
Budget Bureau No. 04-R072.3

1. TYPE OF FLIGHT PLAN				2. AIRCRAFT IDENTIFICATION
	PVFR		VFR	
XX	IFR		DVFR	2426B

3. AIRCRAFT TYPE/SPECIAL EQUIPMENT 1/	4. TRUE AIRSPEED	5. POINT OF DEPARTURE	6. DEPARTURE TIME		7. INITIAL CRUISING ALTITUDE
			PROPOSED (Z)	ACTUAL (Z)	
Bon Air/D	KNOTS	MKC	1600		5000

8. ROUTE OF FLIGHT

MKC V-4 STL

9. DESTINATION (Name of airport and city)	10. REMARKS
Lambert-St. Louis Airport	

11. ESTIMATED TIME EN ROUTE		12. FUEL ON BOARD		13. ALTERNATE AIRPORT(S)	14. PILOT'S NAME
HOURS	MINUTES	HOURS	MINUTES	Rolla National, Vichy, Missouri	Your Name

15. PILOT'S ADDRESS AND TELEPHONE NO. OR AIRCRAFT HOME BASE	16. NO. OF PERSONS ABOARD	17. COLOR OF AIRCRAFT	18. FLIGHT WATCH STATIONS
	3	Red and White	

CLOSE FLIGHT PLAN UPON ARRIVAL

1/ SPECIAL EQUIPMENT SUFFIX
A—DME & 4096 Code Transponder
B—DME & 64 Code Transponder
D—DME
L—DME & transponder—no code
T—64 Code Transponder
U—4096 Code Transponder
X—Transponder—no code

FAA Form 7233—1 (4-66) FORMERLY FAA 398

0052-027-8000

The first test items in the sample test require calculations of estimated time enroute (ETE) and fuel requirements. Complete the preflight calculations by reference to the following Appendix materials:

Flight Time Analysis (remove Figure 1)
Aircraft specifications
Winds aloft forecast
Charts: Kansas City Area Chart
En Route Low Altitude Chart L-21.

NOTE: The time and distance from Kansas City Municipal to Kansas City VORTAC is entered on the Flight Time Analysis. Compute ETE and fuel requirements to the VORTAC at destination and alternate; include time for approaches as shown and use cruise fuel consumption for your missed approach at Lambert-St. Louis.

1. The estimated time enroute from takeoff to the completion of your approach at Lambert-St. Louis Municipal is nearest to—

1—1 hour, 15 minutes.
2—2 hours, no minutes.
3—1 hour, 23 minutes.
4—2 hour, 43 minutes.

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

1—172 pounds.
2—128 pounds.
3—228 pounds.
4—184 pounds.

3. Compass heading for the leg from HLV to STL is calculated to be—

1—096°.
2—075°.
3—091°.
4—102°.

4. With load as specified below, and assuming average fuel consumption of 12.5 gallons per hour, how long could you hold at STL for weather improvement before proceeding to your alternate?

	LBS.
Empty weight (4 gals. unusable fuel included)	1,776
Oil	22
Pilot and passenger	350
Rear seat passenger	200
Baggage	132
Fuel—to max. gross wt.—	?
	2,900 MGW

1—2 hours, 55 minutes.
2—2 hours, 34 minutes.
3—1 hour, 50 minutes.
4—1 hour, 21 minutes.

5. The example of loading specified below is unlikely, but such a situation is possible and is used for the purpose of illustration. Determine the actual C.G. location (arm, or inches aft of datum) and by reference to the loading envelope in figure 4, determine whether or not the C.G. location is within limits.

	WEIGHT	*ARM*	*MOMENT*
Empty weight	1,776	83.6	148,474
Oil	22	28.0	616
Fuel—30 gal. (inboards)	180	90.0	16,200
Fuel—30 gal. (outboards)	180	95.0	17,100
Pilot	150	84.8	?
Passengers—2 (rear seats)	392	120.5	?
Baggage	200	142.0	28,400
	2,900		?

1—92.5 and out of limits.
2—92.5 and within limits.
3—93.4 and out of limits.
4—93.4 and within limits.

6. The stability and performance characteristics of an airplane will vary with load distribution which is important during instrument flight. Which of the following statements concerning the effects of load distribution is correct?

1—Loading toward the forward C.G. limit will improve performance (rate of climb and airspeed).
2—Loading toward the rearward C.G. limit will increase the wing loading.
3—Loading toward the rearward C.G. limit will improve stall characteristics.
4—Loading toward the forward C.G. limit will increase the stall speed.

7. Read the example for takeoff ground run distance required, figure 2, before answering this item. What is the takeoff ground run distance required for your departure from Kansas City Municipal Airport under the following conditions?

Gross weight	2,900 pounds
Temperature	43°F.
Pressure altitude	800 feet
Headwind	6 knots

1— 600 feet.
2—1,000 feet.
3— 900 feet.
4—1,300 feet.

8. Rate of climb capability could become an important factor in case of a climb restriction in your ATC clearance. By reference to the per-

formance charts in figure 3, you can determine that your average rate of climb and best rate of climb speed will be approximately (assume maximum gross weight—gear and flaps retracted—Standard Altitude 2,000 feet)—

1—1,100 fpm at 106 knots.
2—1,000 fpm at 110 knots.
3—1,380 fpm at 94 knots.
4— 850 fpm at 75 knots.

9. Prior to making this flight, you must have acquired, in the last 6 months, total instrument time of at least—

1—6 hours, not more than 3 hours of which may have been in an approved synthetic instrument trainer.
2—2 hours, all of which must have been in an aircraft.
3—6 hours, all of which may have been in an approved synthetic instrument trainer.
4—6 hours, not less than 3 hours of which must have been in an aircraft of the type and model being used for this flight.

10. Unless aircraft and equipment are maintained under an approved continuous maintenance and inspection program, regulations require that VOR receiver accuracy checks be made within the preceding—

1—10 hours of flight or within 10 days before flight.
2—10 days.
3—10 hours of flight and within 10 days before flight.
4—10 flight hours only.

11. From the list below, select the discrepancies that must be corrected prior to takeoff on an instrument flight.

A. Clock sweep second hand is inoperative.
B. DME is inoperative.
C. Vertical speed indicator indicates 250 feet per minute rate of descent.
D. Generator is charging below minimum limit.

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

12. For an IFR flight from an airport located *outside* controlled airspace, a flight plan must be filed and an ATC clearance obtained prior to—

1—takeoff.
2—takeoff if weather is below VFR minimums.
3—entering IFR weather conditions.
4—entering controlled airspace.

13. Which of the following statements regarding the NOTAMs (figure 12) is correct?

1—All information in the NOTAM section is temporary in nature.
2—Underlining indicates new or revised information.
3—Rolla National Airport: Runway 13–31 is closed until further notice.
4—The REIL for runway 36 at Kansas City Municpal Airport are operative.

14. Which of the following statements concerning "Restrictions to Enroute Navigation Aids" (figure 12) is true?

1—One of the enroute navigation aids required for your flight is affected by a restriction.
2—The restrictions are published in the *Airman's Information Manual* one time only.
3—The restrictions are due to inadequate or unreliable azimuth information.
4—Restrictions to Enroute Navigation Aids apply only to VHF facilities (VOR/VORTAC).

15. From the Lambert-St. Louis Airport listing in the Airport/Facility Directory (figure 11), determine which of the following statements are correct.

A. Runway 6-24 is the longest at 7,600 feet.
B. Runway Visual Range (RVR) is provided for runway 24.
C. Pre-taxi clearance delivery frequency is 119.5.
D. The Minimum Descent Altitude (MDA) for an ASR approach to runway 24 is 1,071 feet.
E. A-gear is available for runways 12L–30R.

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

* * * * *

Your weather briefing is accomplished by a visit to the Flight Service Station at 0830 CST. The following test items are based on some of the weather charts, reports, and forecasts which would normally be reviewed and discussed during this briefing.

* * * * *

16. Which of the following statements are true of Weather Depiction Charts?

A. The information from which the chart is made is approximately 1½ hours old when the chart reaches the weather station.

B. Solid contour lines enclose areas of ceilings below 1,000 feet and/or visibilities below 3 miles.

C. Areas where instrument surface weather conditions exist can be easily identified.

D. Scalloped lines enclose areas of ceilings 1,000 to 5,000 feet and visibilities 3 miles or greater.

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

17. Which of the statements below correctly describe a portion of the weather "picture" shown on the 1300Z Weather Depiction Chart (figure 14)?

1—An area of low, thin stratus cloudiness extends from the Dakotas southeastward through Arkansas.
2—Ceilings along the route from MKC to STL are above 1,000 feet and visibilities are 3 miles or more.
3—Skies in northeastern Iowa, northeastern Illinois, and most of Indiana, are overcast with ceilings above 5,000 feet.
4—Skies in eastern Kansas and western Missouri are mostly overcast with ceilings above 1,000 feet and visibilities 3 miles or greater in rain showers.

18. Based on the Radar Summary Chart, figure 18, which statement is correct?

1—The area movement in southern Missouri and in Arkansas is in an easterly direction.
2—The area east of Kansas City has heavy snow showers.
3—East central Oklahoma is in an area of decreasing rain showers.
4—The cell movement in northern Missouri is at the rate of 30 mph.

19. From the 1500Z hourly aviation weather report for STL (figure 15), you can determine that—

1—the reported ceiling is 2,500 feet MSL.
2—surface wind is reported from the NNE at 10 mph.
3—the visibility is 2½ miles in fog and smoke.
4—the second layer of clouds is solid.

20. Comparison of the 1400Z and 1500Z hourly aviation weather reports for STL (figure 15), indicates that the—

1—temperature/dewpoint spread has decreased.
2—barometric pressure has risen.
3—ceiling has lifted.
4—visibility has decreased.

21. Comparison of the 1400Z and 1500Z hourly aviation weather reports (figure 15) for VIH indicates that—

1—there is no change in the wind direction and velocity.
2—the ceiling has lowered in the last hour.
3—visibility has increased.
4—the spread in temperature and dewpoint has increased from 1° to 3°.

22. Review of the terminal forecast for Lambert-St. Louis (figure 16) indicates that—

1—light rain showers are likely.
2—occasional light drizzle may be expected after 2000 CST.
3—occasional light rain showers are forecast.
4—the ceiling is forecast to be 2,000 feet.

23. Which statement regarding the AIRMET in figure 17 is true?

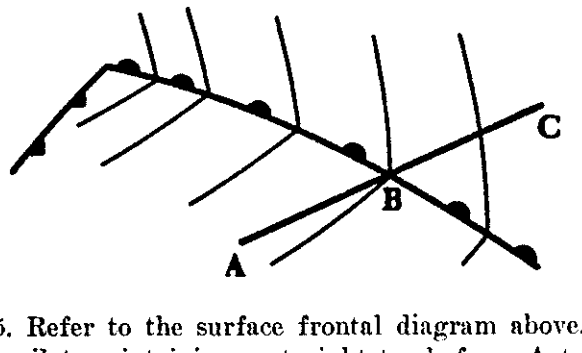
1—AIRMET advisories include weather phenomena potentially hazardous to *all* aircraft.
2—Ceilings in north and central Missouri will be above 1,000 feet.
3—Visibilities frequently less than 1 mile are expected.
4—Occasional moderate icing in clouds and in precipitation below 5,000 feet is expected in northwestern Missouri.

24. Which of the following statements are true regarding fronts?

A. They are found in troughs of low pressure.
B. They form only between air masses of different temperature and/or moisture content.
C. Fronts always slope over the colder air.
D. Fronts always produce hazarding flying weather.

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

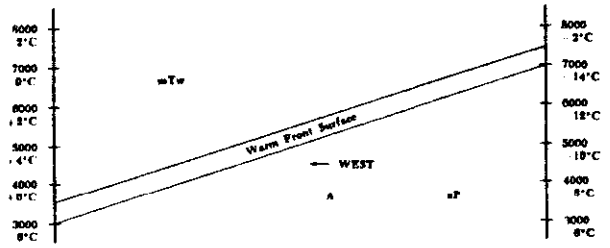
* * * * *



25. Refer to the surface frontal diagram above. A pilot maintaining a straight track from A to C at approximately 3,000 feet above the surface would expect to correct heading to the—

1—right after noting a rise in OAT (outside air temperature) at point B.
2—right after noting a drop in OAT between points B and C.
3—left after noting a rise in OAT between points B and C.
4—right after noting a drop in OAT between points A and B.

26. Assume that you are flying westbound in the cold air mass depicted in the following illustration and encounter freezing rain at position "A." Select from the procedures listed below the ones that would reduce structural ice accumulation to a minimum.



A. Descend to a lower altitude.
B. Remain at the same altitude and reduce airspeed.
C. Remain at the same altitude and increase airspeed.
D. Climb into the warm air.
E. Fly a heading that will allow you to penetrate the front at a right angle.

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

27. Which of the following are necessary for the development of a thunderstorm?

A. Stable air.
B. Unstable air.
C. High moisture content.
D. A lifting force.
E. A front.

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

28. Which of the terms describes the flow of air in a low-pressure system?

1—Diverging and ascending.
2—Converging and descending.
3—Diverging and descending.
4—Converging and ascending.

29. The terms used to report the "degree" of turbulence should be known by, and mean the same to, all pilots. To the list of terms below (A, B, C, and D), match the corresponding appraisal of the "degree" of turbulence (E, F, G, and H).

A. Light.
B. Moderate.
C. Severe.
D. Extreme.
E. Aircraft is violently tossed about.
F. Unsecured objects move about.
G. Loose objects remain at rest.
H. Unsecured objects are tossed about.

1—A-F; B-H.
2—B-F; C-E.
3—C-H; D-E.
4—D-H; A-G.

30. Which statement regarding hypoxia (insufficient oxygen in the blood) is true?

1—Effects are easily recognizable.

2—Occurrence readily impairs night vision.

3—Effects can be accurately predicted.

4—Occurs in the same degree to smokers and nonsmokers.

31. If you were to make this flight with a "VFR CONDITIONS ON TOP" clearance, at an altitude of 15,500 feet MSL, which of the following requirements would apply?

A. Minimum flight visibility of 3 miles.

B. Use of a 29.92 altimeter setting.

C. Minimum horizontal cloud clearance of 1 mile.

D. Minimum flight visibility of 5 miles.

E. Compliance with both visual and instrument flight rules.

1—A, B, and C.

2—B, C, and D.

3—C, D, and E.

4—B, C, D, and E.

32. For all IFR flights along Victor airways, you are required to—

1—monitor the voice feature of the VOR being used for navigation.

2—designate, in your flight plan, all VORs along your proposed route of flight.

3—fly the airway centerline except to avoid other aircraft or when otherwise authorized by ATC.

4—designate, in your flight plan, all proposed altitude changes enroute.

33. The Minimum Enroute Altitude (MEA) between Hallsville VORTAC and St. Paul Intersection (figure 6) is 2,700 feet. Which statement correctly defines the MEA?

1—Provides enroute obstruction clearance and assures navigational signal reception within 50 miles of a VOR.

2—Assures adequate signals to determine specific VOR fixes.

3—Provides enroute obstruction clearance for IFR flight.

4—Assures adequate navigational signal coverage and obstruction clearance between airway radio fixes.

34. When departing IFR from an airport for which Standard Instrument Departures (SIDs) have been published, which statement applies?

1—Pilots are required to request the appropriate SID.

2—A SID is an air traffic coded departure routing which has been established for all airports.

3—Pilots of other than military or air carrier aircraft will not be issued a SID clearance by ATC unless requested by the pilot.

4—SIDs are used for complex departure routes only.

35. If communications cannot be established on a newly assigned frequency, the pilot is expected to follow prescribed steps to re-establish communications. From the list below, select the correct order of procedures.

A. Contact the appropriate center or FSS frequency as shown on the chart.

B. Re-contact the transferring controllers.

C. Contact any facility on 121.5.

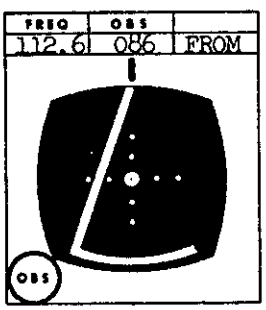
1—B, A, and C.

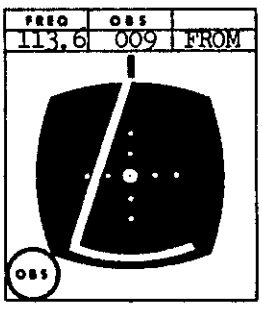
2—A, B, and C.

3—B, C, and A.

4—A and C only.

36. After departing Kansas City eastbound on V-4, your No. 1 receiver tuned to Kansas City "MKC" and your No. 2 receiver tuned to Blue Springs "BSP," have the indications shown below. (See figure 5.)





From these indications you should know that you are to the—

1—left of course and beyond Fleming Intersection.

2—right of course and approaching Fleming Intersection.

3—left of course and approaching Fleming Intersection.

4—right of course and beyond Fleming Intersection.

37. Regulations specify that no alternate is required if the destination airport is forecast to have a ceiling of—

1—1,000 feet above the lowest MEA, MOCA, or the altitude prescribed for the initial approach segment.

2—1,000 feet above alternate minimum altitude.

3—1,500 feet above circling minimum altitude.

4—1,000 feet above straight-in minimum altitude.

* * * * *

While under radar control, you receive the following traffic information:

BON AIR 2426 BRAVO—TRAFFIC TWO O'CLOCK—6 MILES—NORTHBOUND.

* * * * *

38. From this traffic advisory, you can determine that—

1—the traffic is located 60° right of the nose of your aircraft and at your altitude.

2—the advisory pertains to an IFR flight receiving radar service.

3—the advisory was issued because this flight is at or near your altitude.

4—ATC has no information on the altitude of this aircraft.

39. Which statement regarding the Hallsville "HLC" VORTAC (figure 6) is true?

1—Range is not provided to DME equipped aircraft.

2—Kirksville is the controlling FSS for Hallsville.

3—The best frequency to use in the immediate vicinity of Hallsville is 122.2.

4—Voice is not transmitted on the Hallsville VORTAC frequency of 115.4.

40. The altitude marked with an asterisk, between HLV and STL—

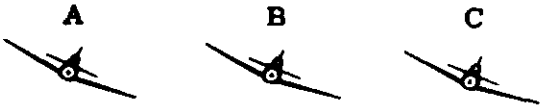
1—provides minimum acceptable navigational signal coverage.

2—provides adequate terrain and obstruction clearance for IFR operation.

3—is the lowest altitude which ATC may assign for the route.

4—is usable only within 33 nautical miles of HLV or STL.

41. Assuming that all three airplanes in the illustration below are making coordinated turns, which of the following statements is completely accurate?



Bank 20° TAS 100 mph **Bank 20° TAS 150 mph** **Bank 20° TAS 200 mph**

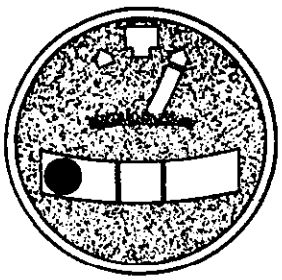
1—Airplanes A, B, and C will have equal rates of turn, but airplane C will have the largest radius of turn.

2—Airplane A will have one-half the rate of turn and one-half the radius of turn of airplane C.

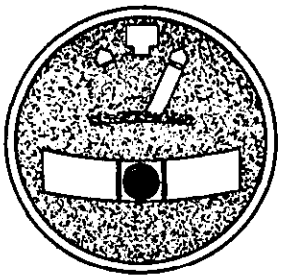
3—Airplane C will have a lesser rate of turn and a greater radius of turn than airplane A.

4—Airplane B will have a greater rate of turn and a greater radius of turn than airplane A.

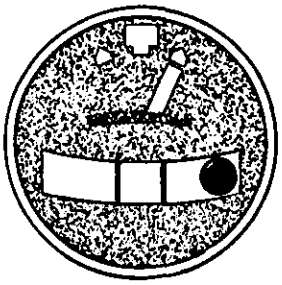
42. The illustration below depicts the turn-and-slip indications during three separate turns made at the same true airspeed. Three of the following statements regarding these turns are false. Which one is true?



A



B



C

1—Angle of bank is greatest in turn A.

2—Rate of turn is greatest in turn A.

3—Angle of bank is least in turn A; rate of turn is the same as B and C.

4—Angle of bank is the same in all turns; rate of turn is greatest in turn C.

43. Which of the following items should be reported to ATC, without request, by aircraft operating under Instrument Flight Rules?

A. Time leaving an assigned holding fix or point.

B. Completion of procedure turn on final approach.

C. Arrival at a newly assigned altitude.

D. Inflight malfunction of VOR, ADF, or marker beacon receiver capability affecting the flight.

E. Time and altitude reaching an assigned holding fix.

F. Vacating an assigned altitude for a newly assigned altitude.

G. Weather conditions—IFR or VFR.

1—A, C, D, G.

2—A, D, E, F.

3—B, C, E, G.

4—A, B, D, F.

44. Assume that your flight departs Station A with an altimeter setting of 30.15. At Station B the altimeter setting is reported as 30.35. If landing at Station B is completed on the Station A setting, your correctly calibrated altimeter would read approximately—

1—200 feet low.

2—10 feet high.

3—100 feet low.

4—1,000 feet high.

* * * * *

After passing Hallsville, you are advised that you are in radar contact and receive the following clearance:

BON AIR 2426 BRAVO—CLEARED TO THE ST. PAUL INTERSECTION — DESCEND AND MAINTAIN 3,000.

* * * * *

45. Which statement regarding this clearance is true?

1—Pilot readback of this clearance is not required.

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

3—You are expected to descend immediately and as rapidly as possible to 3,000 feet.

4—It is an indication that your flight will be delayed.

46. If you arrive at St. Paul and have not received further clearance because of frequency congestion, you should—

1—hold in a nonstandard holding pattern in the direction from which you approached the fix.

2—continue on your route and stand by for further clearance.

3—hold in a standard holding pattern in the direction from which you approached the fix.

4—continue on your route and immediately request further clearance.

* * * * *

From St. Paul you are vectored by radar to the ILS course—runway 24—wind 120° at 9 knots. You are given a heading of 100° for vector to the localizer course, cleared for ILS approach, and instructed to contact St. Louis Tower 118.5 at the outer marker.

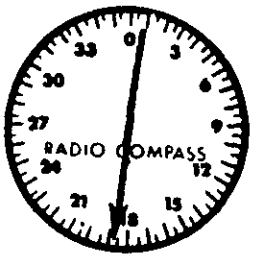
* * * * *

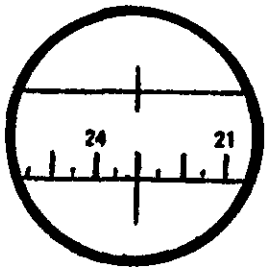
47. By reference to the Approach Procedure Chart in figure 8, the Airport/Facility Directory in figure 11, and the aircraft specifications, select the statements which are true for your approach at STL.

A. Descent below 871 feet not authorized unless approach lights are visible.
B. Distance from LOM to the Airport is 4.2 miles.
C. RVR for runway 24 is 2,400 feet.
D. ASR minimum altitude for runway 24 is 1,071 feet.

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

48. After passing the LOM (figure 8), and assuming no compass deviation, the instrument indications below show the aircraft—





1—on course.
2—right of course.
3—left of course.
4—left of course and correcting for left drift.

49. The rate of descent required to remain on the glide path during an ILS approach or a precision radar approach will—

1—remain the same regardless of true airspeed.
2—remain the same regardless of groundspeed.
3—decrease if the groundspeed is increased.
4—increase if the groundspeed is increased.

50. The speeds listed under Minima on Instrument Approach Charts are power off stalling speeds in—

1—CAS, landing configuration.
2—IAS, landing configuration.
3—TIAS, clean configuration.
4—IAS, clean configuration.

ANALYSIS OF THE ANSWERS TO SAMPLE TEST ITEMS

1—(3)

True Airspeed (155 knots calibrated airspeed—5,000 ft. at +4°C.)	167
Average groundspeed from MKC VORTAC to HLV	165
Average groundspeed from HLV to STL VORTAC	173

2—(3)

Climb and descent	:14	42 lbs.
Estimated time to destination	1:09	86 lbs.
Estimated time to alternate	:35	44 lbs.
Required reserve	:45	56 lbs.
	2:43	228 lbs.

3—(4)

Magnetic course (average)	096°
Wind correction angle	7° Right
Compass correction for 103 is	−1 = 102°

4—(2)

Step 1—Maximum allowable gross weight		2,900 lbs.
	Weight at loading specified	2,480 lbs.
	Available for fuel	420 lbs.
Step 2—Usable fuel		420 lbs.
	Fuel required	228 lbs.
	Extra fuel	192 lbs.

Step 3—192 lbs. @ 75 lbs. per hr.—2 hours and 34 minutes.

5—(3)

Step 1—Moments for pilot and passengers are 12,720 and 47,236, respectively.

Step 2—Total amount of 270,746, divided by maximum gross weight of 2,900, equals 93.4, which is out of limits.

6—(4) The changes in characteristics caused by changes in C.G. locations are minor, unless the forward or aft C.G. limit is exceeded. Alternate 1 is false because a forward C.G. increases the wing loading and increases the drag from the up elevator required. Alternate 2 is false because the wing loading is *decreased.* Alternate 3 is false because the desirable pitch down tendency has been decreased. Alternate 4 is correct because of the increased wing loading; the stalling angle of attack is reached at a higher airspeed.

7—(3) Calculated from figure 2.

8—(3) Use an average altitude of 2,000 feet. Convert m.p.h. to knots.

9—(1) FAR 61.47(d).

10—(3) FAR 91.25.

11—(1) FAR 91.33(d).

12—(4) FAR 91.115.

13—(2) New or revised data are indicated by underlining the first line of the affected item.

14—(3) All restrictions refer to areas of inadequate or unreliable signals. AIM, Part 3.

15—(2) A and E are incorrect as determined from the Airport/Facility Directory.

16—(1) These are items of primary importance, and should be known by all pilots. See *Aviation Weather.*

17—(3) There is no way of determining from the chart that the cloudiness is thin stratus. The general rain situation indicates nimbostratus, which would be several thousand feet thick.

18—(1) Reference *Aviation Weather*, page 192, and figure 19, page 46, of this booklet. The heavy arrow with three barbs shown at the Missouri/Arkansas border indicates an easterly direction.

19—(3) Ceiling is measured 1,200 feet, surface wind 120° at 9 knots.

20—(3) Ceiling has lifted from measured 800 feet overcast to measured 1,200 feet broken.

21—(4) Ceiling has remained the same, temperature/dewpoint spread has increased, visibility has remained the same.

22—(2) Ceiling will vary from 500 to 1,000 feet, visibilities from 1½ to 4 miles, occasional light drizzle after 0200Z or 2000 CST.

23—(4) Airmets are for light aircraft. See *Airman's Information Manual* (AIM), Part 1, for more detailed information.

24—(2) Only alternate "D" is false. See *Aviation Weather.*

25—(2) When flying in the northern hemisphere, pilots can expect to make a heading change to the right after crossing a frontal surface. Because of the frontal slope, the change from warmer to colder air will occur somewhere between B and C in this example.

26—(1) Freezing rain is certain evidence of warmer air above. Perpendicular penetration of the front will reduce the time of exposure to the ice. Perhaps the best procedure of all, not mentioned here, would be to reverse course.

27—(1) See *Aviation Weather.*

28—(4) The net flow of air about a low center is inward, toward low pressure. This convergence can only be accompanied by a resultant ascending flow.

29—(3) See *Airman's Information Manual.*

30—(2) See *Airman's Information Manual.*

31—(3) Flight would be in the Continental Control Area, where higher VFR minimums are required than in the underlying airspace. VFR operations on an IFR flight plan require compliance with applicable visual flight rules and instrument flight rules. See Instrument Pilot Exam-O-Gram No. 6, and FAR 91.81 and 91.105.

32—(3) FAR 91.123(a) Alternates 1, 2, and 4 are false.

33—(4) *Airman's Information Manual* (Part 1) Glossary of Aeronautical Terms. The MEA provides both adequate navigation signal coverage and obstruction clearance between radio fixes.

34—(3) Use of Standard Instrument Departures by non-aircarrier and non-military pilots is optional. There is no SID applicable for this departure.

35—(1) The appropriate frequencies are found on the front panels of the enroute charts. In an emergency use 121.5. See *Airman's Information Manual* (AIM), Part 1, "Frequency Use Plan."

36—(4) The aircraft is right of course on V-4 and radial 086 and is beyond radial 009 of Blue Springs VORTAC. For further study in this area, see FAA—*Instrument Flying Handbook*, AC 61-27A.

37—(1) FAR 91.83.

38—(4) Radar traffic advisories are issued on observed targets which are unknown to, or are not being controlled by, the radar controller. ATC may also issue traffic advisories on IFR traffic in your vicinity if such traffic is within visual range, but will give specific information in such a case. Also, see *Airman's Information Manual* (AIM), Part 1.

39—(3) Frequency 122.2 is best for the immediate vicinity of Hallsville VORTAC. See Legend, figure 7a.

40—(2) The MOCA provides adequate obstruction clearance and may be used by pilots if necessary. Adequate navigational signals at this altitude are assured only for a distance of 22 nautical miles from the VOR. See Instrument Pilot Exam-O-Gram No. 8.

41—(3) For a specific angle of bank an increase in airspeed will produce a greater radius of turn and a lesser rate of turn.

42—(3) Turn A is a skidding (underbanked) turn. Turn C is a slipping (overbanked) turn. The rate of turn is shown to be the same in all three turns.

43—(2) See *Airman's Information Manual*, Part 1; also see FAR 91.129(a)(1).

44—(1) The altimeter setting is lower than it should be. Consequently, the altimeter will indicate lower than actual altitude. This test item illustrates the importance of the correct altimeter setting during an approach. See Instrument Pilot Exam-O-Gram No. 10.

45—(1) There is no requirement to read back enroute clearances. You may simply "Roger"

if you are sure you understand and have copied correctly. If you are not sure, you are expected to read back or ask for a repeat. Alternate 3 is wrong because descents (or climbs) through the last 1,000 feet to assigned altitude should be made at the rate of 500 feet per minute. Alternates 2 and 4 are wrong because clearances similar to this one are often issued without holding instructions, when there is no likelihood that holding will be necessary.

46—(3) See *Airman's Information Manual* Part 1.

47—(2) You have equipment capability to utilize ILS minimums on this approach.

48—(1) Magnetic bearing of the localizer course is 238°, aircraft heading is 8° left. ADF needle indicates that the aircraft is on course. In a no wind condition, these indications could also show that the aircraft was crossing the course at an 8° angle.

49—(4) The rate of descent required to remain on the glide slope is determined by the true airspeed plus or minus the wind component.

50—(1) It is important to know this in order to utilize the data properly. Many airspeed systems have large errors (difference between Calibrated Airspeed and Indicated Airspeed) when operating at or near stalling speed in landing configuration. See FAR 97.3(k).

FLIGHT TIME ANALYSIS

CHECK POINTS		ROUTE CRUISE ALT./FLT. LEVEL	TRUE COURSE	AIRSPEED-KTS.		WINDS ALOFT DIRECTION VELOCITY TEMPERATURE	DRIFT CORR ANGLE	GROUND SPEED	DISTANCE N.M.	TIME		FUEL CONSUMPTION LBS.		MISC.
FROM	TO			CAS	TAS					LEG	TOTAL	LEG	TOTAL	
Kans. City Muni.	MKC	Climb	---	---	---	-------	---	---	---	:06		32		Fuel: Taxi Runup & Climb
MKC	HLV	V-4 5000												
HLV	STL	V-4 5000												
STL	Lambert St. Louis Muni		---	---	---	Approach	---	---	---	:08		10.0		

ALTERNATE DATA

Lambert STL Muni.	STL	Climb	---	---	---	---------	---	---	---	:06				
STL	VIH	Cl. 6000												

Winds:

MKC - HLV 1815 + 04
HLV - STL 2122 + 04
STL - VIH 2024 + 07

FUEL SUMMARY

	TIME	LBS.
ENROUTE		
ALTERNATE		
RESERVE		
EXTRA		
TOTAL		

Figure 1--Flight time analysis.

AIRCRAFT DATA

Specifications

BON AIR 2426B

4-place, single engine, typical of present general aviation aircraft.

Calibrated Airspeeds	(knots)
Climb (cruise climb)	110
Cruise	155
Approach (final)	75
Stall	53

Weights	(lbs.)
Max. gross	2,900
Empty (as equipped)	1,776
Useful load	1,124

Fuel Consumption	(gals.)
Per Hour	12.5

Baggage Compartment	(lbs.)
Maximum	200

Fuel Capacity	(gals.)
Total—4 tanks	90
Inboards 60 (4 gals. unusable)	
Outboards 30	

Oil Capacity	(gals.)
	3

Deicing—Anti-Icing
None

Compass Correction Card

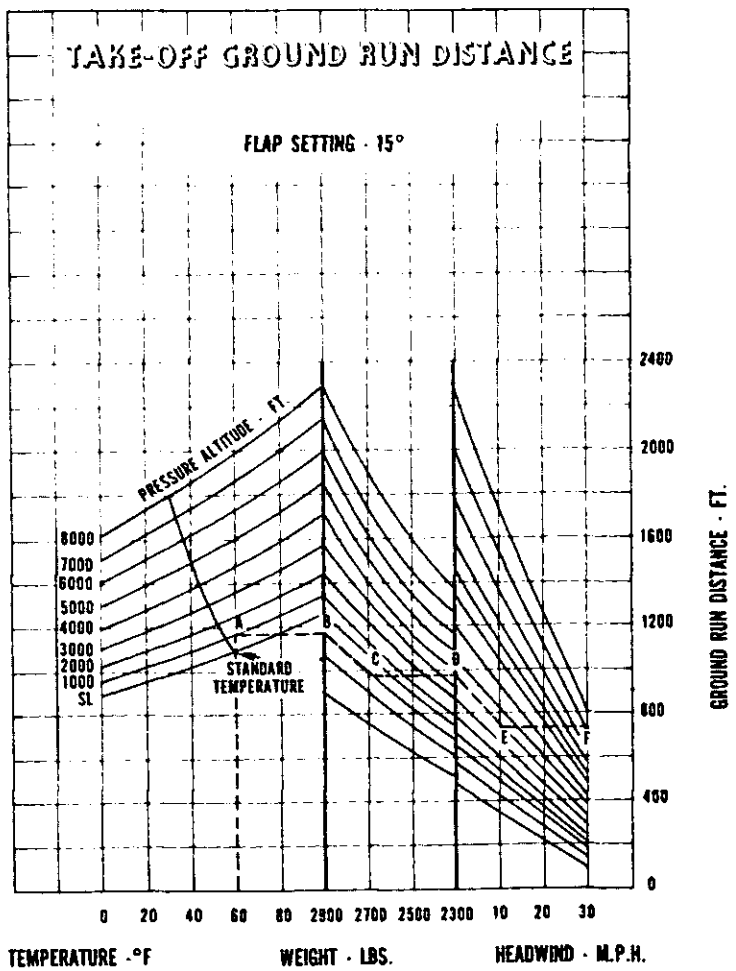
FOR (MH)	0	30	60	90	120	150	180	210	240	270	300	330
STEER (CH)	0	28	54	88	120	152	179	210	240	272	300	330

Weight and Balance

Item	Weight	Arm	Moment
Empty weight (includes unusable fuel)	1776	83.6	148,474
Oil 3 gals.	22	28.0	
Fuel 56.0 gals. inboard tanks @ 6 lbs. per gal.		90.0	
Fuel 30.0 gals. outboard tanks @ 6 lbs. per gal.		95.0	
Pilot and passenger		84.8	
Two passengers (rear seats)		120.5	
Baggage		142.0	

Radio Communications and Navigation Equipment

VHF Communications (Dual—90 and 360 channel)
VOR/LOC (Dual—with glide slope)
ADF
Marker beacon receiver
DME



EXAMPLE (dotted line)

Temperature - 60°F

Pressure altitude - 1000 feet (determined by reading the altimeter when set to 29.92.)

Gross Weight - 2680 lbs.

Headwind - 10 mhp (9K)

Step 1. Read up from temperature to pressure altitude, point A.

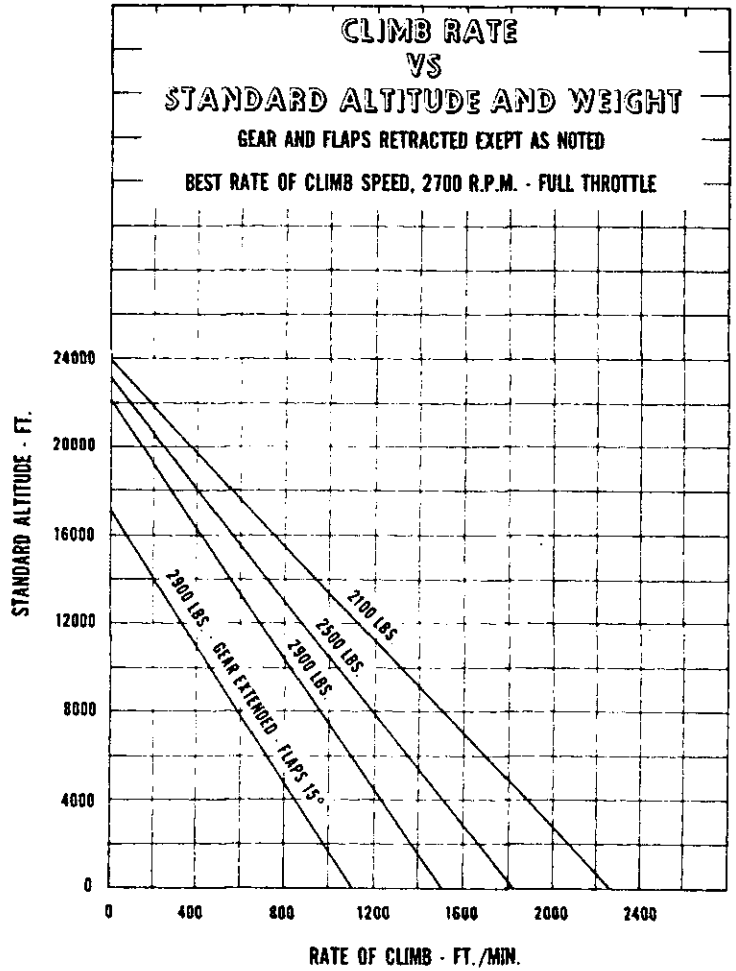
Step 2. Read across to base line B, then down to gross weight, point C.

Step 3. Read across to base line D, then down to headwind, point E.

Step 4. Read across for ground run distance, point F.

Ground run distance in this example - approximately 730 feet.

Figure 2—Takeoff ground run distance and explanation.



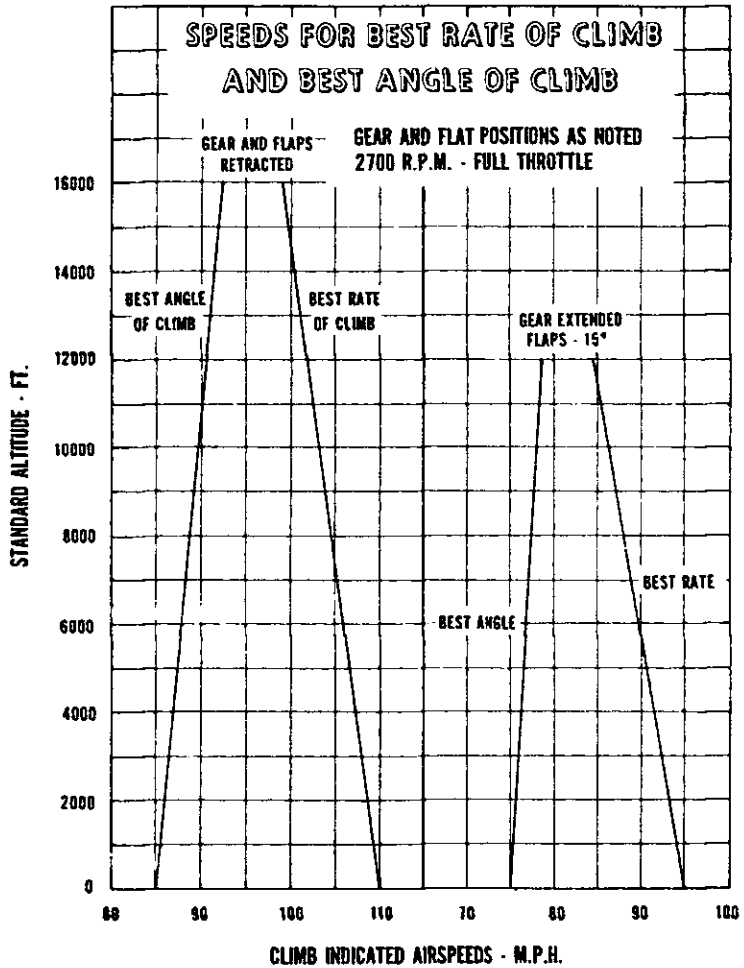


Figure 3—Rate of climb charts.

APPROVED C. G. RANGE AND WEIGHT

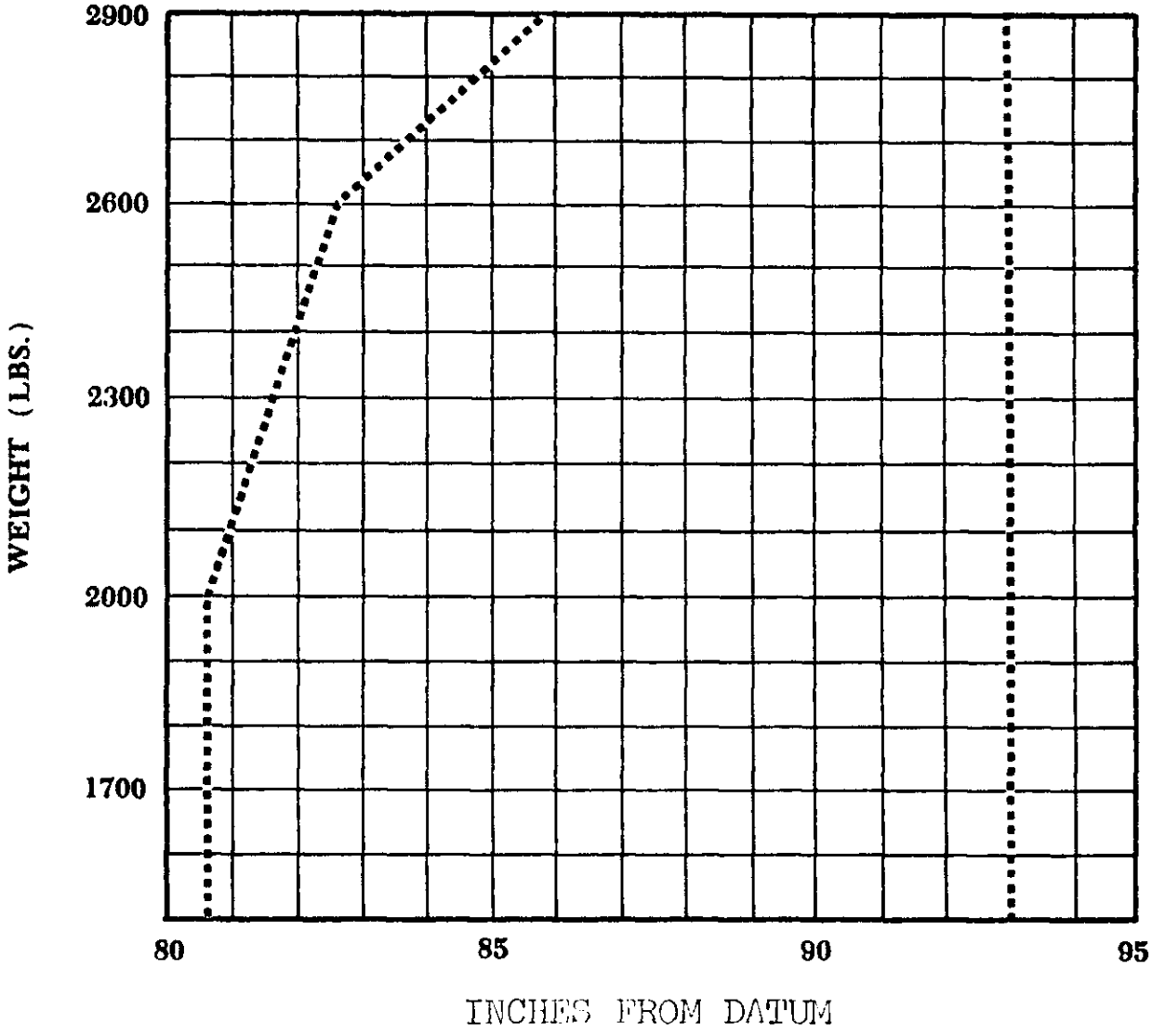
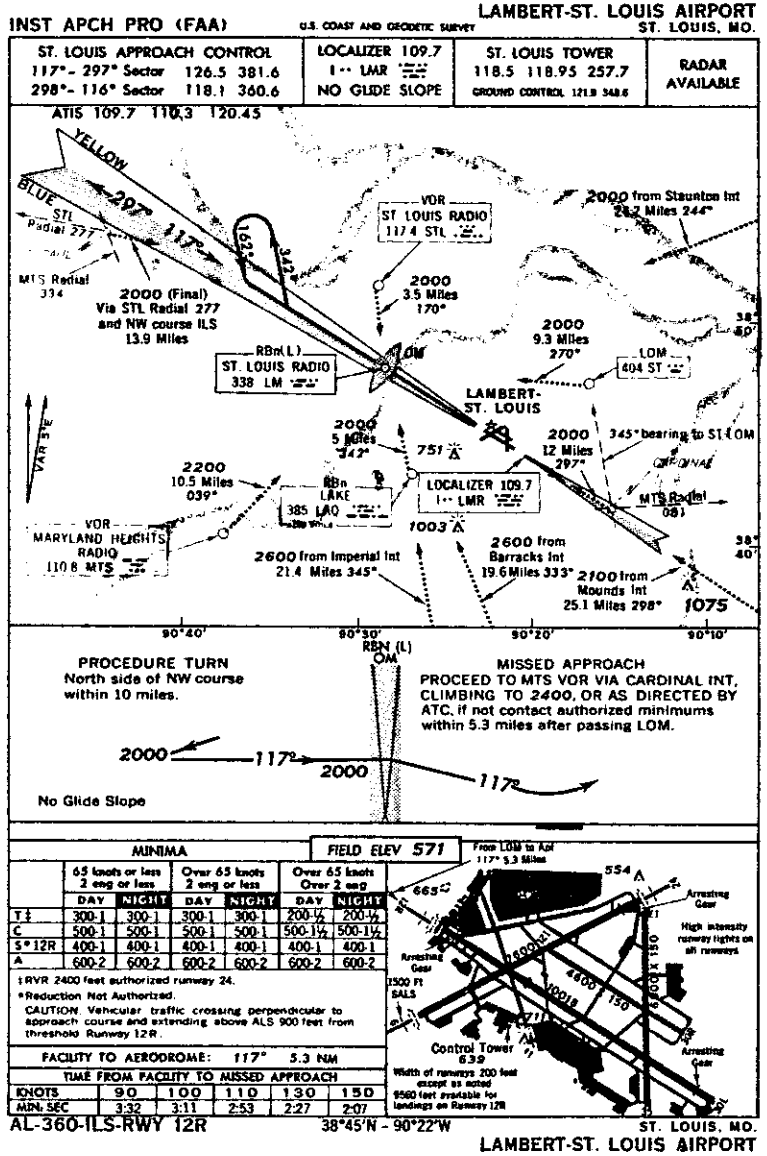


Figure 4—Approved C.G. range and weight.



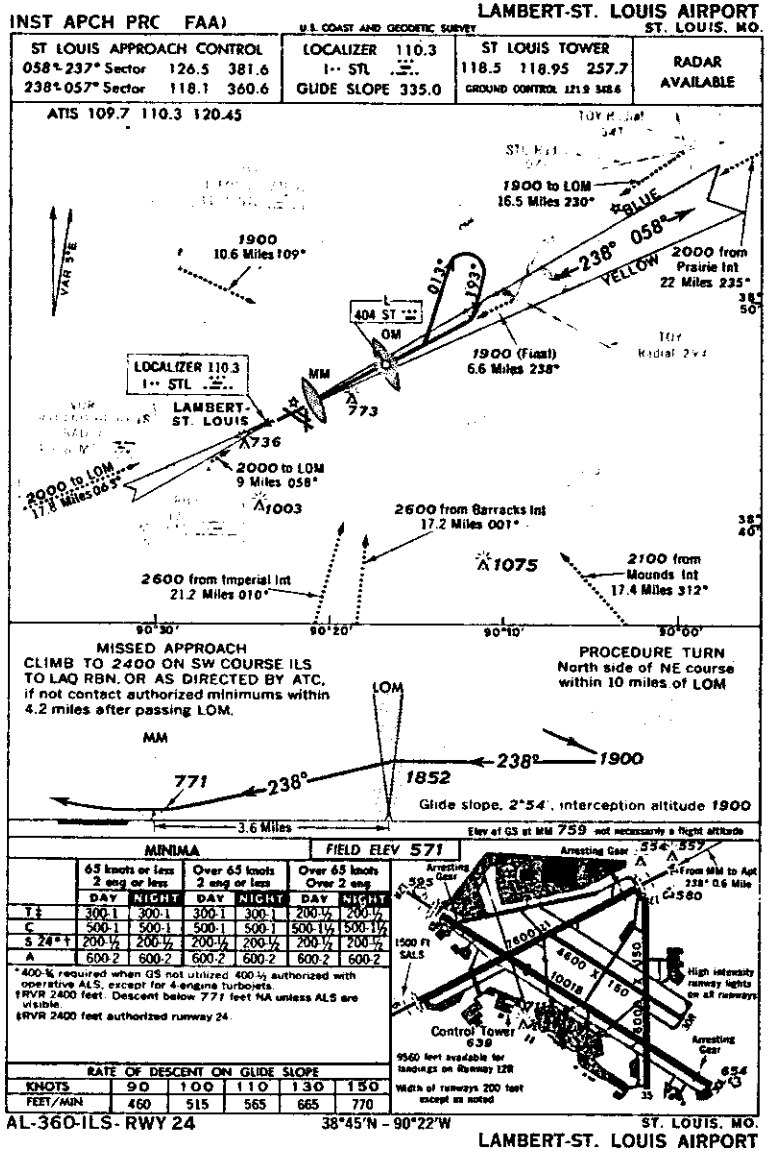
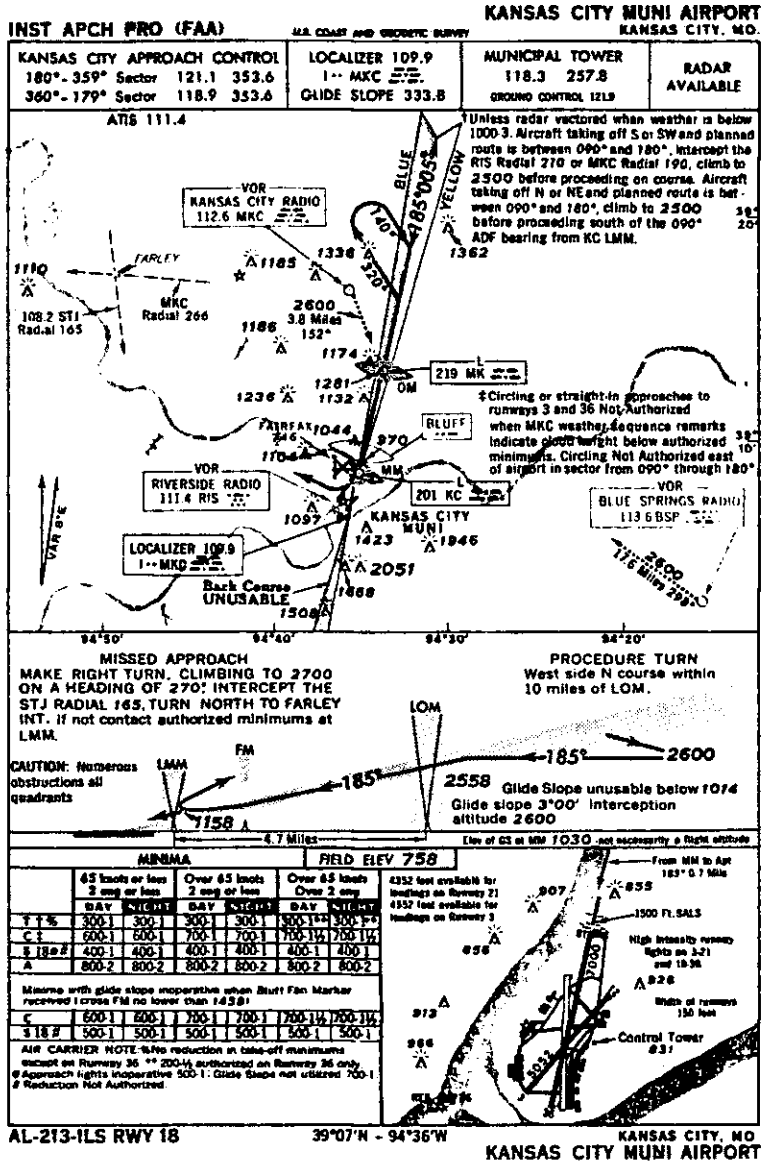


Figure 8—Instrument approach procedure charts—Lambert-St. Louis.



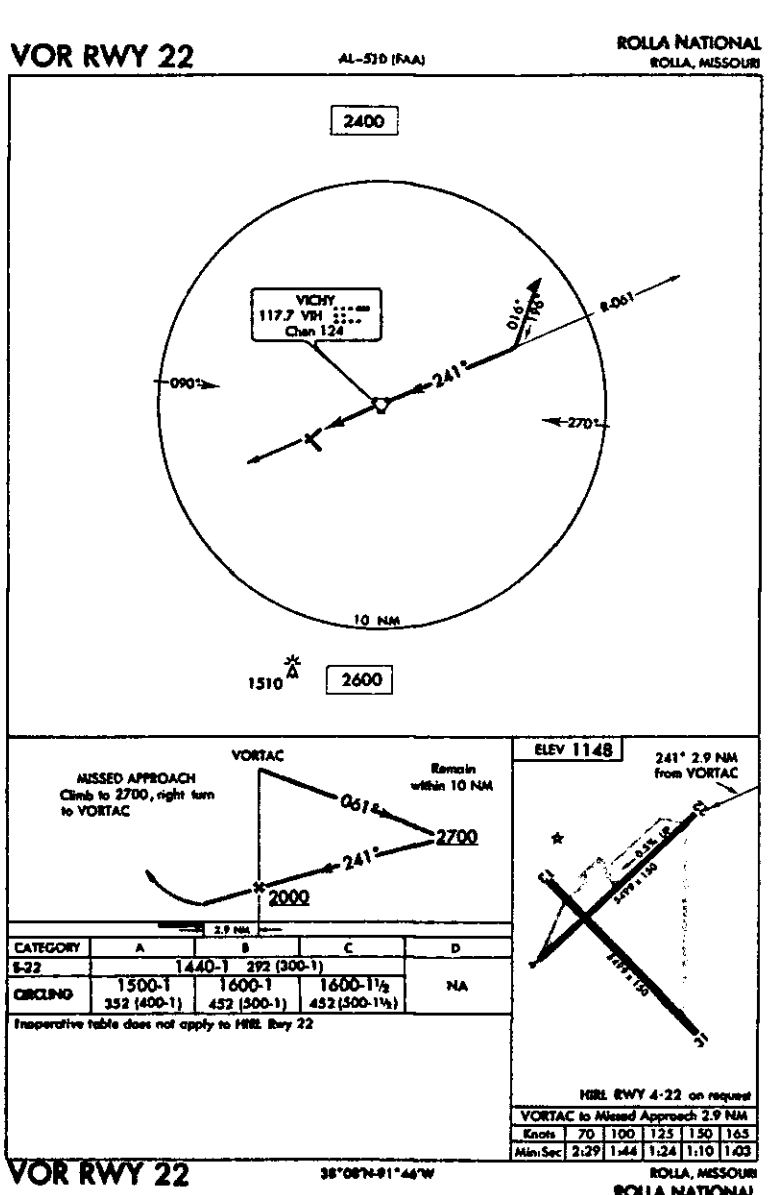


Figure 9—Instrument approach procedure charts—Kansas City and Rolla, Mo.

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).

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

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

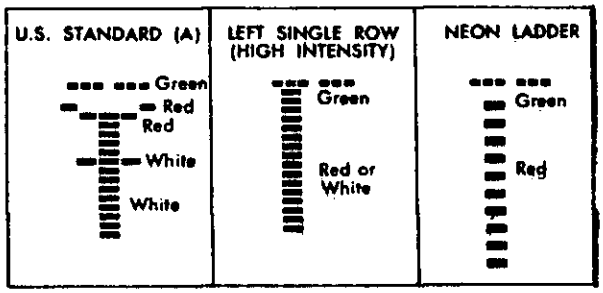
4—Low Intensity Runway

5—Medium Intensity Runway

6—High Intensity Runway

7—Instrument Approach (neon)

8A, B, or C—High Intensity Instrument Approach (ALS)



9—Sequence Flashing Lights (SFL) (3,000' out unless otherwise stated)

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.

Figure 10—Airport/Facility directory legend.

SERVICING

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

FUEL

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

OTHER

AOE—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 (LC481-5867)." When an Interphone line exists between the field and the FSS, it is indicated by "(DL)" (direct line) immediately following the name of the FSS, i.e., "FSS: OTTO (DL)."

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".

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 123.6 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 and may be used for en route communications at those locations.

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, LF. 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.

Figure 10—Airport/Facility directory legend—cont'd.

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.

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 (Stage III).
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):

CLASS	NORMAL USABLE ALTITUDES AND RADIUS DISTANCES 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.

B ..... Scheduled Broadcast Station (broadcasts weather at 15 and 45 minutes after the hour.
DME ..... UHF standard (TACAN compatible) distance measuring equipment.
H ..... Non-directional radio beacon (homing), power 50 watts to less than 2,000 watts.
HH ..... Non-directional radio beacon (homing), power 2,000 watts or more.
H-SAB ..... Non-directional radio beacons providing automatic transcribed weather service.
ILS ..... Instrument Landing System (voice, where available, on localizer channel).
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 10—Airport/Facility directory legend—cont'd.

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

TACAN ----- UHF navigational facility—omnidirectional course and distance information.

VOR -------- VHF navigational facility—omnidirectional, course only.

VOR/DME -- Collocated VOR navigational facility and UHF standard distance measuring equipment.

VORTAC --- Collocated VOR and TACAN navigational facilities.

W ---------- Without voice facilities on range frequency.

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

NOTES

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

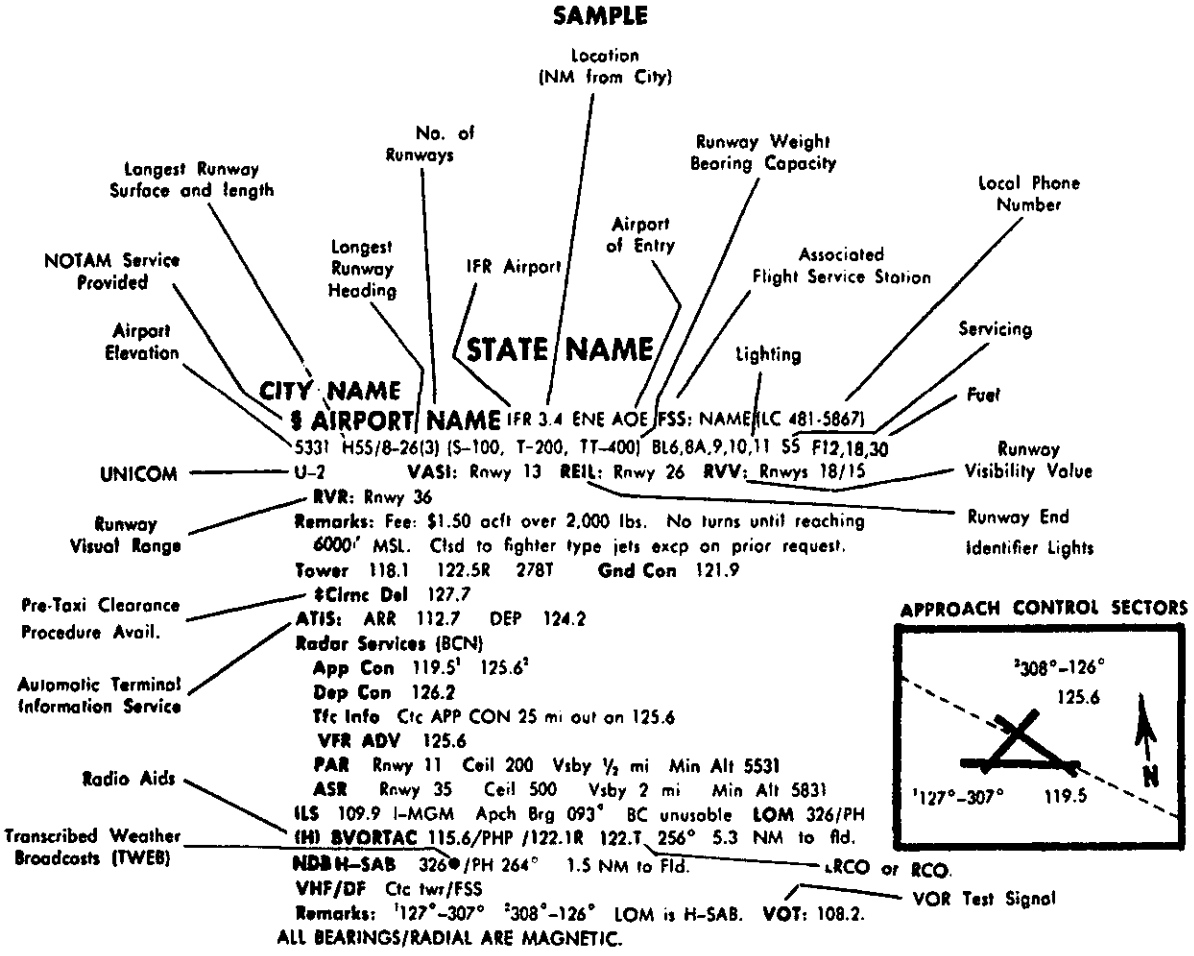


Figure 10—Airport/Facility directory legend—cont'd.

AIRPORT/FACILITY DIRECTORY

ILLINOIS

§ALTON CIVIC MEML *IFR* 5E **FSS: ST. LOUIS**
544 H57/11-29(2) (S-21, T-26) BL5 S5 F18,30 U2 (LC HO 5-4112)
Remarks: First 450' sod strip 35R clsd. N 2860' avbl.
Tower[3] 121.1 122.4R **Gnd Con** 121.7
St. Louis App Con 118.1
St. Louis Dep Con 119.9
Tfc Info Ctc St. Louis App Con
NDB[1] **MHW** 263/ALN
Remarks: [1]Oper 0700-2300 lcl time. Freq 121.5 not avbl. [2]Operated by city. Rot Bcn not visible to acft in SE Quad.

MISSOURI

BLUE SPRINGS (L) BVORTAC 113.6/BSP/122.1R **FSS: KANSAS CITY**

BUTLER (H) BVORTAC 115.9/BUM/122.1R 123.6 **FSS: KANSAS CITY**

CAPE GIRARDEAU FSS 122.1R 122.2 122.6 123.6 **DF**

CAPE GIRARDEAU (L) BVOR 112.9/CGI **FSS: CAPE GIRARDEAU**

COLUMBIA FSS 121.5 122.1R 122.3 122.6 123.6

COLUMBIA (L) BVOR 111.2/CBI **FSS: COLUMBIA**

DOGWOOD (L) BVORTAC 109.4/DGD/122.1R **FSS: SPRINGFIELD**

FARMINGTON (H) BVORTAC 115.7/FAM/121.5 122.1R 123.6
FSS: CAPE GIRARDEAU

FORNEY (L) VOR 110.0/TBN
NDB MH 391/TBN

HALLSVILLE (L) BVORTAC 115.4/HLV **FSS: COLUMBIA**

JEFFERSON CITY (L) BVOR 110.2/JEF/122.1R 126.7R **FSS: COLUMBIA**

KANSAS CITY FSS 121.5 122.1R 122.2 122.6 123.6

§KANSAS CITY INTL *IFR* 15NW **FSS: KANSAS CITY**
1025 H95/9-27(2) (S-100+, T-185, TT-350) BL6,8A,9 F12
RVR: Rnwy 36
Intl Tower[2] 120.7 126.5 **Gnd Con** 121.8
Radar Services:
Kansas City App Con 118.9[1] 121.1[2] 112.6T 109.9T
Kansas City Dep Con 118.1
Tfc Info Ctc Kansas City App Con.
ILS 110.5 I-MCI Apch Brg 005° **LOM:** 359/MC
Kansas City VORTAC 112.6/MKC/122.1R 268° 4.8nmi to fld.
NDB H-SAB 359●/MC 005° 4.4 to rnwy 36.
Remarks: [1]E sector. [2]W sector. [3]Freq 121.5 not avbl. LOM is MC NDB.

§KANSAS CITY MUNI *IFR* 4N **FSS: KANSAS CITY on Fld**
758 H70/18-36(2) (S-100, T-185, TT-350) BL4,6,8A,9,11,13
S5 F18,30 U2 **REIL:** Rnwy 36 **RVV:** Rnwy 18
Remarks: Overrun each end rnwy 18-36. 1163' (2049' MSL) twr 3 NM S. 1042' (2049' MSL) twr 3.5 NM S and 1023' (1946' MSL) twr 4.5 NM ESE. Lead-in lgts rnwy 36.
Muni Tower 118.3 122.7R 121.1 **Gnd Con** 121.9
‡Clrnc Del: 121.9
ATIS: 111.4
Radar Services: (BCN)
App Con 118.9[1] 121.1[2] 112.6T 109.9T
Dep Con 118.1
Tfc Info: Ctc App Con
ILS[3] 109.9 I-MKC Apch Brg 185° BC unusable **LOM:** 219/MK
(H) BVORTAC 112.6/MKC 171° 8.7NM to fld.
Riverside (T) VOR[3] 111.4/RIS on fld.
VHF/DF Ctc App Con.
Remarks: Acft approaching from 001-180° use 118.9 and/from 179-360° 121.1. Radar advisories not avbl within a 5 nmi radius of the antenna site aprxly 5 nmi NW of arpt. [1]E sector. [2]W sector. ASR apch not auth. [3]Glide slope unusable below 1014' MSL. Front crs unusable beyond 20 NM. [4]Unusable above 10,000' MSL. **VOT:** 108.6

MISSOURI—*Continued*

MARYLAND HEIGHTS (L) BVORTAC 110.8/MTS **FSS: ST. LOUIS**

§ROLLA, ROLLA-NATIONAL 11N IFR **FSS: Vichy on Fld**
1148 H55/4-22(2) (S-55, T-70, TT-105) BL4, 6 S5 F18, 30
Remarks: Attended daylgt hrs. 93' radar twr (75' lgtd) lctd 1800' NNE of NW end rnwy 13-31.

ST. LOUIS FSS 121.5 122.1R 122.2 122.6 123.6

ST. LOUIS
§LAMBERT-ST LOUIS *IFR* 10NW **FSS: ST. LOUIS on Fld**
571 H100/12R-30L(4) (S-100, T-200, TT-400) BL5,6,8A,9,12 S5 F12,18,22,30,34,40,45 U2 **RVR:** Rnwy 24
Remarks: U.S. Customs lndg rgts arpt (3 hr advance notice reqd. Rnwy 12R threshold d'splaced 458'. 9560' avbl lndg rnwy 12R and tkof rnwy 30L. 10,018' avbl lndg rnwy 30L and tkof rnwy 12R. A-gear all rnwys except 12L-30R. Fee. No solo student flying.
St. Louis Tower 118.5 118.95 122.7R **Gnd Con** 121.9
‡Clrnc Del 119.5
ATIS[4] 120.45 110.3 109.7
Radar Services: (BCN)
St. Louis App Con 126.5[1] 123.7 118.1[2]
St. Louis Dep Con 119.9 124.9
Tfc Info Ctc St. Louis App Con.
ASR Rnwys 12L, 30R, 30L, 17 Ceil 500 Vsby 1 Min Alt 1071
Rnwys 6, 35 Ceil 500 Vsby ¾ Min Alt 1071
Rnwy 24 Ceil 500 Vsby ½ Min Alt 1071
Rnwy 12R Ceil 400 Vsby 1 Min Alt 971
ILS 110.3 I-STL Apch Brg 238° **LOM:** 404/ST
[3]109.7 I-LMR Apch Brg 117° **LOM:** 338/LM
St. Louis (H) BVORTAC 117.4/STL 138° 8.0NM to fld.
St. Louis NDB H-SAB 338●/LM 117° 5.3NM to fld.
Remarks: LOM is LM NDB. [1]117-297° [2]298-116°. [3]Opers 0600-2400 lcl time. [4]G/S not avbl. **VOT:** 111.0

§ SPIRIT OF ST. LOUIS IFR 20W **FSS: ST. LOUIS (DL)**
462 H51/17-25(1) (S-33, T-50, TT-80) BL6 S5 F18,30
Remarks: Attended 0700-0000. Special Air Traffic Rules—Part 93, Subpart G in effect. Rgt tfc rnwy 7. When twr clsd tkoff W only, lndgs not authorized.
Tower[1] 118.3 122.5R **Gnd Con** 121.7
St. Louis App Con 126.5[2] 118.1[3]
Tfc Info Ctc St. Louis App Con
Remarks: [1]Opers 0700-2400 lcl time. [2]Southeast arrivals. [3]Northwest arrivals.

SEDALIA NDB MHW 281/DMO **FSS: COLUMBIA**
Remarks: City owned.

SPRINGFIELD FSS 121.5 122.1R 122.2 122.6 123.6 **DF**
Remarks: FSS com unreliable 020-130° below 3700' at 40 NM.

§SPRINGFIELD MUNI *IFR* 5NW **FSS: SPRINGFIELD on Fld**
1267 H65/1-19(2) (S-65, T-95, TT-172) BL5,6,8A,9 S5
F22 U2 **RVV:** Rnwy 1
Tower 119.9 122.5R **Gnd Con** 121.9
App Con 125.8
Tfc Info Ctc App Con 25 mi out
ILS 109.9 I-SGF Apch Brg 015° **LOM:** 404/SG
(H) BVORTAC 116.9/SGF 193° 6.8NM to fld
NDB H-SAB 254●/SGF 137° 3.6NM to fld

TRENTON NDB MHW 400/TRX **FSS: KIRKSVILLE**
Remarks: Owned and oper by City of Trenton.

VICHY FSS 121.5 122 1R122.3 122.6 123.6

VICHY (L) BVORTAC 117.7/VIH **FSS: VICHY**

Figure 11—Airport/Facility directory.

RESTRICTIONS TO ENROUTE NAVIGATION AIDS

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

Restricted areas are defined in degrees from magnetic North.

MISSOURI

JEFFERSON CITY VOR: Unusable beyond 20 NM 040–105° and 140–285°; unusable below 4000' beyond 20 mi 285–040° and 105–140°; unusable below 4000' 0–20 mi 040–105° and 140–285°.

MARYLAND HEIGHTS VORTAC: VOR portion unusable 150–210° beyond 35 mi below 3,500' MSL. DME portion unusable 150–215° beyond 30 mi below 3,500' MSL.

IVERSIDE VOR: Unusable in following areas: 125–170°, 252–200° and 300–310°; all other azimuths beyond 15 mi below 2,400' MSL. Unusable above 10,000' MSL.

ILLINOIS

CHICAGO O'HARE VORTAC: VOR portion unusable 060–080° beyond 18 NM below 2300' MSL. beyond 25 NM below 7000' MSL, 145–190° beyond 13 NM below 3500' MSL, 210–250° beyond 13 NM below 3500' MSL, 250–275° beyond 17 NM below 4000' MSL beyond 30 NM below 7500' MSL, 290–305° 340–360° all altitudes. DME portion unusable 004–014°, 138–156°, 250–255°, 285–315°, 340–350° beyond 5 NM.

CHICAGO HEIGHTS VORTAC: VOR portion unusable 330–350° beyond 20 nmi below 8,000' MSL.

NORTHBROOK VOR: Unusable 230–280° beyond 35 nmi below 3000' MSL.

PEOTONE VORTAC: VOR portion unusable 341–010° beyond 33 mi below 3000' MSL.

Part 3–A—NOTICES TO AIRMEN

This part is issued every 14 days and is primarily designed to supplement Part 3 of the AIM. It contains appropriate notices from the daily NOTAM Summary, new or revised Oil Burner Routes and other items considered essential to flight safety.

NOTE: Data preceded by a checkmark (✓) are considered permanent and will usually be cited only once. Such information should be noted on charts and records. Temporary information is normally carried twice unless re-submitted.

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

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

ILLINOIS

ALTON, CIVIC MEM ARPT: Rotating beacon not visible to pilots in SE quadrant.

CHAMPAIGN-UNIVERSITY OF ILLINOIS-WILLARD ARPT: ILS shutdown UFN due rnwy extension.

CHAMPAIGN, UNIVERSITY OF ILLINOIS-WILLARD ARPT: First 2189' clsd days, first 1636' clsd ngts rnwy 13 due constr NW end rnwy 13–31 UFN. Usable length rnwy 13–31 4311' days and 4864' ngts. Rnwy 13 threshold lgts displaced 1636' SE each side rnwy. Rnwy 18 threshold lgts located 30' out from rnwy end. Usable length rnwy 18-36 5300'. Threshold lgts on rnwys 4, 22, 31 and 36 located out 60' from rnwy ends. Turf areas between threshold lgts and end of runways may be soft when wet. Rnwy lgts along clsd sections are inop.

✓CHICAGO O'HARE INTL ARPT: Decomsng of PAR Service cancelled. PAR will remain on standby status avbl only on pilot request. Request service on initial ctc with App Con.

CHICAGO, O'HARE INTL ARPT: ILS G/S rnwy 32L inop til aprxly Jan 10.

JOLIET, MUNI ARPT: Glider operns in progress between rnwys 16 and 19.

PEORIA, GREATER PEORIA ARPT: Rnwy 4–22 clsd UFN.

MISSOURI

CAPE GIRARDEAU MUNI ARPT: Rnwy 10–28 now open for ngt operns.

CARUTHERSVILLE MEML ARPT: Constr on rnwy 18–36 (extension on S end) UFN. At present, 2400' avbl with low int rnwy lgts operg dusk-dawn on 1000' N end.

HANNIBAL MUNI ARPT: New E-W rnwy West 1000'x30' asphalt remaining 1700'x50' crushed rock. Rnwy not lgtd. Estimated completion of East end Spring 1969.

HARRISONVILLE ARPT: Rnwy 2–20 under constr, 500' extension to each end.

KANSAS CITY MUNI ARPT: REIL rnwy 36 inop. Lgts 150' AGL bridge 0.5 NM SE inop. Lgts 300' AGL Grain Elevator 1.5 NM SW inop.

LAMAR MUNI ARPT: Arpt clsd due constr NE-SW rnwy UFN.

MARYLAND HEIGHTS RDO: VORTAC ident "MTS" may have intermittent roughness and bending plus momentary flag and/or unlock UFN due constr near facility.

MOSBY ARPT: Clsd UFN.

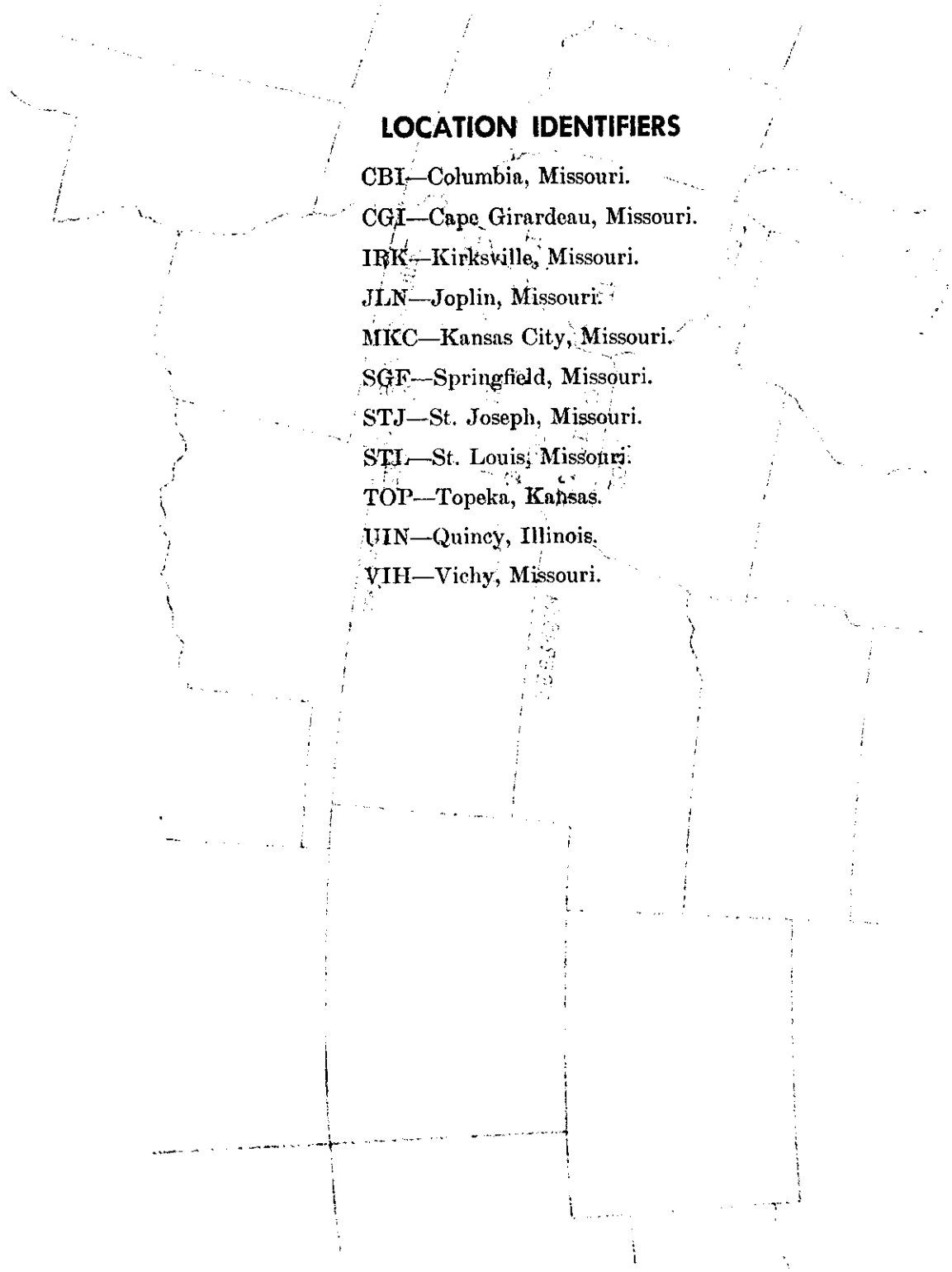
NEVADA MUNI ARPT: WIP each end rnwy 2–20 0800–1600 lcl time, til aprxly April 1969. Constr area marked with red flags. Rnwy 14–32 unusable UFN.

ROLLA NATL ARPT: Rnwy 18–36 clsd UFN.

ST. CHARLES, SMART FLD: Rnwy 18R–36L clsd UFN due extsn S end.

ST. JOSEPH, ROSECRANS MEML ARPT: First 500' rnwy 22 apch clsd UFN. Usable length both directions 5600'.

Figure 12—Restrictions to enroute NAVAIDS and NOTAMS.



LOCATION IDENTIFIERS

CBI—Columbia, Missouri.

CGI—Cape Girardeau, Missouri.

IRK—Kirksville, Missouri.

JLN—Joplin, Missouri.

MKC—Kansas City, Missouri.

SGF—Springfield, Missouri.

STJ—St. Joseph, Missouri.

STL—St. Louis, Missouri.

TOP—Topeka, Kansas.

UIN—Quincy, Illinois.

VIH—Vichy, Missouri.

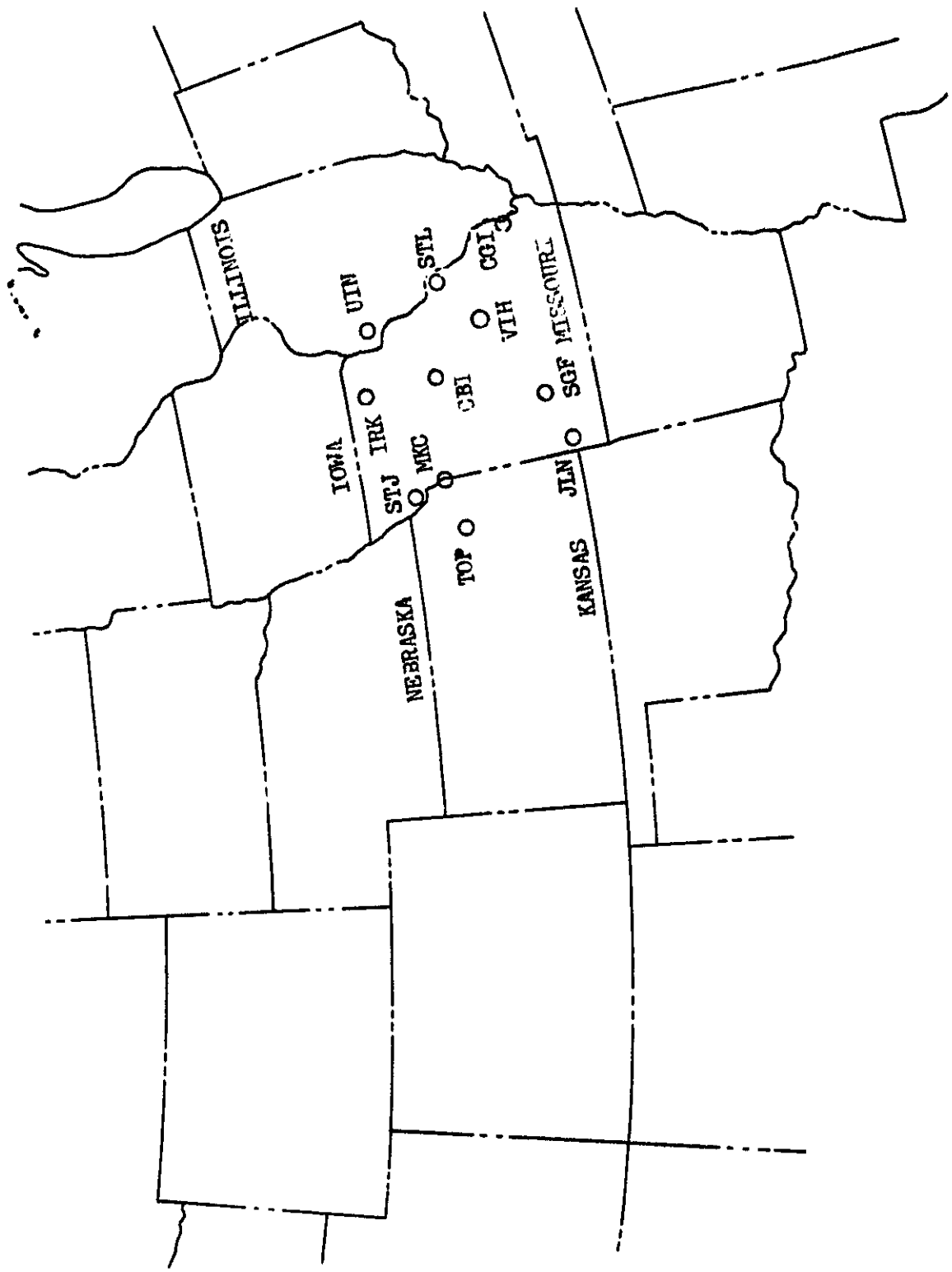


Figure 13—Map of mid-United States.

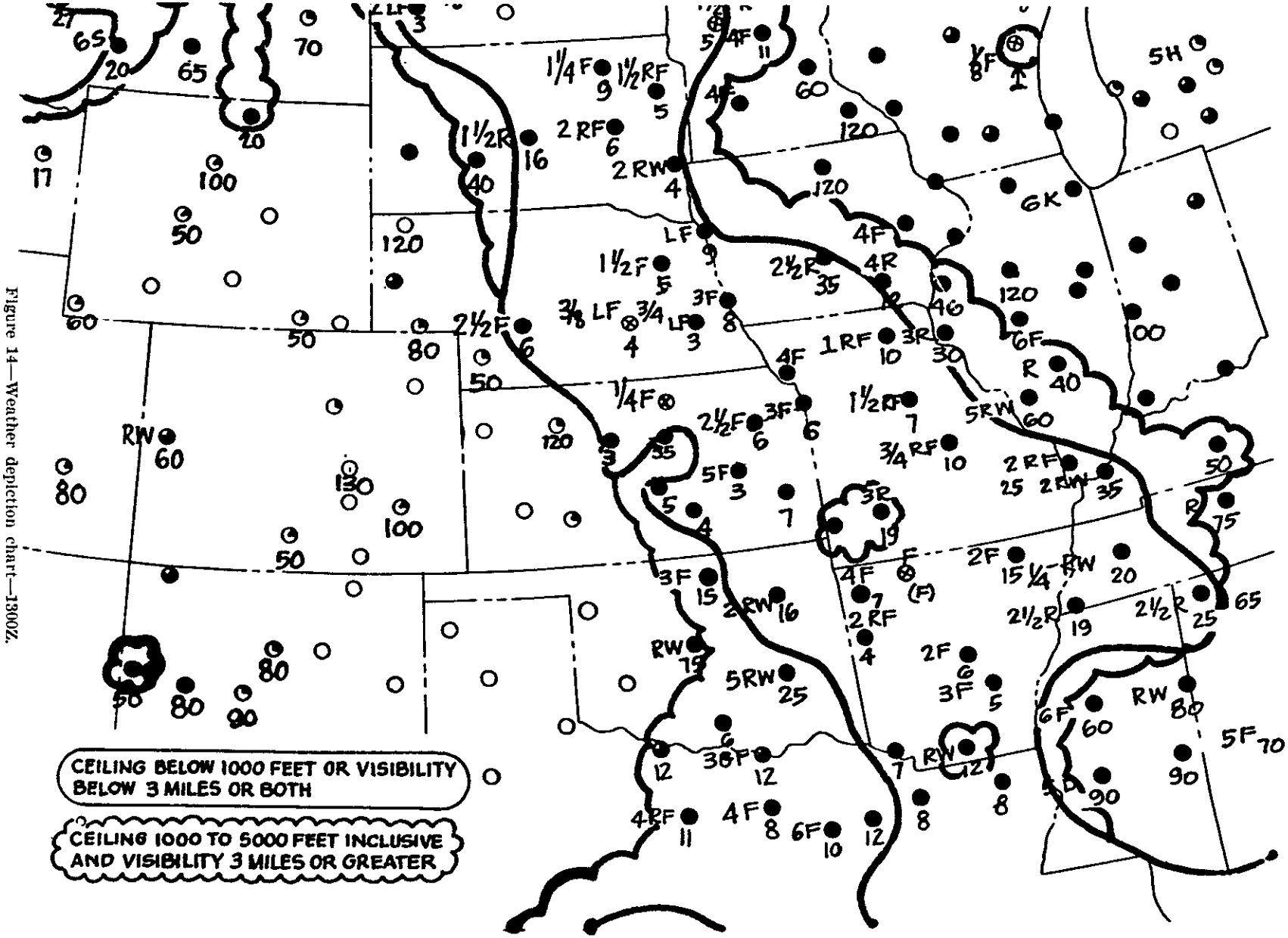


Figure 14—Weather depiction chart—1300Z.

SCHEDULED HOURLY AVIATION
WEATHER REPORTS

```
Ø27 SA27Ø714ØØ

CBI S M13⊕3/F 128/35/35/ØØØØ/988→CBI ↘2/1 9K4 OA 2/2 MBY IR
CGI S 1Ø⊕4F 136/43/41/Ø5Ø5/992
IRK W1X1/16F 132/32/32/Ø8Ø6/989
JLN /-⊕12 Ø95/34/31/11Ø8/978
MKC S M5⊕2F 118/33/33/131Ø/985/R18VV17/8 KCK QURAX/2
13-31 PUP→MKC ↘2/3 3GV OM
SGF /-⊕7 113/32/28/14Ø7/983
STJ M4⊕3/4F 34/32/Ø6Ø6/984/R35VV3/4
STL M8⊕1FK 138/43/41/13Ø6/992/ R24VR45V55
TOP S M5⊕21/2F 1Ø2/34/29/1Ø11/98Ø
UIN WØXØL--F 13Ø/34/32/Ø9Ø5/989/RØ3VV LESS THAN 1/8→UIN ↘1/4IO
VIH E12⊕12 126/36/35/13Ø6/987→VIH ↘1/5 EN→TBN2/1EE


Ø27 SA27Ø715ØØ

CBI S M13⊕11/2F 128/37/35/12Ø9/988/ 1Ø3 15//→CBI ↘2/1 9K4 OA
2/2 MBY IR
CGI S E1Ø⊕5F 139/44/42/Ø6Ø6/993/ 217
IRK W1X1/16F 133/32/32/11Ø5/989/ 1Ø5
JLN U⊕12 Ø77/53/32/1212/974/ 819
MKC M6⊕2FK 111/34/33/Ø91Ø/983/8Ø5 16// KCK QURAX/2 13-31 PUP
    →.←O↘2/3 3GV OM 2/4IX
SGF /-⊕8 111/39/32/1412/983/ 1Ø3 1ØØ7
STJ M4⊕11⊕1F 34/32/11Ø7/983 R35VV11/2
STL M12⊕25⊕21/2FK 128/45/41/12Ø9/989
TOP S M4⊕2F Ø98/34/3Ø/1Ø13/979/ 8Ø7 16//
UIN W1X1/8F 133/35/33/121Ø/99Ø/RØ3VV1/8 LE3Ø/ 3Ø7→UIN ↘1/4IO
VIH E12⊕12 127/37/34/12Ø6/988/ 1Ø3→VIH ↘1/5ENTBN ↘2/1EE
```

Figure 15—Hourly surface weather reports (SA).

TERMINAL FORECAST

```
FT 1 MKC 071440
1440Z-23Z FRI

CBI 5OC10⊕2F OCNL C5⊕. 21Z C15⊕7..
CGI C7⊕4F. 21Z 25OC10⊕7..
JLN 30OC300O. 19Z C30O10⊕7
    OCNL R-..
MKC C7⊕2F. 22Z 5OC10⊕3F OCNL C5⊕2L-F..
SGF C300O. 20Z C25O8⊕7 OCNL R-..
STJ C10⊕3F OCNL C6⊕2F CHC L-..
STL C5⊕2F. 20Z C10⊕4F. 02Z C5⊕11/2F OCNL L-..
TOP C7⊕2F OCNL L-. 20Z C10⊕3F OCNL C6⊕2L-F..
```

WINDS ALOFT FORECAST

FD VALID 071500Z FOR USE 1200-1800Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
MKC	1213	1815+04	2020-03	2123-10	2332-25	2346-35	246218	246954	256958
SGF	1619	2025+08	2130+00	2235-08	2347-22	2463-33	248246	259252	259559
STL	1517	2122+05	2126-02	2230-09	2342-23	2459-33	258047	259053	760059

Figure 16—Terminal forecasts (FT1) and winds aloft forecasts (FD).

AREA FORECAST

FA MKC Ø71245
13Z FRI-Ø1Z SAT

NEB EXCP PNHDL IA KANS MO

HGTS ASL UNLESS NOTED

SYNOPSIS. A NRLY STNRY FNT FM ARK MO BDR NWWD THRU KANS AND NERN COLO WL MOV SLOLY NWD AS A WRM FNT DURG THE DAY THEN CHG LTL.

CLDS AND WX. OVR NRN TWO THIRDS OF MO N-CNTRL AND ERN KANS ERN NEB AND PTNS OF CNTRL NEB AND IA N AND E OF A LN FM CGI CNU HLC THEN NWD THRU NEB CO-1Ø⊕ TOPS 4Ø-6Ø. VSBY Ø-3 MI IN PCPN AND FOG. LTL CHG EXPCD TIL AFT 17Z THEN SLOW IPVMT OF CIG AND VSBY TO C5-15⊕2-6 IN PCPN AND FOG.

OVR THE RMNDR OF MO KANS AND THE RMNDR OF CNTRL NEB CLR TO C3ØØ⊕. LWR CLDS DVLPG OVR THE RMNDR OF CNTRL NEB THIS FRNN WITH C4-1Ø⊕1-3F

ICG. LGT TO LCLY MDT ICGICIP OVR IA AND ERN NEB. FRZLVL SFC NEB IA NRN MO AND MST OF KANS SLPG UP TO 8Ø OVR SW KANS

TURBC. LGT TO OCNL MDT CAT BLO 4ØØ SW KANS

OTLK Ø1Z-19Z SAT. LOW CNTR ERN COLO BCMG BTR ORGANIZED AND WV MOVG EWD THRU KANS AND MO WITH CIGS LWRG TNGT OVR KANS AND THE RMNDR OF CNTRL NEB WITH LGT RAIN OVR KANS AND WRN MO AND LGT SNW OVR NEB WITH C5-15⊕1-5R-S-F. PCPN AND LOW CIG SPRDG EWD TO THE MISS RVR BY Ø6Z SAT AND PCPN DMSHG AND ENDG FM THE W OVR KANS AND NEB BY 12Z SAT.

AIRMET

FL MKC Ø7124Ø
Ø7124Ø-Ø717ØØZ

AIRMET ALFA 11. IN E AND CNTRL NEB-IA-N AND CNTRL MO AND NE HALF KANS CIGS BLO 1 THSD FT AND VSBY FQTLY LESS THAN 2 MIS FOG AND OCNL L- IN MO BCMG S- OCNLY MXD WITH FRZG DRZL ELSW. OCNL MDT ICGICIP IN IA EXTRM NW MO NEB AND NE KANS BLO 5Ø. CONTG THRU 17ØØZ

Figure 17—Area forecasts (FA) and AIRMETS (FL).

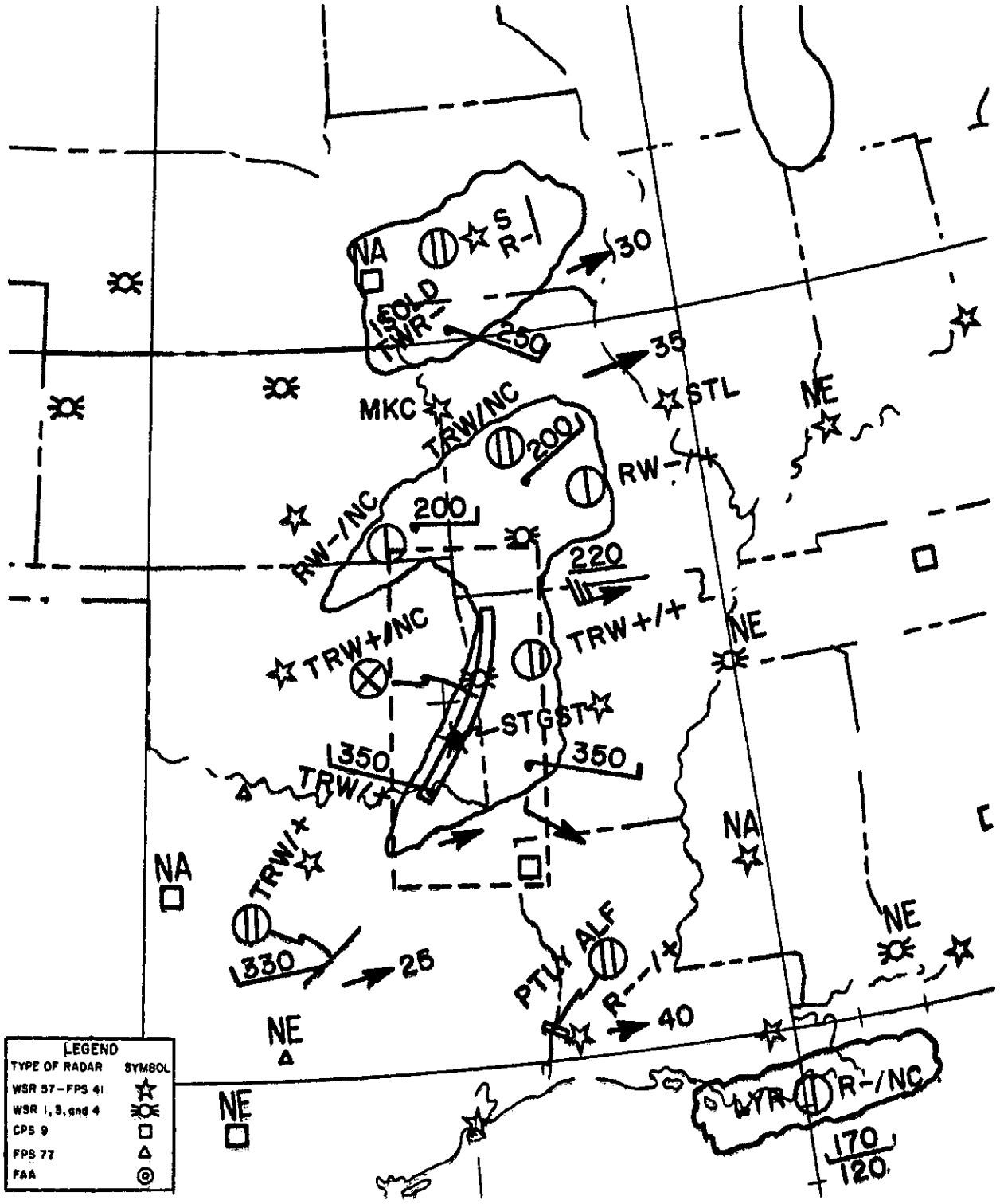
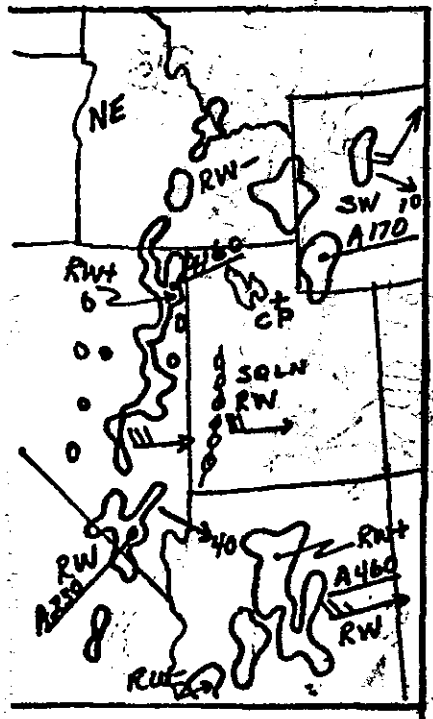


Figure 18—Radar summary chart—1445Z.

NAFAX RADAR CHART LEGEND



SYMBOLS COMMON TO BOTH TYPES OF REPORTS

SURFACE WEATHER ASSOCIATED WITH

R	Rain	E	Sleet
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.

STATUS OF EQUIPMENT

NE	No echoes
NA	Observation not available
OM	Equipment out for maintenance (WSR-57 reports only)
CP	Moderate to strong echoes reported only
STC	Reduced detection capability within 30 miles of radar
MAG	Radar on reduced power (ARTC reports only)

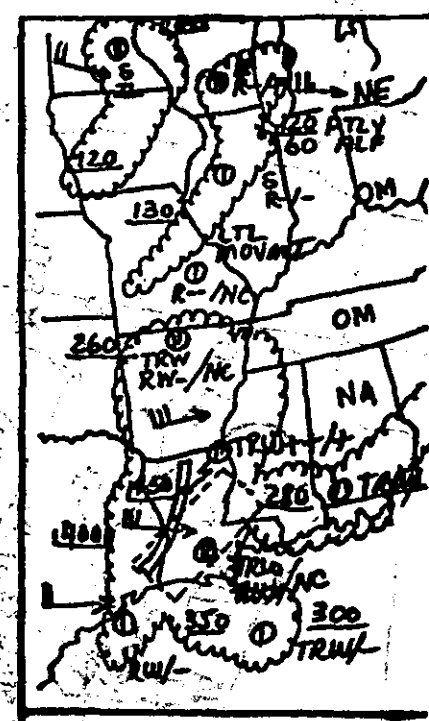
ECHO HEIGHT INFORMATION

hhh	height of echo tops in hundred of feet
hhh/	height of maximum echo top
hhh	height of echo bases
/hhh/	height of melting level
Ahhh	visual cloud top seen by aircraft (MSL)

DESCRIPTION OF SYMBOLS

Actual echo boundary copied from ARTCC scopes

Line of echoes -- possible squall line



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

Figure 19—Explanation of radar summary chart.

* U. S. GOVERNMENT PRINTING OFFICE : 1969 O - 369-351