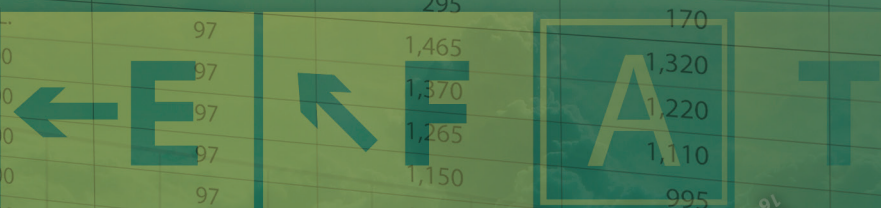


# Airman Knowledge Testing Supplement for Commercial Pilot



U.S. Department  
of Transportation  
**Federal Aviation  
Administration**

n - LIMIT WING LOAD FACTORS "G" UNITS



*This publication was formerly known as:  
"Computer Testing Supplement for Commercial Pilot"*

**DO NOT MARK IN THIS BOOK**



KEY: HIGH-PERF CATEGORY GROSS WGT = 1,340 LB  
UTILITY CATEGORY GROSS WGT = 1,430 LB





# Airman Knowledge Testing Supplement for Commercial Pilot

## 2016

*This publication was formerly known as  
“Computer Testing Supplement for Commercial Pilot”*

U.S. Department of Transportation  
**FEDERAL AVIATION ADMINISTRATION**  
Flight Standards Service





# Preface

This computer testing supplement is designed by the Flight Standards Service of the Federal Aviation Administration (FAA) for use by computer testing designees (CTDs) and testing centers in the administration of airman knowledge tests in the following knowledge areas:

Commercial Pilot—Airplane (CAX)  
Commercial Pilot—Glider (CGX)  
Commercial Pilot—Lighter-Than-Air—Airship (CLA)  
Commercial Pilot—Rotorcraft/Gyroplane (CRG)  
Commercial Pilot—Rotorcraft/Helicopter (CRH)  
Commercial Pilot—Balloon Gas (CBG)  
Commercial Pilot—Balloon—Hot Air (CBH)  
Military Competence—Airplane (MCA)  
Military Competence—Rotorcraft/Helicopter (MCH)

FAA-CT-8080-1D supercedes FAA-CT-8080-1C, Computer Testing Supplement for Commercial Pilot, dated 2005.

Comments regarding this supplement, or any AFS-630 publication, should be sent, in email form, to the following address:

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# Contents

<b>Preface.....</b>	<b>iii</b>
<b>Contents.....</b>	<b>v</b>
FIGURE 1.—Drag vs. Velocity.....	1
FIGURE 2.—Stall Speeds .....	1
FIGURE 3.—Angle of Attack vs. Lift .....	2
FIGURE 3A.—Maximum Glide Distance.....	3
FIGURE 4.—Stall Speed vs. Load Factor.....	3
FIGURE 5.—Velocity vs. Load Factor .....	4
FIGURE 6.—Adiabatic Chart.....	5
FIGURE 8.—Fuel Consumption vs. Brake Horsepower.....	6
FIGURE 9.—Fuel, Time, and Distance to Climb.....	7
FIGURE 10.—Fuel, Time, and Distance to Climb.....	8
FIGURE 11.—Cruise and Range Performance.....	9
FIGURE 12.—Cruise Performance .....	10
FIGURE 13.—Fuel, Time, and Distance to Climb.....	11
FIGURE 14.—Fuel, Time, and Distance to Climb.....	12
FIGURE 15.—Fuel, Time, and Distance to Climb.....	13
FIGURE 17.—Horizontal Situation Indicator (HSI) .....	14
FIGURE 25.—ILS or LOC RWY 13 (DSM) .....	15
FIGURE 26.—ILS or LOC RWY 24R (LAX) .....	16
FIGURE 27.—ILS or LOC RWY 35R (DEN) .....	17
FIGURE 27A.—ILS RWY 35R (SA CAT I) (DEN).....	18
FIGURE 27B.—ILS RWY 35R (CAT II & III) (DEN).....	19
FIGURE 28.—ILS or LOC RWY 31 (DSM) .....	20
FIGURE 28A.—ILS RWY 31 (CAT II & III) (DSM).....	21
FIGURE 28B.—HI-ILS or LOC RWY 31 (KDSM).....	22
FIGURE 29.—ILS or LOC RWY 8L (ATL).....	23
FIGURE 30.—VOR/DME or GPS-A (7D3) .....	24
FIGURE 31.—Wind Component Chart.....	25
FIGURE 32.—Obstacle Take-off Chart .....	26
FIGURE 33.—Maximum Rate of Climb Chart.....	27
FIGURE 34.—Cruise Performance Chart.....	28
FIGURE 35.—Normal Landing Chart.....	29
FIGURE 36.—Stations Diagram .....	30
FIGURE 37.—Center of Gravity Envelope and Loading Graph.....	31
FIGURE 38.—Loading Graph and Center of Gravity Envelope.....	32
FIGURE 39.—Stations Diagram .....	33
FIGURE 40.—Weight and Balance Chart.....	34
FIGURE 41.—Hover Ceiling vs. Gross Weight.....	35
FIGURE 42.—Rate of Climb (FT/MIN) .....	36
FIGURE 43.—Best Rate of Climb Speed.....	37
FIGURE 44.—Rate of Climb.....	38
FIGURE 45.—Running Takeoff.....	39
FIGURE 46.—Jump Takeoff.....	40
FIGURE 48.—Performance Curves Chart.....	41

FIGURE 49.—Performance Curves Chart.....	42
FIGURE 50.—Flight Envelope.....	43
FIGURE 51.—Airport Signs.....	44
FIGURE 52.—Sectional Chart Excerpt .....	45
FIGURE 53.—Sectional Chart Excerpt.....	46
FIGURE 54.—Sectional Chart Excerpt.....	47
FIGURE 55.—En Route Low Altitude Segment .....	48
FIGURE 55A.—En Route Low Altitude Segment.....	49
FIGURE 56.—Two signs .....	50
FIGURE 57.—Sign .....	50
FIGURE 58.—Airport Diagram and Sign.....	50
FIGURE 59.—Taxiway Diagram and Sign.....	51
FIGURE 60.—Two Signs.....	51
FIGURE 61.—Sign .....	52
FIGURE 62.—Sign .....	52
FIGURE 63.—Sign and Intersection Diagram.....	52
FIGURE 64.—Sign .....	53
FIGURE 65.—Sign .....	53



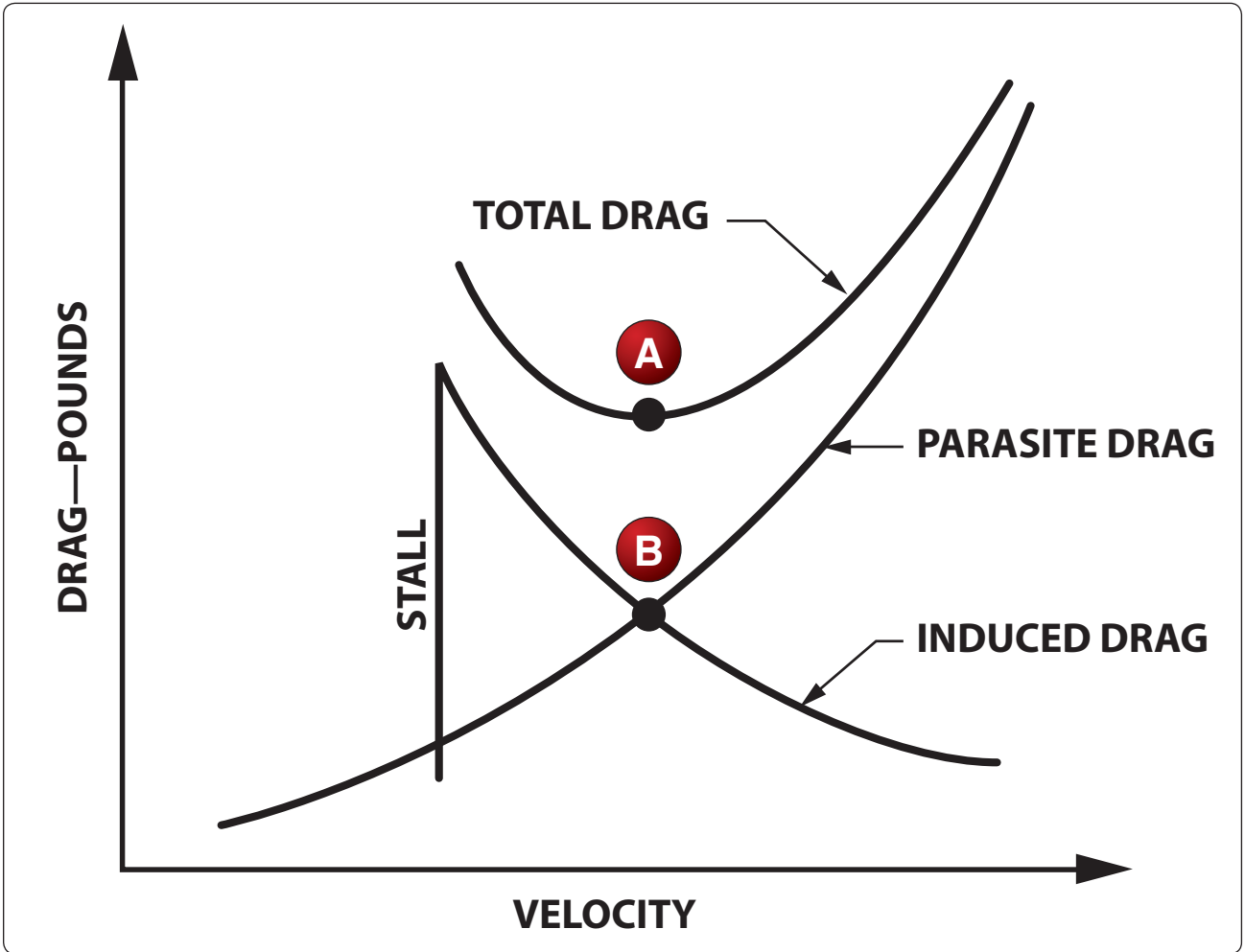


FIGURE 1.—Drag vs. Velocity.

GROSS WEIGHT 2,750 LB		ANGLE OF BANK			
		LEVEL	30°	45°	60°
<b>POWER</b>		<b>GEAR AND FLAPS UP</b>			
ON	MPH	62	67	74	88
	KTS	54	58	64	76
OFF	MPH	75	81	89	106
	KTS	65	70	77	92
		<b>GEAR AND FLAPS DOWN</b>			
ON	MPH	54	58	64	76
	KTS	47	50	56	66
OFF	MPH	66	71	78	93
	KTS	57	62	68	81

FIGURE 2.—Stall Speeds.

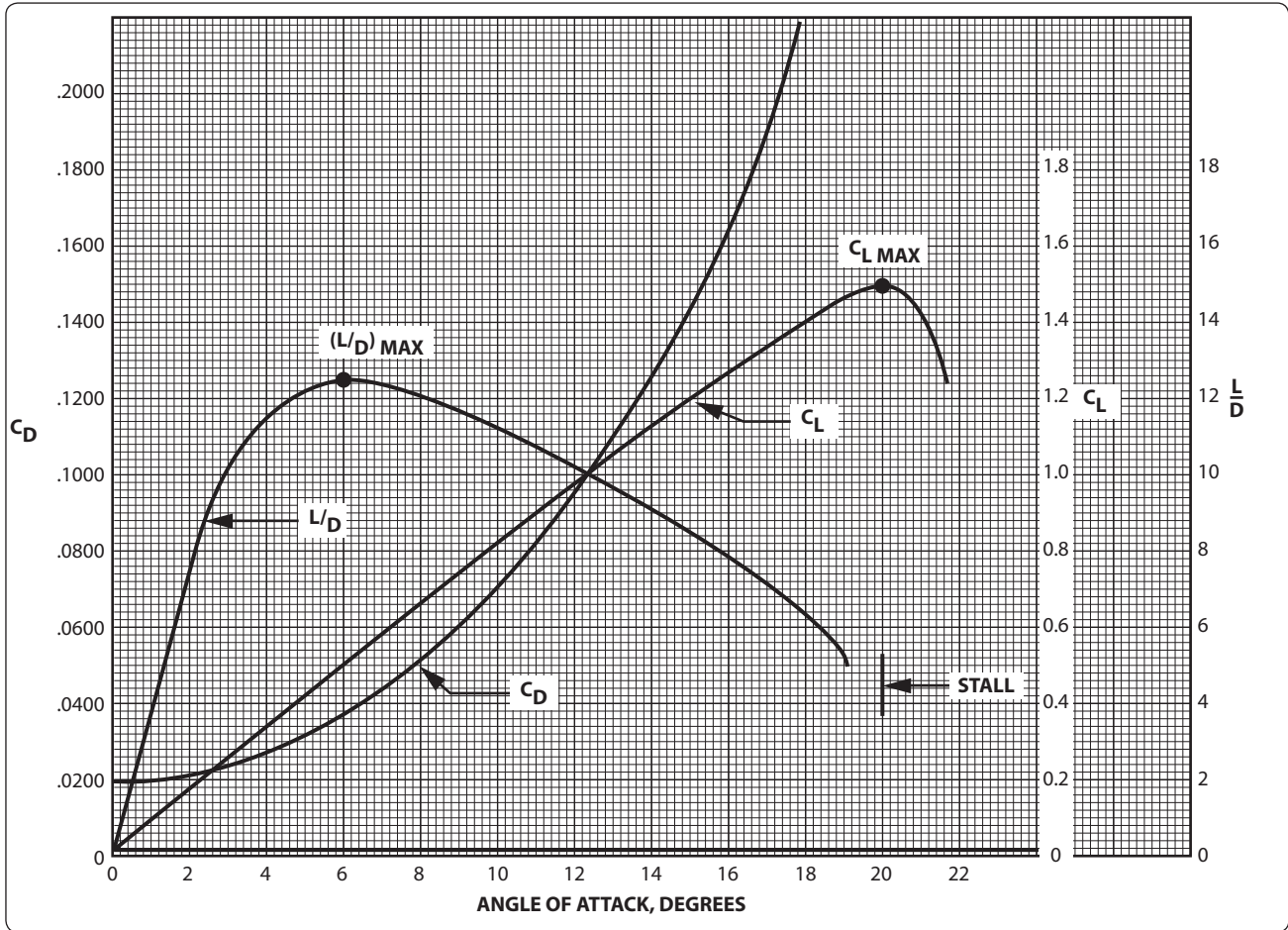


FIGURE 3.—Angle of Attack vs. Lift.

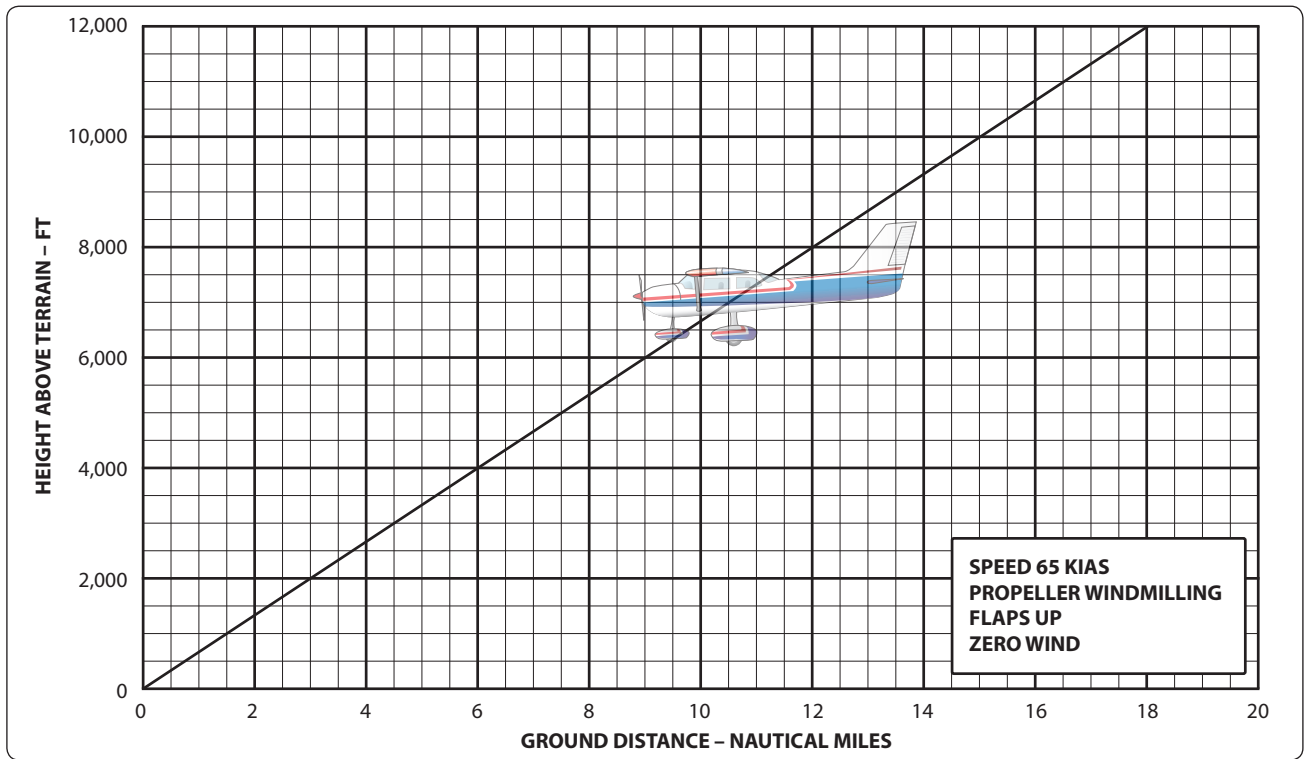


FIGURE 3A.—Maximum Glide Distance.

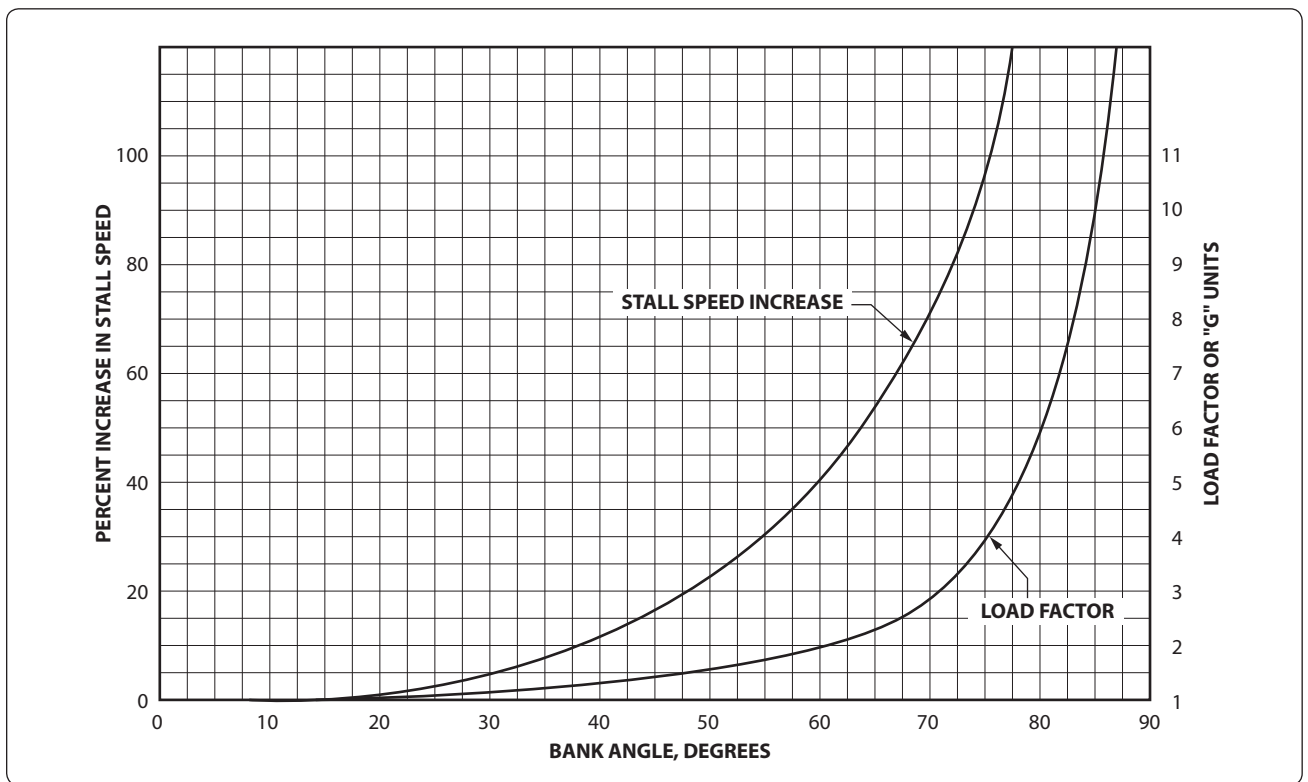


FIGURE 4.—Stall Speed vs. Load Factor.

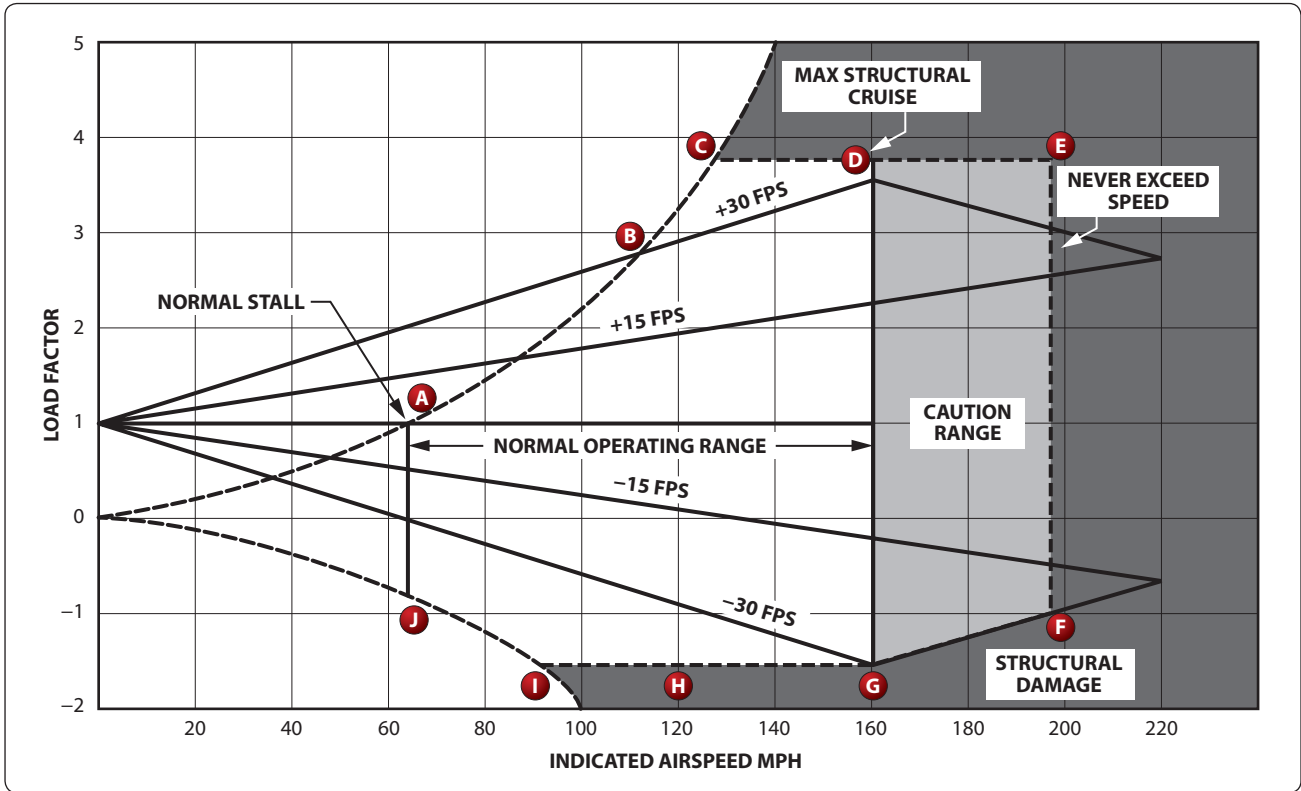


FIGURE 5.—Velocity vs. Load Factor.

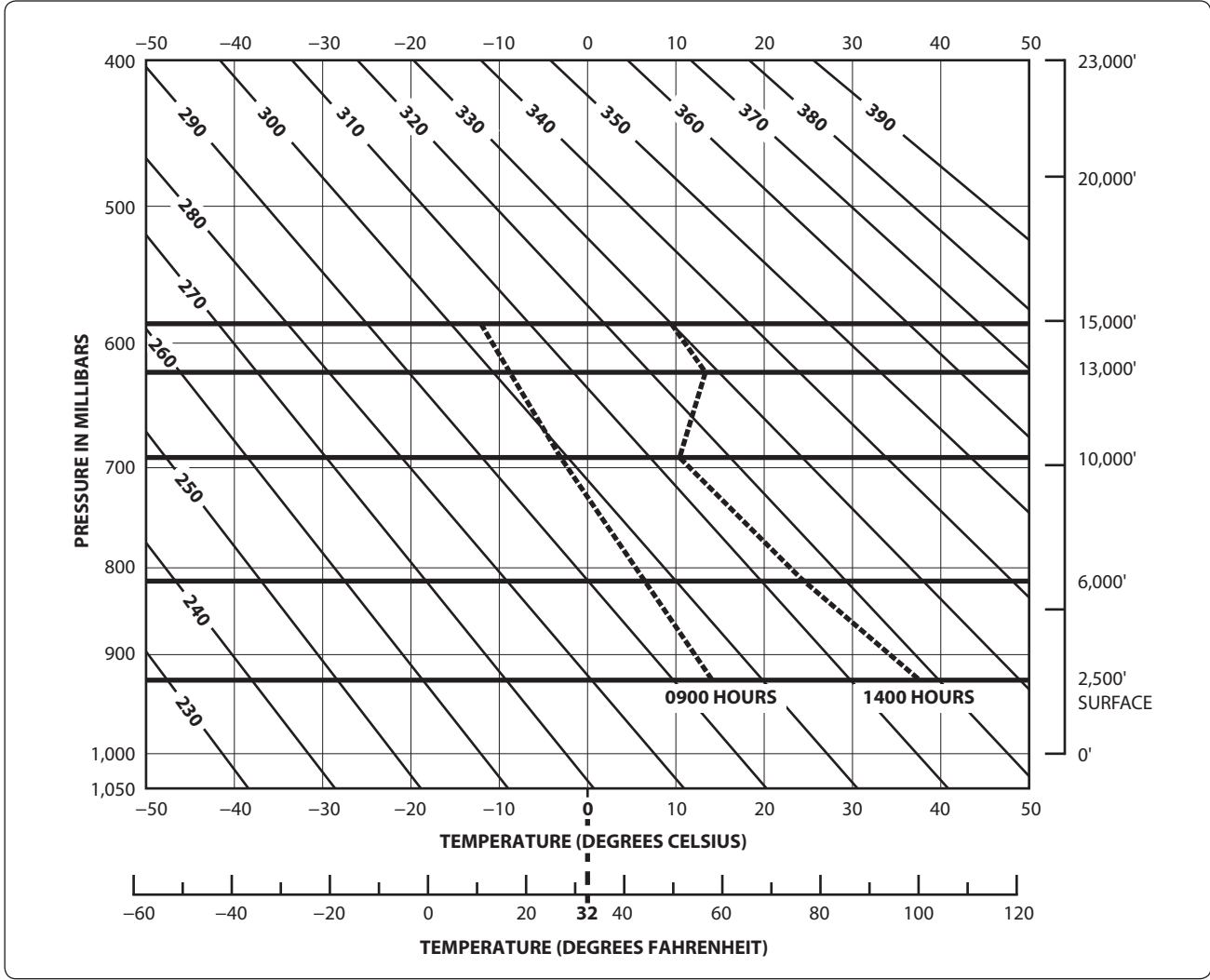


FIGURE 6.—Adiabatic Chart.

NOTE: TAKEOFF AND CLIMB FUEL FLOW PROVIDES ADDITIONAL COOLING IN HIGH AMBIENT TEMPERATURES

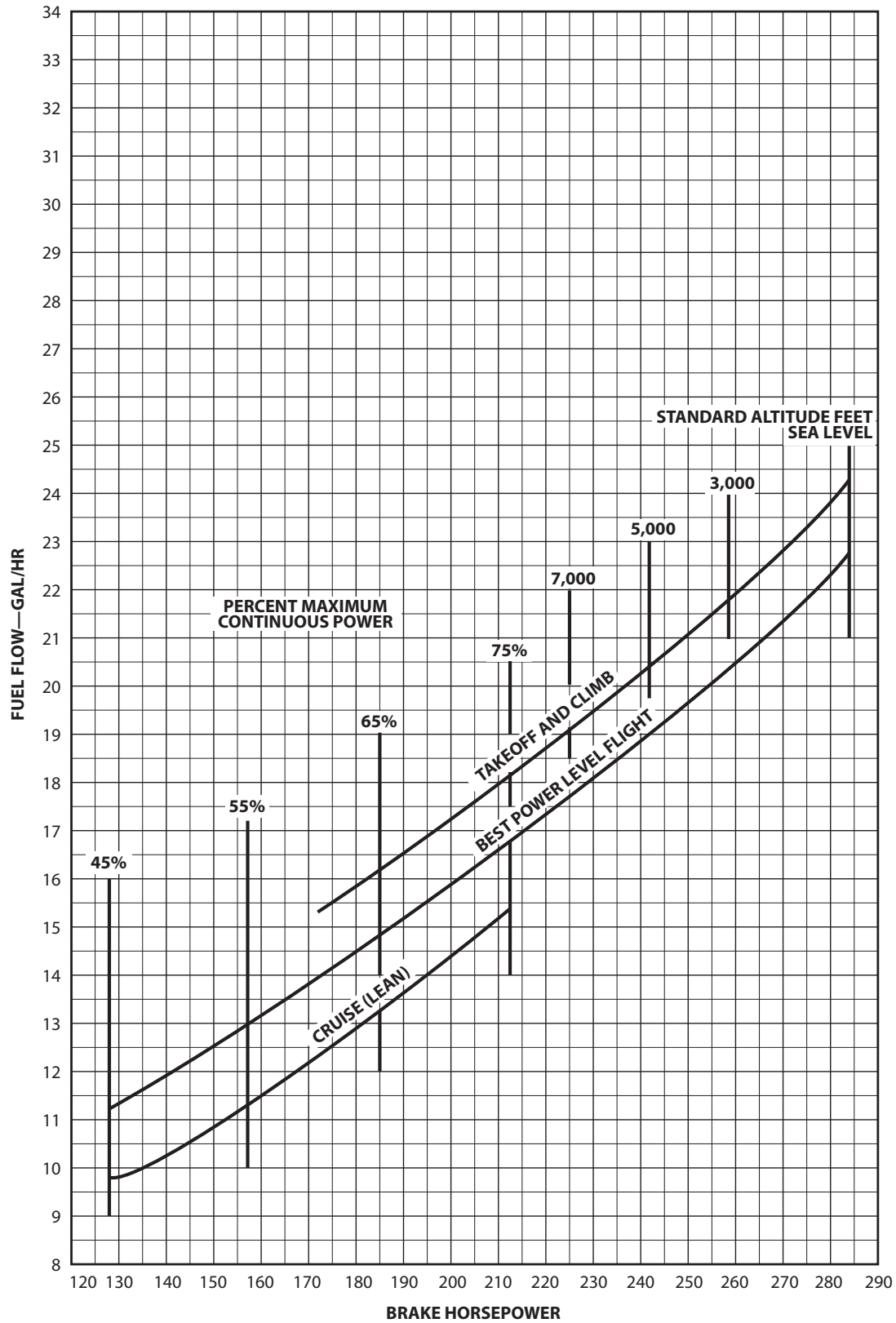


FIGURE 8.—Fuel Consumption vs. Brake Horsepower.

**NORMAL CLIMB—100 KIAS**

**CONDITIONS:**

FLAPS UP  
 GEAR UP  
 2,550 RPM  
 25 INCHES MP OR FULL THROTTLE  
 COWL FLAPS OPEN  
 STANDARD TEMPERATURE

MIXTURE SETTING	
PRESS ALT	PPH
S.L. to 4,000	108
8,000	96
12,000	84

**NOTES:**

1. INVERSE TIME, FUEL, AND DISTANCE BY 10% FOR EACH 10 °C ABOVE STANDARD TEMPERATURE.
2. ADD 12 POUNDS OF FUEL FOR ENGINE START, TAXI, AND TAKEOFF ALLOWANCE.
3. DISTANCES SHOWN ARE BASED ON ZERO WIND.

WEIGHT (LB)	PRESS ALT (FT)	RATE OF CLIMB (FPM)	FROM SEA LEVEL		
			TIME (MIN)	FUEL USED (LB)	DISTANCE (NM)
3,800	S.L.	580	0	0	0
	2,000	580	3	6	6
	4,000	570	7	12	12
	6,000	470	11	19	19
	8,000	365	16	27	28
	10,000	265	22	37	40
	12,000	165	32	51	59
3,500	S.L.	685	0	0	0
	2,000	685	3	5	5
	4,000	675	6	11	10
	6,000	565	9	16	16
	8,000	455	13	23	23
	10,000	350	18	31	33
	12,000	240	25	41	46
3,200	S.L.	800	0	0	0
	2,000	800	2	4	4
	4,000	795	5	9	8
	6,000	675	8	14	13
	8,000	560	11	19	19
	10,000	445	15	25	27
	12,000	325	20	33	37

FIGURE 9.—Fuel, Time, and Distance to Climb.



# MAXIMUM RATE OF CLIMB

**CONDITIONS:**

FLAPS UP  
 GEAR UP  
 2,700 RPM  
 FULL THROTTLE  
 MIXTURE SET AT PLACARD FUEL FLOW  
 COWL FLAPS OPEN  
 STANDARD TEMPERATURE

MIXTURE SETTING	
PRESS ALT	PPH
S.L.	138
4,000	126
8,000	114
12,000	102

**NOTES:**

1. ADD 12 POUNDS OF FUEL FOR ENGINE START, TAXI, AND TAKEOFF ALLOWANCE.
2. INCREASE TIME, FUEL, AND DISTANCE BY 10% FOR EACH 10 °C ABOVE STANDARD TEMPERATURE.
3. DISTANCES SHOWN ARE BASED ON ZERO WIND.

WEIGHT (LB)	PRESS ALT (FT)	CLIMB SPEED (KIAS)	RATE OF CLIMB (FPM)	FROM SEA LEVEL		
				TIME (MIN)	FUEL USED (LB)	DISTANCE (NM)
3,800	S.L.	97	860	0	0	0
	2,000	95	760	2	6	4
	4,000	94	660	5	12	9
	6,000	93	565	9	18	14
	8,000	91	465	13	26	21
	10,000	90	365	18	35	29
	12,000	89	265	24	47	41
3,500	S.L.	95	990	0	0	0
	2,000	94	885	2	5	3
	4,000	93	780	5	10	7
	6,000	91	675	7	16	12
	8,000	90	570	11	22	17
	10,000	89	465	15	29	24
	12,000	87	360	20	38	32
3,200	S.L.	94	1,135	0	0	0
	2,000	92	1,020	2	4	3
	4,000	91	910	4	9	6
	6,000	90	800	6	14	10
	8,000	88	685	9	19	14
	10,000	87	575	12	25	20
	12,000	86	465	16	32	26

FIGURE 10.—Fuel, Time, and Distance to Climb.

GROSS WEIGHT – 2,300 LB  
 STANDARD CONDITIONS  
 ZERO WIND LEAN MIXTURE

NOTE: MAXIMUM CRUISE IS NORMALLY LIMITED TO 75% POWER.

ALT.	RPM	% BHP	TAS MPH	GAL/HOUR	38 GAL (NO RESERVE)		48 GAL (NO RESERVE)	
					ENDR (HOURS)	RANGE (MILES)	ENDR (HOURS)	RANGE (MILES)
2,500	2,700	86	134	9.7	3.9	525	4.9	660
	2,600	79	129	8.6	4.4	570	5.6	720
	2,500	72	123	7.8	4.9	600	6.2	760
	2,400	65	117	7.2	5.3	620	6.7	780
	2,300	58	111	6.7	5.7	630	7.2	795
	2,200	52	103	6.3	6.1	625	7.7	790
5,000	2,700	82	134	9.0	4.2	565	5.3	710
	2,600	75	128	8.1	4.7	600	5.9	760
	2,500	68	122	7.4	5.1	625	6.4	790
	2,400	61	116	6.9	5.5	635	6.9	805
	2,300	55	108	6.5	5.9	635	7.4	805
	2,200	49	100	6.0	6.3	630	7.9	795
7,500	2,700	78	133	8.4	4.5	600	5.7	755
	2,600	71	127	7.7	4.9	625	6.2	790
	2,500	64	121	7.1	5.3	645	6.7	810
	2,400	58	113	6.7	5.7	645	7.2	820
	2,300	52	105	6.2	6.1	640	7.7	810
10,000	2,650	70	129	7.6	5.0	640	6.3	810
	2,600	67	125	7.3	5.2	650	6.5	820
	2,500	61	118	6.9	5.5	655	7.0	830
	2,400	55	110	6.4	5.9	650	7.5	825
	2,300	49	100	6.0	6.3	635	8.0	800

FIGURE 11.—Cruise and Range Performance.

## PRESSURE ALTITUDE – 18,000 FEET

**CONDITIONS:**

4,000 POUNDS  
 RECOMMENDED LEAN MIXTURE  
 COWL FLAPS CLOSED

**NOTES:**

FOR BEST FUEL ECONOMY AT 70% POWER OR LESS, OPERATE AT 6 PPH LEANER THAN SHOWN IN THIS CHART OR AT PEAK EGT.

		20 °C BELOW STANDARD TEMPERATURE –41 °C			STANDARD TEMPERATURE –21 °C			20 °C ABOVE STANDARD TEMP –1 °C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2,500	30	---	---	---	81	188	106	76	185	100
	28	80	184	105	76	182	99	71	178	93
	26	75	178	99	71	176	93	67	172	88
	24	70	171	91	66	168	86	62	164	81
	22	63	162	84	60	159	79	56	155	75
2,400	30	81	185	107	77	183	101	72	180	94
	28	76	179	100	72	177	94	67	173	88
	26	71	172	93	67	170	88	63	166	83
	24	66	165	87	62	163	82	58	159	77
	22	61	158	80	57	155	76	54	150	72
2,300	30	79	182	103	74	180	97	70	176	91
	28	74	176	97	70	174	91	65	170	86
	26	69	170	91	65	167	86	61	163	81
	24	64	162	84	60	159	79	56	155	75
	22	58	154	77	55	150	73	51	145	65
2,200	26	66	166	87	62	163	82	58	159	77
	24	61	158	80	57	154	76	54	150	72
	22	55	148	73	51	144	69	48	138	66
	20	49	136	66	46	131	63	43	124	59

FIGURE 12.—Cruise Performance.

## MAXIMUM RATE OF CLIMB

**CONDITIONS:**  
 FLAPS UP  
 GEAR UP  
 2,600 RPM  
 COWL FLAPS OPEN  
 STANDARD TEMPERATURE

MIXTURE SETTING		
PRESS ALT	MP	PPH
S.L. TO 17,000	35	162
18,000	34	156
20,000	32	144
22,000	30	132
24,000	28	120

- NOTES:**
1. ADD 16 POUNDS OF FUEL FOR ENGINE START, TAXI, AND TAKEOFF ALLOWANCE.
  2. INCREASE TIME, FUEL, AND DISTANCE BY 10% FOR EACH 10 °C ABOVE STANDARD TEMPERATURE.
  3. DISTANCES SHOWN ARE BASED ON ZERO WIND.

WEIGHT (LB)	PRESS ALT (FT)	CLIMB SPEED (KIAS)	RATE OF CLIMB (FPM)	FROM SEA LEVEL		
				TIME (MIN)	FUEL USED (LB)	DISTANCE (NM)
4,000	S.L.	100	930	0	0	0
	4,000	100	890	4	12	7
	8,000	100	845	9	24	16
	12,000	100	790	14	38	25
	16,000	100	720	19	52	36
	20,000	99	515	26	69	50
	24,000	97	270	37	92	74
3,700	S.L.	99	1,060	0	0	0
	4,000	99	1,020	4	10	6
	8,000	99	975	8	21	13
	12,000	99	915	12	33	21
	16,000	99	845	17	45	30
	20,000	97	630	22	59	42
	24,000	95	370	30	77	60
3,400	S.L.	97	1,205	0	0	0
	4,000	97	1,165	3	9	5
	8,000	97	1,120	7	19	12
	12,000	97	1,060	11	29	18
	16,000	97	985	15	39	26
	20,000	96	760	19	51	36
	24,000	94	485	26	65	50

FIGURE 13.—Fuel, Time, and Distance to Climb.

**NORMAL CLIMB – 110 KIAS**

**CONDITIONS:**

FLAPS UP  
 GEAR UP  
 2,500 RPM  
 30 INCHES HG  
 120 PPH FUEL FLOW  
 COWL FLAPS OPEN  
 STANDARD TEMPERATURE

**NOTES:**

1. ADD 16 POUNDS OF FUEL FOR ENGINE START, TAXI, AND TAKEOFF ALLOWANCE.
2. INCREASE TIME, FUEL, AND DISTANCE BY 10% FOR EACH 7 °C ABOVE STANDARD TEMPERATURE.
3. DISTANCES SHOWN ARE BASED ON ZERO WIND.

WEIGHT (LB)	PRESS ALT (FT)	RATE OF CLIMB (FPM)	FROM SEA LEVEL		
			TIME (MIN)	FUEL USED (LB)	DISTANCE (NM)
4,000	S.L.	605	0	0	0
	4,000	570	7	14	13
	8,000	530	14	28	27
	12,000	485	22	44	43
	16,000	430	31	62	63
	20,000	365	41	82	87
3,700	S.L.	700	0	0	0
	4,000	665	6	12	11
	8,000	625	12	24	23
	12,000	580	19	37	37
	16,000	525	26	52	53
	20,000	460	34	68	72
3,400	S.L.	810	0	0	0
	4,000	775	5	10	9
	8,000	735	10	21	20
	12,000	690	16	32	31
	16,000	635	22	44	45
	20,000	565	29	57	61

FIGURE 14.—Fuel, Time, and Distance to Climb.

**ASSOCIATED CONDITIONS:**

MAXIMUM CONTINUOUS POWER \*, 3,600 LB GROSS WEIGHT  
 FLAPS UP, 90 KIAS, NO WIND

**EXAMPLE**

DEPARTURE AIRPORT PRESSURE ALTITUDE: 1,400 FT  
 DEPARTURE AIRPORT OAT: 15 °C  
 CRUISE PRESSURE ALTITUDE: 12,000 FT  
 CRUISE OAT: 0 °C  
 FUEL TO CLIMB: 7.5 MINUS 0.5 = 7.0 GAL  
 TIME TO CLIMB: 14 MINUS 1.5 = 12.5 MIN  
 DISTANCE TO CLIMB: 20 MINUS 2 = 18.0 NM

\* 2,700 RPM & 36 IN M.P. (3-BLADE PROP)  
 2,575 RPM & 36 IN M.P. (2-BLADE PROP)

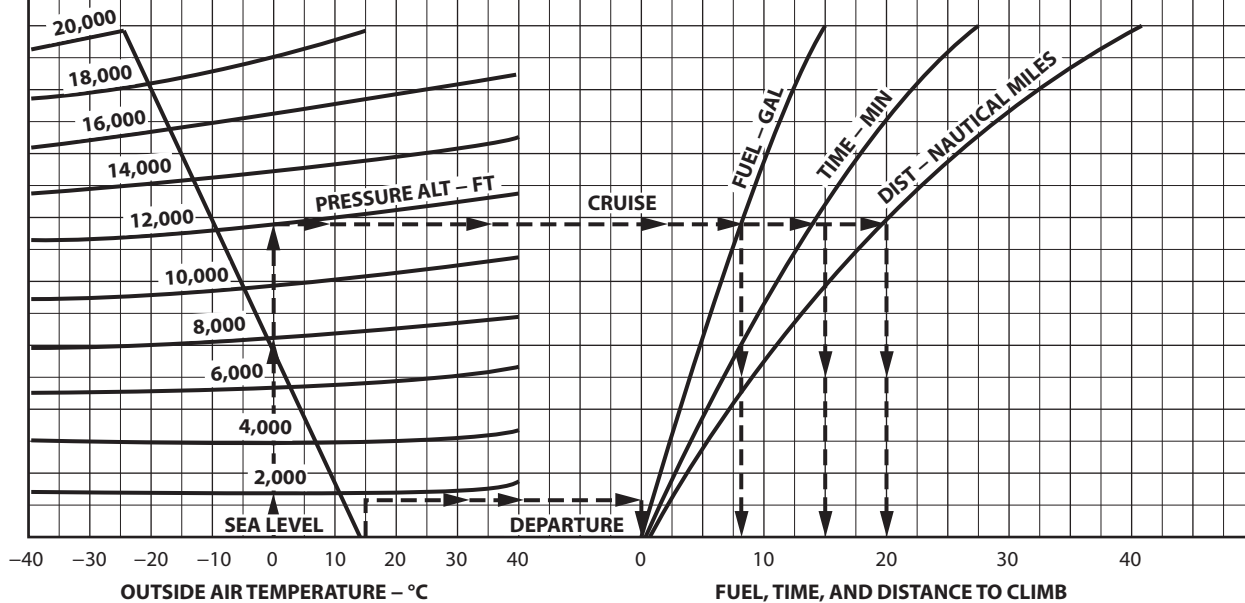


FIGURE 15.—Fuel, Time, and Distance to Climb.

**UPPER LUBBER LINE**

Indicates magnetic heading of aircraft.

**BEARING POINTER**

Indicates magnetic bearing from aircraft to navigational aid selected.

**COURSE ARROW**

Indicates course set in Course Selector window.

**ROTATING COMPASS CARD**

Actuated by Master Compass system and rotates as the aircraft turns.

**HEADING MARKER**

Rotates with the Compass Card. Can be manually set with the Heading Set knob.

**TO/FROM INDICATOR**

Shows whether the course selected, if intercepted and flown, will take you TO or FROM station.

**COURSE SELECTOR WINDOW**

Selected course is read in this window.

**COURSE DEVIATION INDICATOR**

Shows position of selected radial in relation to aircraft.

**COURSE SET KNOB**

Used to select any desired course.



1



2



3



4



5



6

FIGURE 17.—Horizontal Situation Indicator (HSI).



LOC I-VGU <b>111.9</b>	APP CRS <b>129°</b>	Rwy Idg TDZE Apt Elev	<b>9002</b> <b>921</b> <b>958</b>
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# ILS or LOC RWY 13

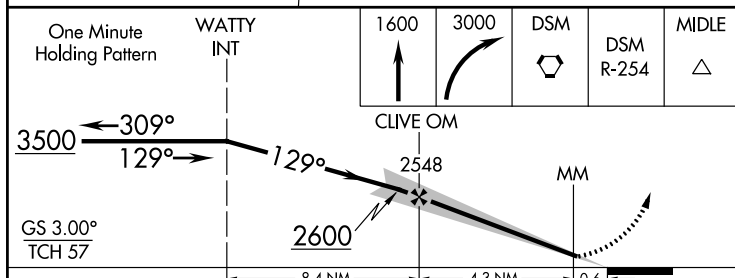
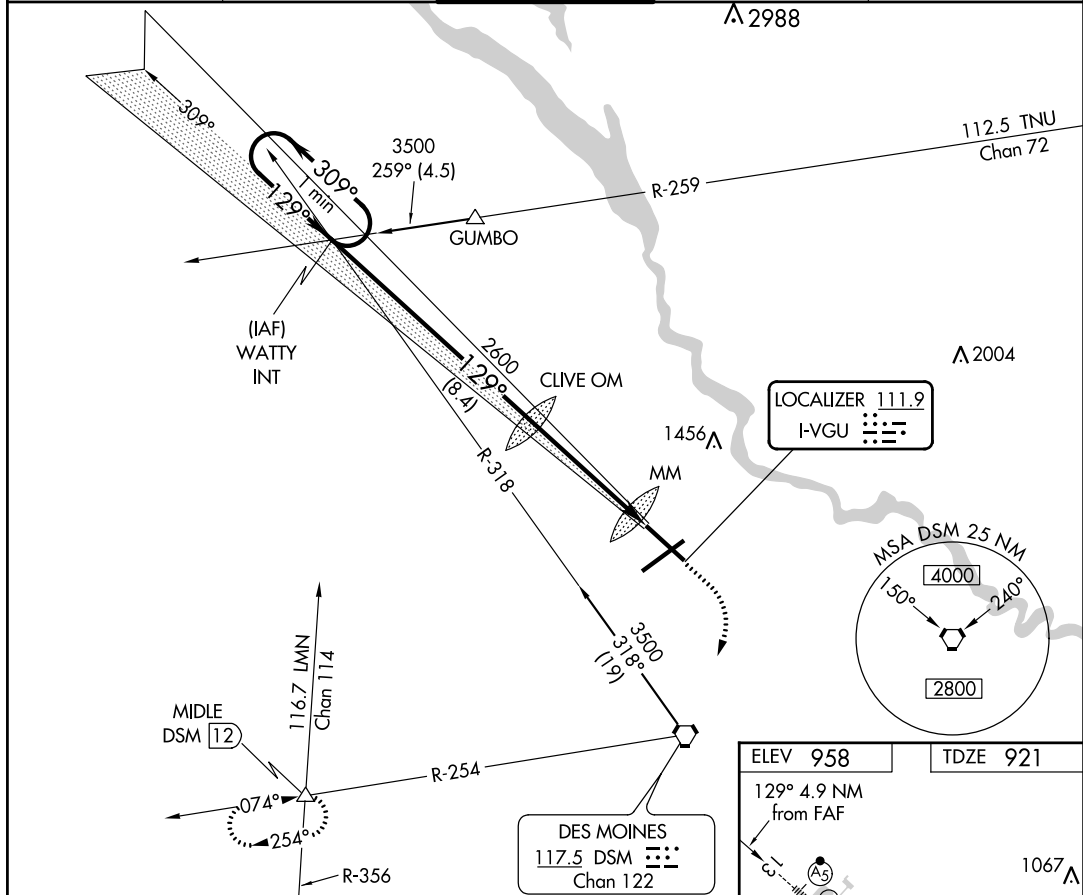
DES MOINES INTL (DSM)

**▼** For inoperative MALSR increase S-ILS 13 Cat E visibility to RVR 4000 and S-LOC 13 Cat E visibility to 1½ mile.  
**▲**



**MISSED APPROACH:** Climb to 1600 then climbing right turn to 3000 direct DSM VORTAC then via DSM R-254 to MIDDLE Int/DSM 12 DME and hold.

ATIS <b>119.55 251.05</b>	DES MOINES APP CON <b>123.9 307.15</b>	DES MOINES TOWER <b>118.3 257.8</b>	GND CON <b>121.9 348.6</b>	CLNC DEL <b>134.15 317.55</b>
------------------------------	---	--	-------------------------------	----------------------------------



ELEV 958	TDZE 921
129° 4.9 NM from FAF	
REIL Rwy 23 TDZ/CL Rwy 31 HIRL Rwy 13-31 and 5-23	
FAF to MAP 4.9 NM	
Knots	60 90 120 150 180
Min:Sec	4:54 3:16 2:27 1:58 1:38

CATEGORY	A	B	C	D	E
S-ILS 13	1121/24 200 (200-½)				
S-LOC 13	1380/24	459 (500-½)	1380/40 459 (500-1¾)	1380/50	459 (500-1)
CIRCLING	1420-1	462 (500-1)	1420-1½ 462 (500-1½)	1520-2 562 (600-2)	1760-2¾ 802 (900-2¾)

DES MOINES, IOWA  
Amdt 9B 23AUG12

41°32'N-93°40'W

# DES MOINES INTL (DSM)

## ILS or LOC RWY 13

FIGURE 25.—ILS or LOC RWY 13 (DSM).

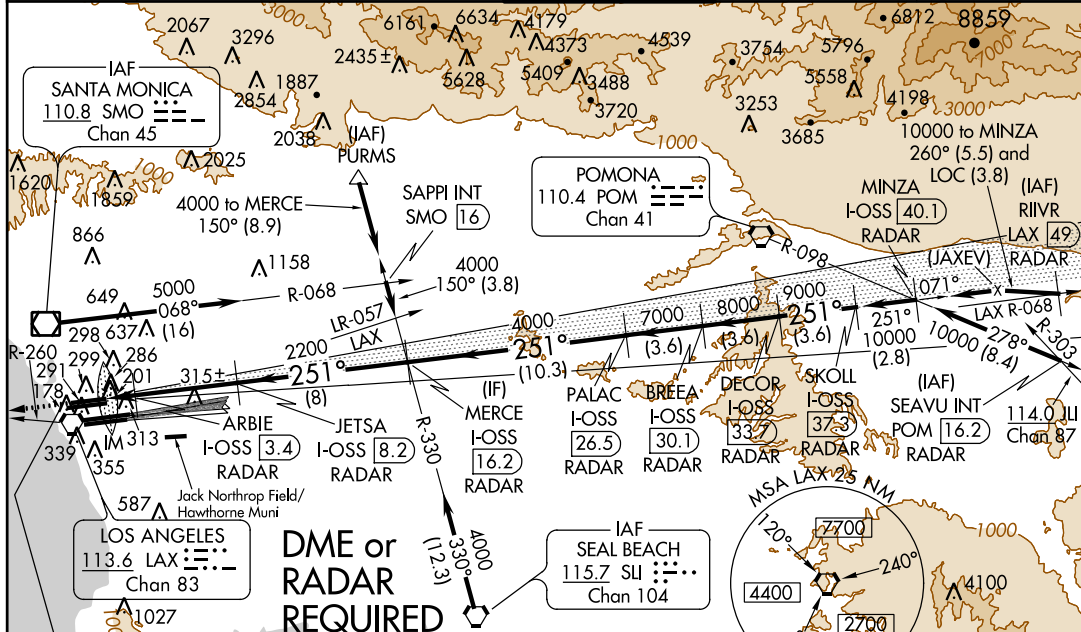
LOC/DME I-OSS <b>108.5</b> Chan 22	APP CRS <b>251°</b>	Rwy Idg <b>8926 10285</b>	24R <b>120</b>	24L <b>121</b>
		TDZE <b>126 126</b>		
		Apt Elev <b>126 126</b>		

# ILS or LOC RWY 24R

LOS ANGELES INTL (LAX)

**▼** Inoperative table does not apply to Sidestep Rwy 24L Cats A/B. For inoperative MALSR, increase S-LOC Rwy 24R Cat D visibility to RVR 5000. Simultaneous approach authorized with LAX 25L/R. Simultaneous approach authorized with HHR 25.

ATIS ARR <b>133.8</b> DEP <b>135.65</b>	SOCAL APP CON <b>124.3 363.2</b> (APCH FM WEST) <b>124.5 235.975</b> (225°-044°)	CON <b>124.9 269.0</b> (090°-224°) <b>128.5 360.7</b> (045°-089°)	LOS ANGELES TOWER <b>N 133.9 239.3</b> <b>S 120.95 379.1</b>	GND CON <b>N 121.65 327.0</b> <b>S 121.75 327.0</b> <b>W 121.4 327.0</b>	CLNC DEL <b>120.35 327.0</b>
---	--	---	--	---	---------------------------------



**DME or RADAR REQUIRED**

**MISSIED APCH FIX**  
Chan 72  
112.5 FM  
R-148

RAFFS INT LAX [15.1]  
113.6 LAX R-260 Chan 83

Procedure NA for arrivals at PURMS via V186 northwest bound.  
Procedure NA for arrival on SLI VORTAC airway radials 272 CW 319.  
Procedure NA for arrivals at SMO VOR/DME via V107 westbound.

ELEV 126	TDZE 24R 120 TDZE 24L 121	RAFFS INT LAX [15.1]	VGSI and ILS glidepath not coincident (VGSI Angle 3.00/TCH 73).	SKOLL I-OSS [37.3] RADAR
251° 6.3 NM from FAF		ARBIE I-OSS [3.4] RADAR	BREEA I-OSS [30.1] RADAR	DECOR I-OSS [33.7] RADAR
*LOC only.		JETSA I-OSS [8.2] RADAR	PALAC I-OSS [26.5] RADAR	Procedure Turn NA
I-OSS [2]		MERCE I-OSS [16.2] RADAR	IM I-OSS [2.8]	GS 3.00° TCH 59
0.2 0.7 0.6		4000	7000	8000
-4.8 NM -8 NM -10.3 NM		2200	9000	
CATEGORY A		320/18 200 (200-1/2)		
S-ILS 24R		460/24 340 (400-1/2)		
S-LOC 24R		580-1 1/2 459 (500-1)		
SIDESTEP RWY 24L		580-1 1/2 459 (500-1 1/2)		

LOS ANGELES, CALIFORNIA  
Amdt 24C 24JUL14

LOS ANGELES INTL (LAX)  
ILS or LOC RWY 24R

33°57'N-118°24'W

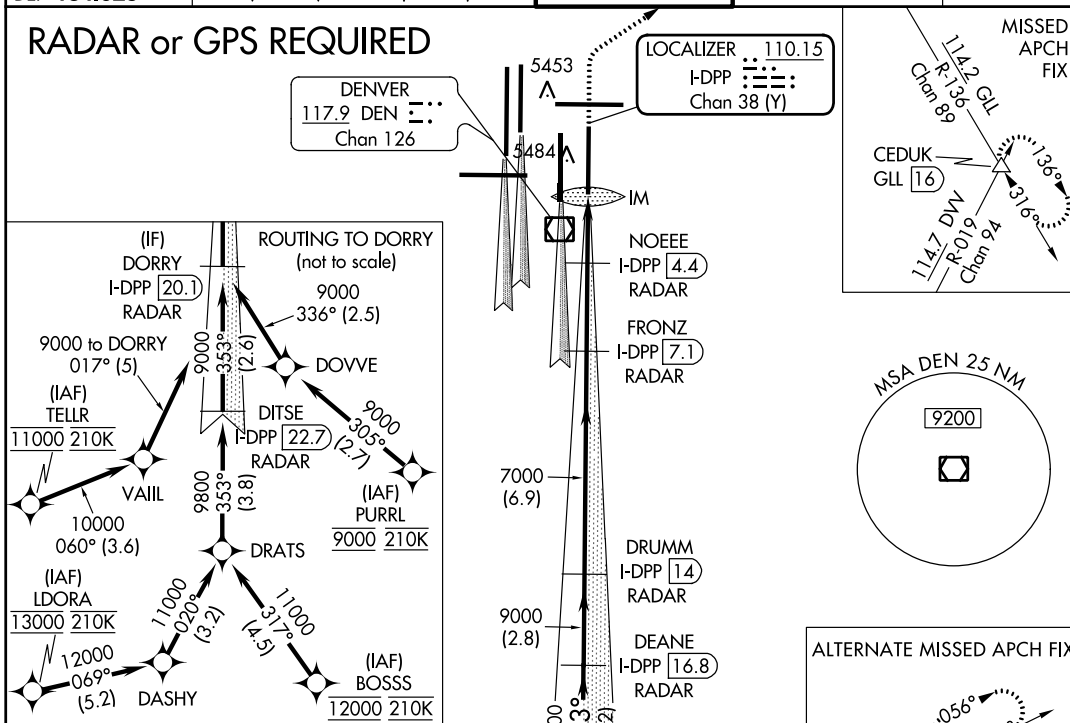
FIGURE 26.—ILS or LOC RWY 24R (LAX).

LOC/DME I-DPP <b>110.15</b> Chan <b>38(Y)</b>	APP CRS <b>353°</b>	Rwy Idg <b>12000</b> THRE <b>5370</b> Apt Elev <b>5434</b>
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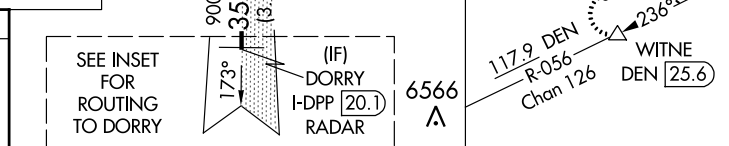
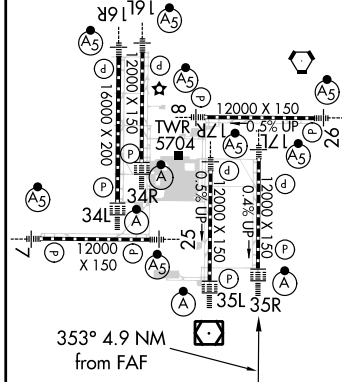
# ILS or LOC RWY 35R

DENVER INTL (DEN)

<p><b>▼</b> S-LOC 35R DME or RADAR required. Simultaneous approach authorized with Rwy 34L, Rwy 34R, and Rwy 35L.</p>		<p>ALSF-2 </p>	<p>MISSED APPROACH: Climb to 5800 then climbing right turn to 10000 on heading 048° and on GLL VORTAC R-136 to CEDUK/GLL 16 DME and hold.</p>		
<p>ATIS ARR <b>125.6 379.9</b> DEP <b>134.025</b></p>	<p>DENVER APP CON <b>119.3 307.3 120.35 379.3</b> (NORTH) (SOUTH)</p>	<p>DENVER TOWER <b>132.35 239.275</b></p>	<p>GND CON <b>121.85 377.1</b></p>	<p>CLNC DEL <b>118.75</b></p>	



ELEV <b>5434</b>	<b>D</b> THRE <b>5370</b>
<p>HIRL all Rwys TDZ/CL Rwys 7, 16L, 16R, 17R, 26, 34L, 34R, 35L, 35R 5559</p>	



5800	10000	GLL R-136	CEDUK	<p>VGSI and ILS glidepath not coincident (VGSI Angle 3.00/TCH 66).</p>			
* LOC only		FRONZ I-DPP [7.1] RADAR	DRUMM I-DPP [14] RADAR	DEANE I-DPP [16.8] RADAR	DORRY I-DPP [20.1] RADAR		
I-DPP [2.2]	I-DPP [3.1]	NOEEE I-DPP [4.4] RADAR					
0.1	0.9	1.3	2.7	6.9	2.8	3.2	
CATEGORY		A		B		C	
S-ILS 35R		5570/18 200 (200-½)					
S-LOC 35R		5740/24 370 (400-½)		5740/35 370 (400-¾)			

DENVER, COLORADO  
Amdt 3 15NOV12

39°52'N-104°40'W

# DENVER INTL (DEN)

## ILS or LOC RWY 35R

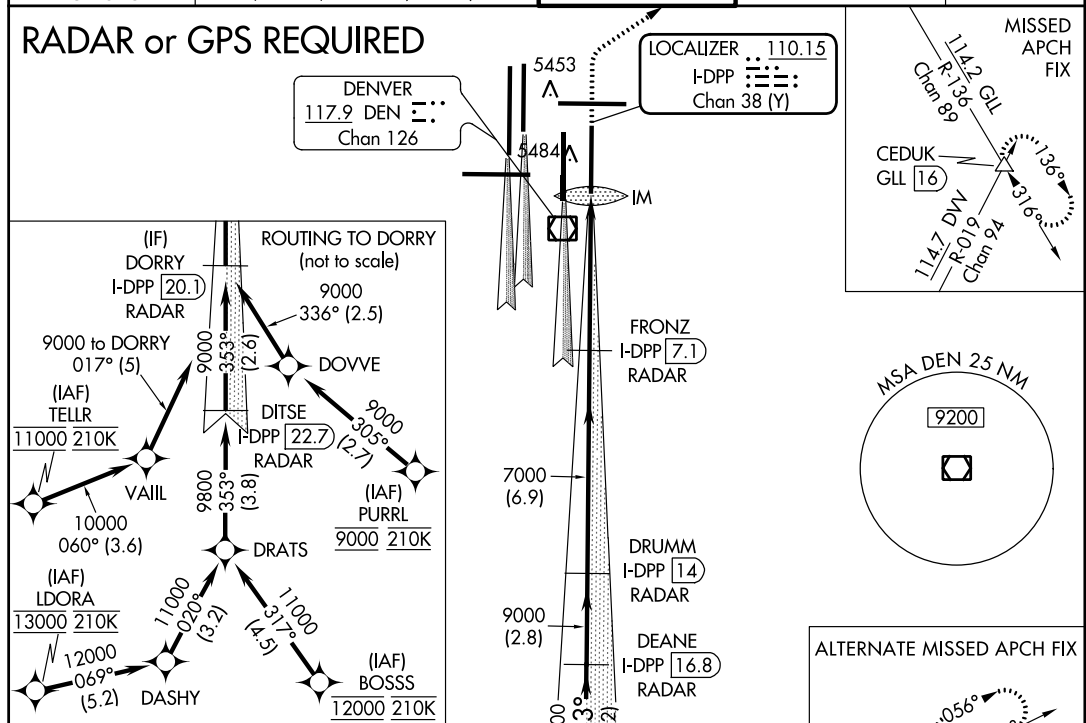
FIGURE 27.—ILS or LOC RWY 35R (DEN).

LOC/DME I-DPP <b>110.15</b> Chan <b>38</b> (Y)	APP CRS <b>353°</b>	Rwy Idg <b>12000</b> TDZE <b>5370</b> Apt Elev <b>5434</b>
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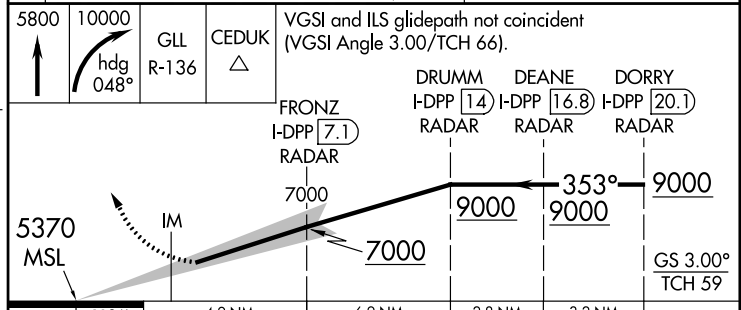
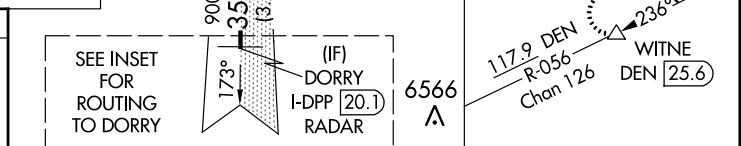
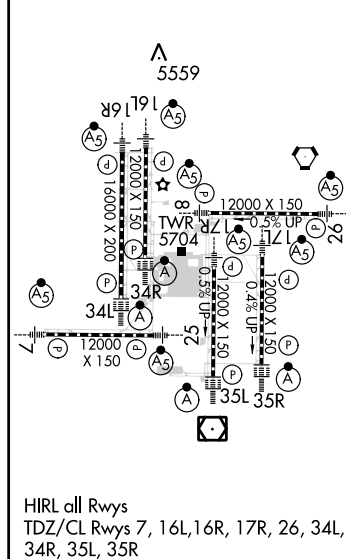
# ILS RWY 35R (SA CAT I)

DENVER INTL (DEN)

<p>Requires specific OPSPEC, MSPEC, or LOA approval and use of HUD to DH. Simultaneous approach authorized with Rwy 34L, Rwy 34R, and Rwy 35L.</p>		<p>ALSIF-2</p>	<p>MISSED APPROACH: Climb to 5800 then climbing right turn to 10000 on heading 048° and on GLL VORTAC R-136 to CEDUK/GLL 16 DME and hold.</p>	
<p>ATIS ARR <b>125.6 379.9</b> DEP <b>134.025</b></p>	<p>DENVER APP CON <b>119.3 307.3 120.35 379.3</b> (NORTH) (SOUTH)</p>	<p>DENVER TOWER <b>132.35 239.275</b></p>	<p>GND CON <b>121.85 377.1</b></p>	<p>CLNC DEL <b>118.75</b></p>



ELEV 5434 **D** TDZE 5370



CATEGORY	A	B	C	D
S-ILS 35R	RA 161/14 150 DA 5520			

**SA CATEGORY I ILS - SPECIAL AIRCREW & AIRCRAFT CERTIFICATION REQUIRED**

FIGURE 27A.—ILS RWY 35R (SA CAT I) (DEN).

LOC/DME I-DPP <b>110.15</b> Chan <b>38</b> (Y)	APP CRS <b>353°</b>	Rwy Idg <b>12000</b> TDZE <b>5370</b> Apt Elev <b>5434</b>
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# ILS RWY 35R (CAT II & III)

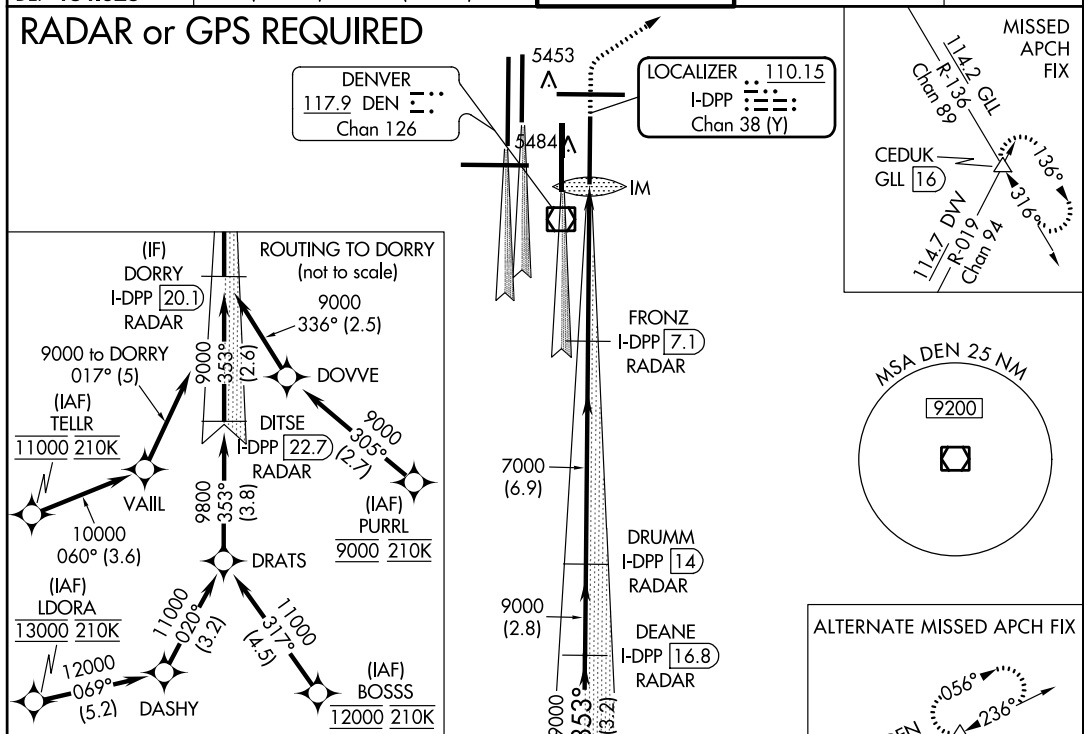
DENVER INTL (DEN)

Simultaneous approach authorized with Rwy 34L, Rwy 34R, and Rwy 35L. CAT II: RVR 1000 authorized with specific OPSPEC, MSPEC, or LOA approval and use of autoland or HUD to touchdown.

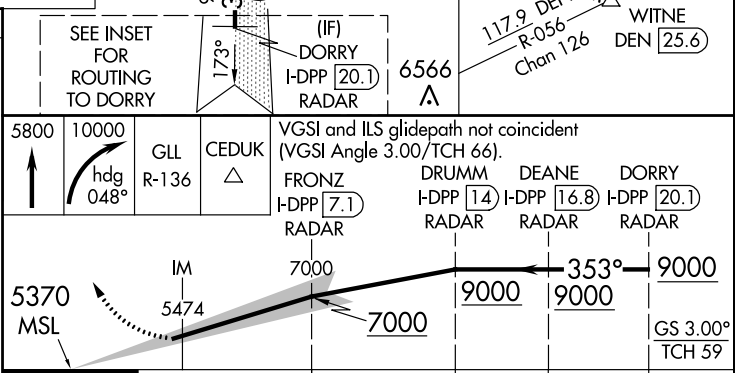
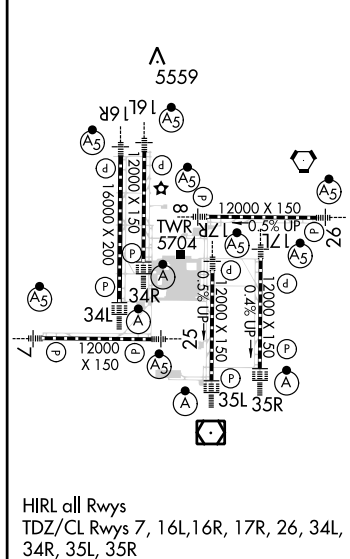
ALSF-2

MISSED APPROACH: Climb to 5800 then climbing right turn to 10000 on heading 048° and on GLL VORTAC R-136 to CEDUK/GLL 16 DME and hold.

ATIS ARR <b>125.6 379.9</b> DEP <b>134.025</b>	DENVER APP CON <b>119.3 307.3 120.35 379.3</b> (NORTH) (SOUTH)	DENVER TOWER <b>132.35 239.275</b>	GND CON <b>121.85 377.1</b>	CLNC DEL <b>118.75</b>
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ELEV 5434 TDZE 5370



CATEGORY	A	B	C	D
S-ILS 35R	CAT II RA 111/12 100 DA 5470			
S-ILS 35R	CAT IIIa RVR 07			
S-ILS 35R	CAT IIIb RVR 03			
S-ILS 35R	CAT IIIc NA			

## CATEGORY II & III ILS - SPECIAL AIRCREW & AIRCRAFT CERTIFICATION REQUIRED


FIGURE 27B.—ILS RWY 35R (CAT II & III) (DEN).

LOC/DME I-DSM <b>110.3</b> Chan 40	APP CRS <b>310°</b>	Rwy Idg THRE Apt Elev <b>9002</b> <b>958</b> <b>958</b>
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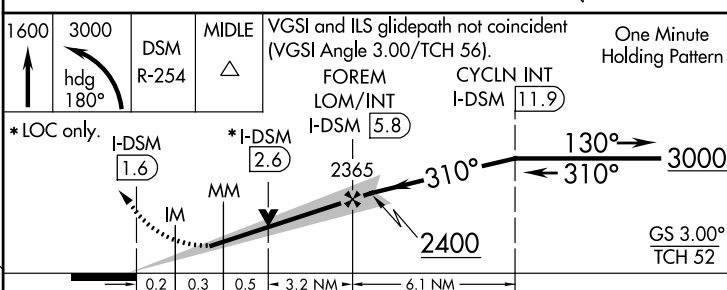
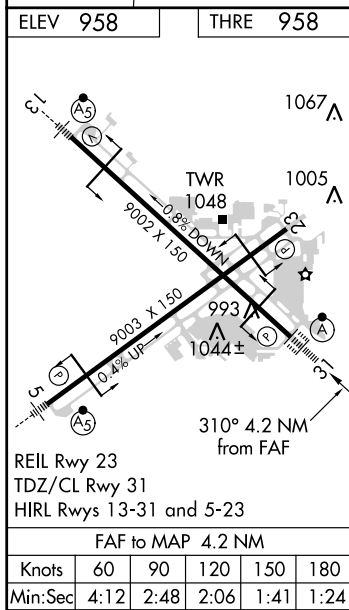
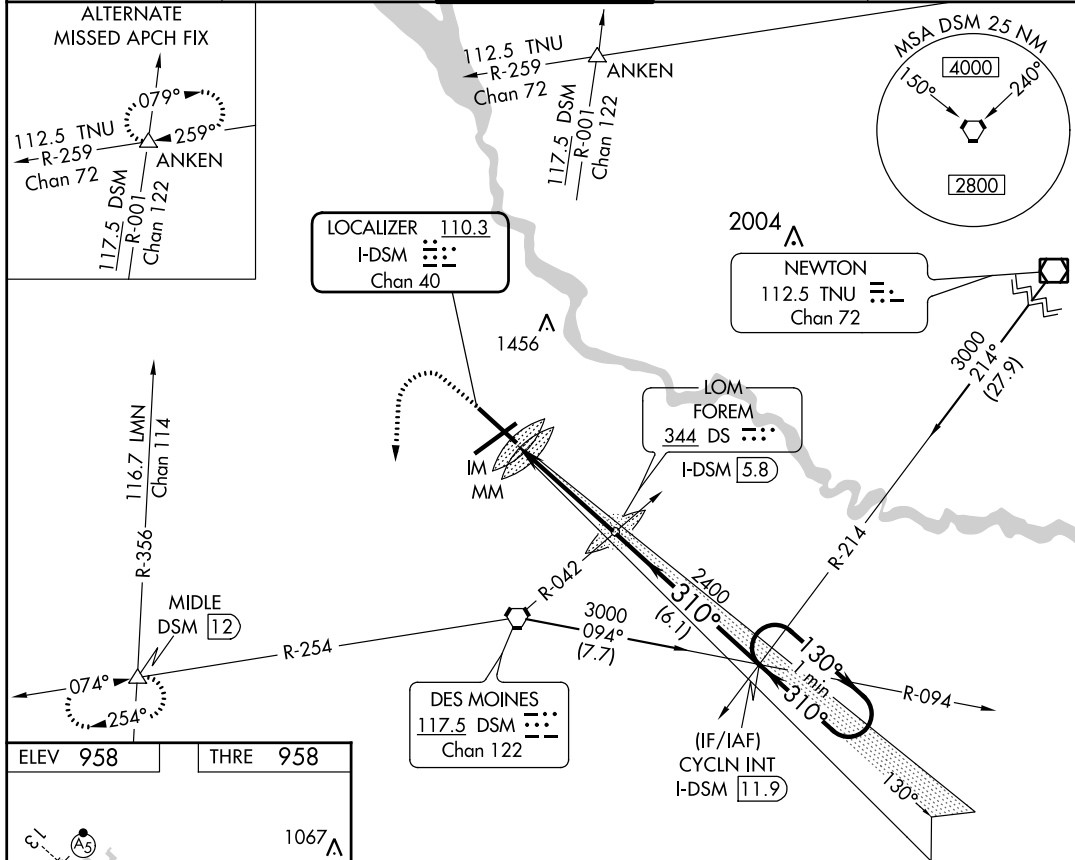
# ILS or LOC RWY 31

DES MOINES INTL (DSM)

**▲** For inop ALSF, increase S-ILS 31 Cat E visibility to RVR 4000 and S-LOC 31 Cat E visibility to RVR 6000.

ALSF-2  MISSED APPROACH: Climb to 1600 then climbing left turn to 3000 on heading 180° and DSM VORTAC R-254 to MIDLE INT/12 DME and hold.

ATIS <b>119.55 251.05</b>	DES MOINES APP CON <b>123.9 307.15</b>	DES MOINES TOWER <b>118.3 257.8</b>	GND CON <b>121.9 348.6</b>	CLNC DEL <b>134.15 317.55</b>
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CATEGORY	A	B	C	D	E
S-ILS 31	1158/18 200 (200-½)				
S-LOC 31	1320/24	362 (400-½)	1320/35 362 (400-¾)		
CIRCLING	1420-1	462 (500-1)	1420-1½ 462 (500-1½)	1520-2 562 (600-2)	1760-2¾ 802 (900-2¾)

DES MOINES, IOWA  
Amdt 23A 26JUL12

41°32'N-93°40'W

# DES MOINES INTL (DSM)

## ILS or LOC RWY 31

FIGURE 28.—ILS or LOC RWY 31 (DSM).







DES MOINES, IOWA

# HI-ILS or LOC RWY 31

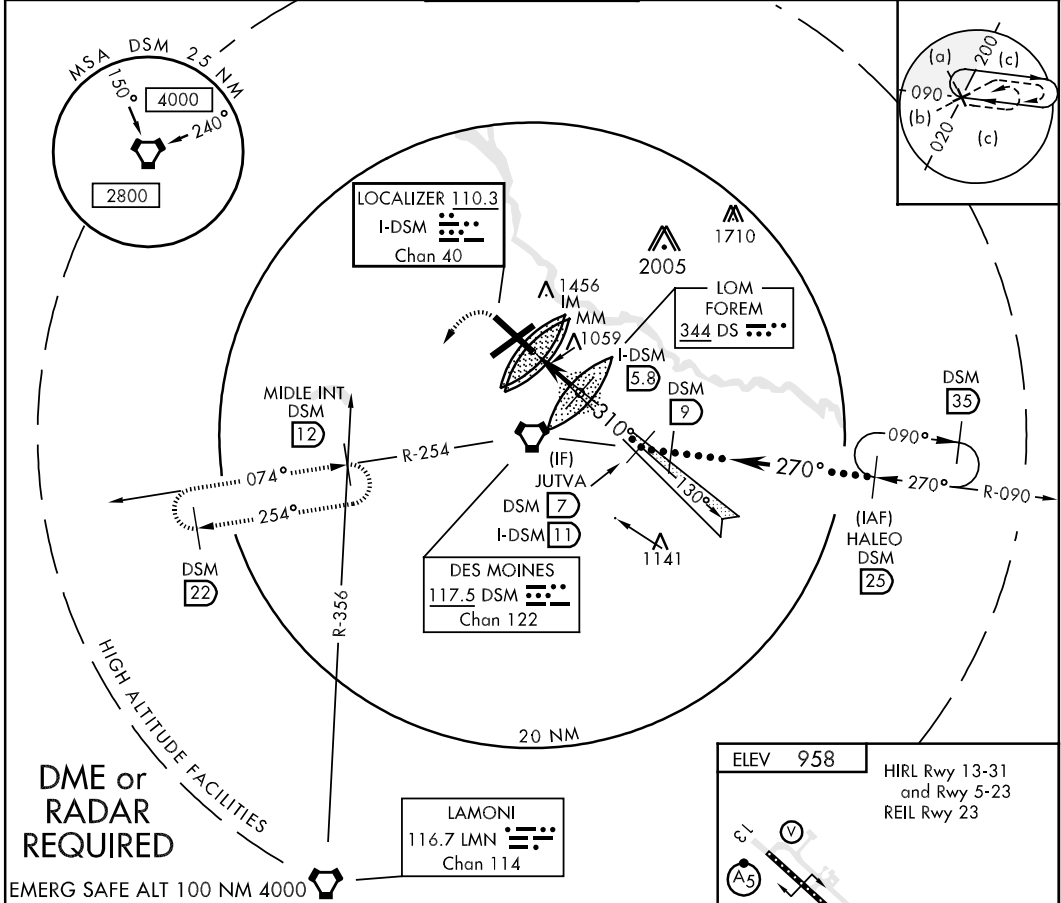
LOC I-DSM <b>110.3</b> Chan 40	APCH CRS <b>310°</b>	Rwy Idg THRE <b>9002</b> Arpt Elev <b>958</b>	JAL-117 [USAF]	DES MOINES INTL (KDSM)
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▼ Use I-DSM DME while on the LOC course.
ALSF-2
MISSED APPROACH: Climb to 1600 then climbing left turn to 3000 via heading 180° and DSM VORTAC R-254 to MIDDLE INT/DSM 12 DME and hold.

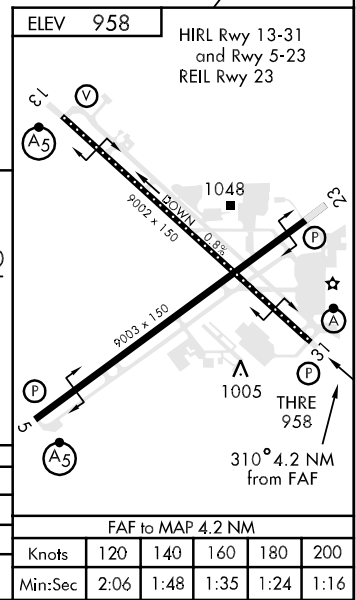
\* When ALS inop, increase CAT E RVR to 4000.

\*\* When ALS inop, increase CAT E vis to 1 mile.

ATIS <b>119.55 251.05</b>	DES MOINES APP CON <b>135.2 360.7</b>	DES MOINES TOWER <b>118.3 257.8</b>	GND CON <b>121.9 348.6</b>	CLNC DEL <b>134.15 317.55</b>
------------------------------	--	--	-------------------------------	----------------------------------



1600	3000	DSM R-254 MIDDLE INT	VGSI and ILS glidepath not coincident	HALEO R-090
↑	Hdg 180°	12	JUTVA DSM 7 I-DSM 11 DSM 9 DSM 25	10,000
I-DSM DME	I-DSM 1.3	I-DSM 2.3	FOREM LOM DSM 2365	10,000
				4000
				4000
				GS 3.00°
				TCH 52
	0.5	3.7 NM		
CATEGORY	C		D	E
S-ILS 31 *	1158/18		200	(200-¾)
S-LOC 31 **	1320/35		362	(400-¾)
CIRCLING	1420-1½	1520-2	1760-2¾	
	462 (500-1½)	562 (600-2)	802 (900-2¾)	



DES MOINES, IOWA 41° 32'N-93° 40'W DES MOINES INTL (KDSM)

# HI-ILS or LOC RWY 31

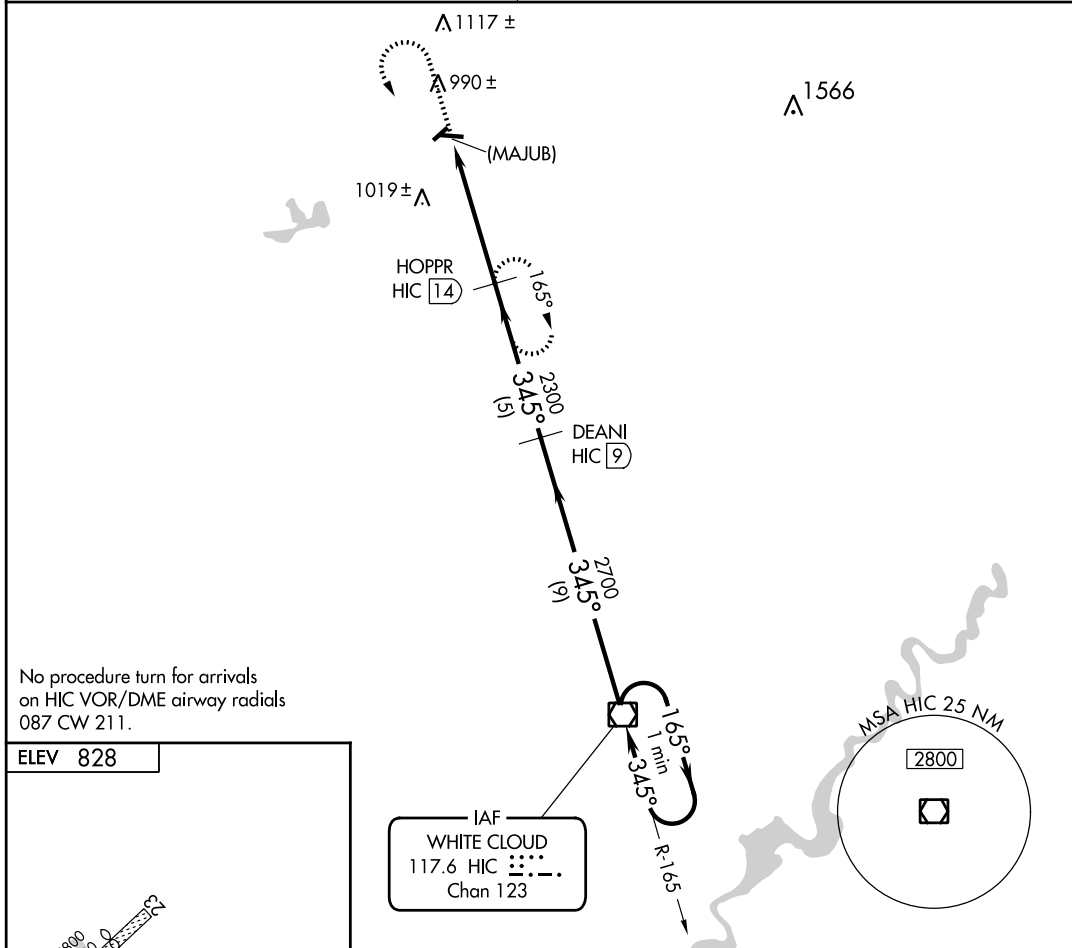
FIGURE 28B.—HI-ILS or LOC RWY 31 (KDSM).



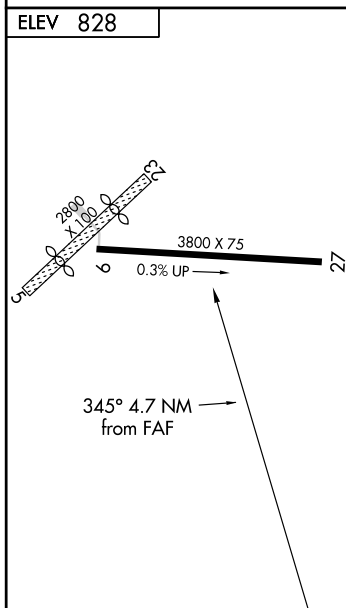
VOR/DME HIC <b>117.6</b> Chan <b>123</b>	APP CRS <b>345°</b>	Rwy ldg TDZE N/A Apt Elev <b>828</b>
--	------------------------	---

**VOR/DME or GPS-A**  
BALDWIN MUNI (7D3)

<p>▼ Use Manistee altimeter setting. ▲ NA Procedure not authorized at night.</p>	<p>MISSED APPROACH: Climb to 2600, then left turn via the HIC VOR/DME R-345 to HOPPR/14 DME and hold.</p>
<p>MINNEAPOLIS CENTER <b>120.85 322.35</b></p>	<p>CTAF <b>122.9</b></p>



No procedure turn for arrivals on HIC VOR/DME airway radials 087 CW 211.



2600	HIC R-345	HOPPR INT	DEANI HIC 9	HIC VOR/DME	One Minute Holding Pattern
2700	165°	2700	2700	2700	2700
2300	345°	2300	2300	2300	2300
MAJUB HIC 18.7	HOPPR HIC 14	DEANI HIC 9	HIC VOR/DME	One Minute Holding Pattern	
4.7 NM	5 NM	9 NM			
CATEGORY	A	B	C	D	
CIRCLING	1400-1	572 (600-1)	1400-1½ 572 (600-1½)	NA	

FIGURE 30.—VOR/DME or GPS-A (7D3).

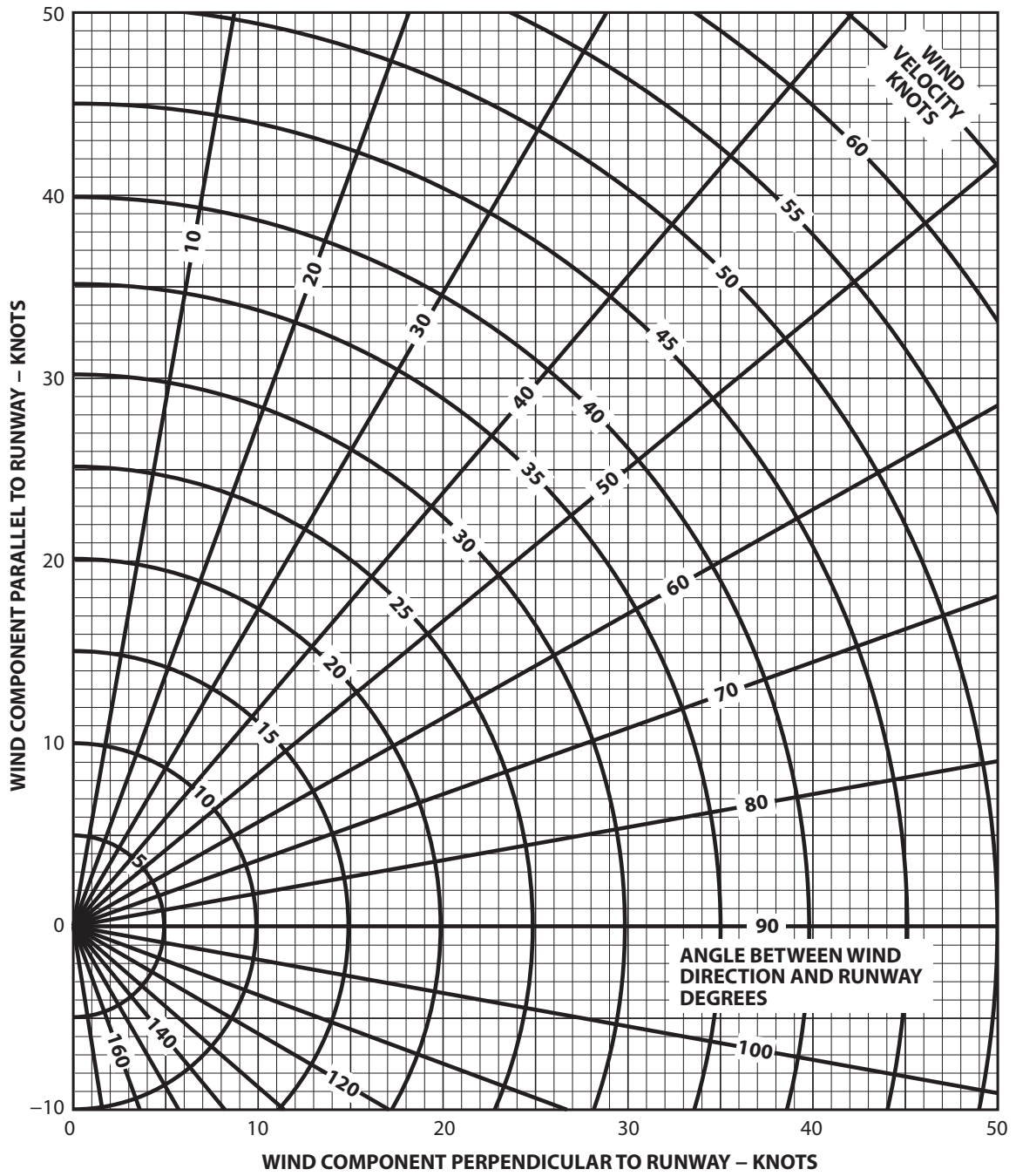


FIGURE 31.—Wind Component Chart.

**ASSOCIATED CONDITIONS:**

POWER TAKEOFF POWER  
 SET BEFORE  
 BRAKE RELEASE  
 FLAPS 20°  
 RUNWAY PAVED, LEVEL, DRY SURFACE  
 TAKEOFF SPEED IAS AS TABULATED

NOTE: GROUND ROLL IS APPROX 73% OF TOTAL TAKEOFF  
 DISTANCE OVER A 50 FT OBSTACLE

**EXAMPLE:**

OAT 75 °F  
 PRESSURE ALTITUDE 4,000 FT  
 TAKEOFF WEIGHT 3,100 LB  
 HEADWIND 20 KNOTS

TOTAL TAKEOFF DISTANCE  
 OVER A 50 FT OBSTACLE 1,350 FT  
 GROUND ROLL (73% OF 1,350) 986 FT  
 IAS TAKEOFF SPEED  
 LIFT-OFF 74 MPH  
 AT 50 FT 74 MPH

WEIGHT (LB)	IAS TAKEOFF SPEED (ASSUMES ZERO INSTR ERROR)			
	LIFT-OFF		50 FEET	
	MPH	KNOTS	MPH	KNOTS
3,400	77	67	77	67
3,200	75	65	75	65
3,000	72	63	72	63
2,800	69	60	69	60
2,600	66	57	66	57
2,400	63	55	63	55

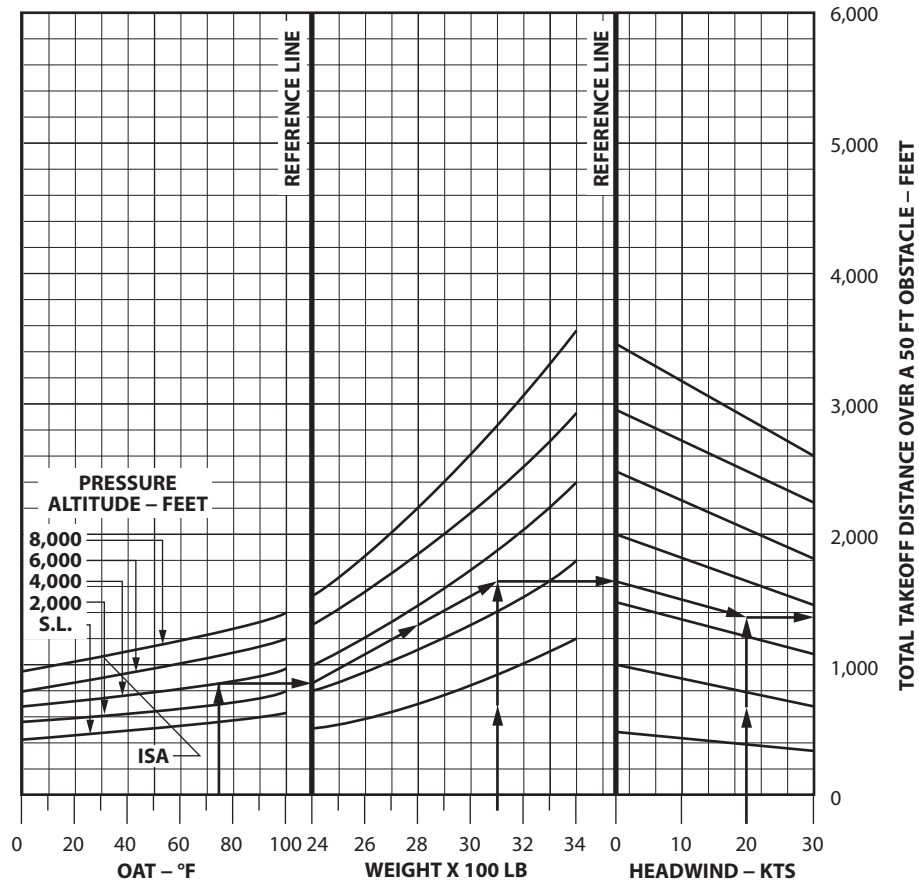


FIGURE 32.—Obstacle Take-off Chart.

**CONDITIONS:**  
 FLAPS UP  
 GEAR UP  
 2,600 RPM  
 COWL FLAPS OPEN

PRESS ALT	MP	PPH
S.L. TO 17,000	35	162
18,000	34	156
20,000	32	144
22,000	30	132
24,000	28	120

WEIGHT (LB)	PRESS ALT (FT)	CLIMB SPEED (KIAS)	RATE OF CLIMB (FPM)			
			-20 °C	0 °C	20 °C	40 °C
4,000	S.L.	100	1,170	1,035	895	755
	4,000	100	1,080	940	800	655
	8,000	100	980	840	695	555
	12,000	100	870	730	590	---
	16,000	100	740	605	470	---
	20,000	99	485	355	---	---
	24,000	97	190	70	---	---
3,700	S.L.	99	1,310	1,165	1,020	875
	4,000	99	1,215	1,070	925	775
	8,000	99	1,115	965	815	670
	12,000	99	1,000	855	710	---
	16,000	99	865	730	590	---
	20,000	97	600	470	---	---
	24,000	95	295	170	---	---
3,400	S.L.	97	1,465	1,320	1,165	1,015
	4,000	97	1,370	1,220	1,065	910
	8,000	97	1,265	1,110	955	795
	12,000	97	1,150	995	845	---
	16,000	97	1,010	865	725	---
	20,000	96	730	595	---	---
	24,000	94	405	275	---	---

FIGURE 33.—Maximum Rate of Climb Chart.

## PRESSURE ALTITUDE 6,000 FEET

**CONDITIONS:**

3,800 POUNDS

RECOMMENDED LEAN MIXTURE

COWL FLAPS CLOSED

		20 °C BELOW STANDARD TEMPERATURE -17 °C			STANDARD TEMPERATURE 3 °C			20 °C ABOVE STANDARD TEMPERATURE 23 °C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2,550	24	---	---	---	78	173	97	75	174	94
	23	76	167	96	74	169	92	71	171	89
	22	72	164	90	69	166	87	67	167	84
	21	68	160	85	65	162	82	63	163	80
2,500	24	78	169	98	75	171	95	73	172	91
	23	74	166	93	71	167	90	69	169	87
	22	70	162	88	67	164	85	65	165	82
	21	66	158	83	63	160	80	61	160	77
2,400	24	73	165	91	70	166	88	68	167	85
	23	69	161	87	67	163	84	64	164	81
	22	65	158	82	63	159	79	61	160	77
	21	61	154	77	59	155	75	57	155	73
2,300	24	68	161	86	66	162	83	64	163	80
	23	65	158	82	62	159	79	60	159	76
	22	61	154	77	59	155	75	57	155	72
	21	57	150	73	55	150	71	53	150	68
2,200	24	63	156	80	61	157	77	59	158	75
	23	60	152	76	58	153	73	56	154	71
	22	57	149	72	54	149	70	53	149	67
	21	53	144	68	51	144	66	49	143	64
	20	50	139	64	48	138	62	46	137	60
	19	46	133	60	44	132	58	43	131	57

FIGURE 34.—Cruise Performance Chart.



**ASSOCIATED CONDITIONS:**

POWER AS REQUIRED TO MAINTAIN 800 FT/MIN  
 DESCENT ON APPROACH  
 FLAPS DOWN  
 RUNWAY PAVED, LEVEL, DRY SURFACE  
 APPROACH SPEED IAS AS TABULATED

NOTE: GROUND ROLL IS APPROX 53% OF TOTAL LANDING  
 DISTANCE OVER A 50 FT OBSTACLE.

**EXAMPLE:**

OAT 75 °F  
 PRESSURE ALTITUDE 4,000 FT  
 LANDING WEIGHT 3,200 LB  
 HEADWIND 10 KNOTS

TOTAL LANDING DISTANCE  
 OVER A 50 FT OBSTACLE 1,475 FT  
 GROUND ROLL (53% OF 1,475) 782 FT  
 IAS TAKEOFF SPEED 87 MPH IAS

WEIGHT (LB)	IAS APPROACH SPEED (ASSUMES ZERO INSTR ERROR)	
	MPH	KNOTS
3,400	90	78
3,200	87	76
3,000	84	73
2,800	81	70
2,600	78	68
2,400	75	65

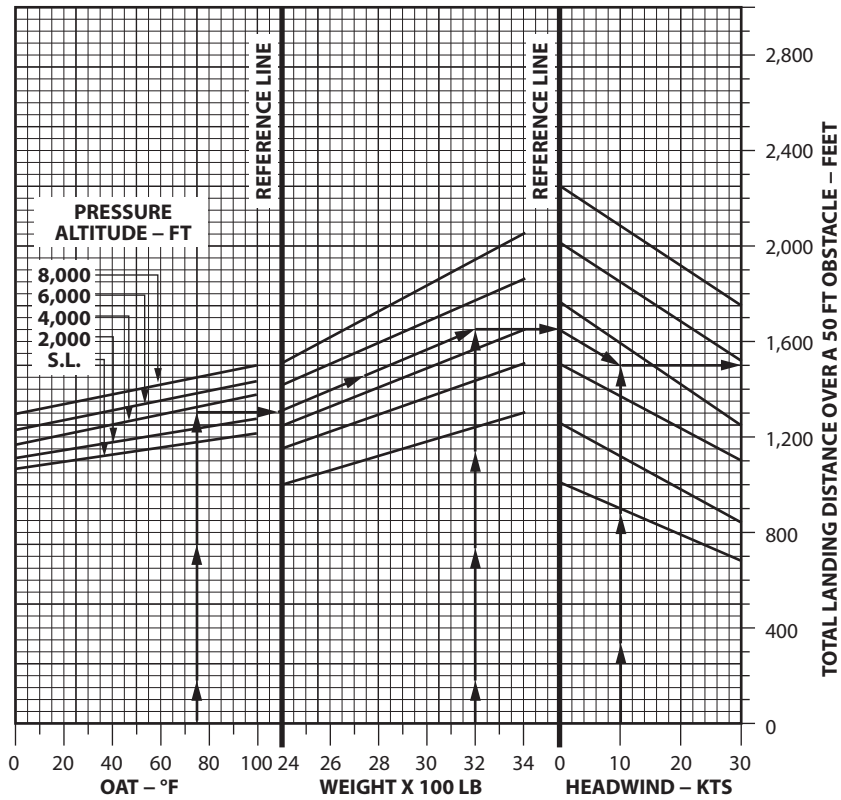


FIGURE 35.—Normal Landing Chart.

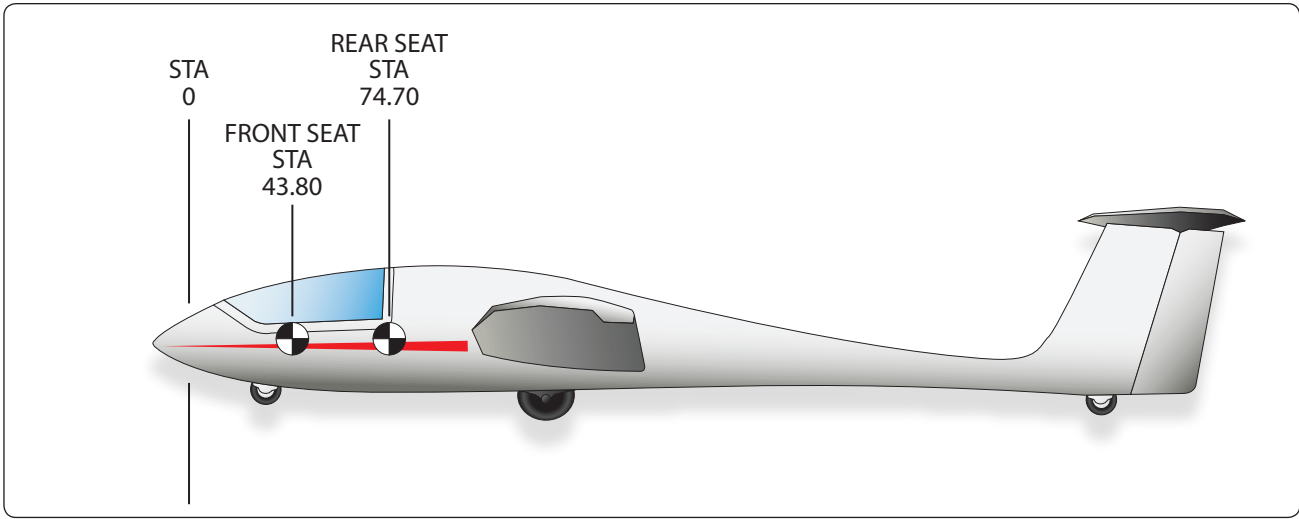


FIGURE 36.—Stations Diagram.

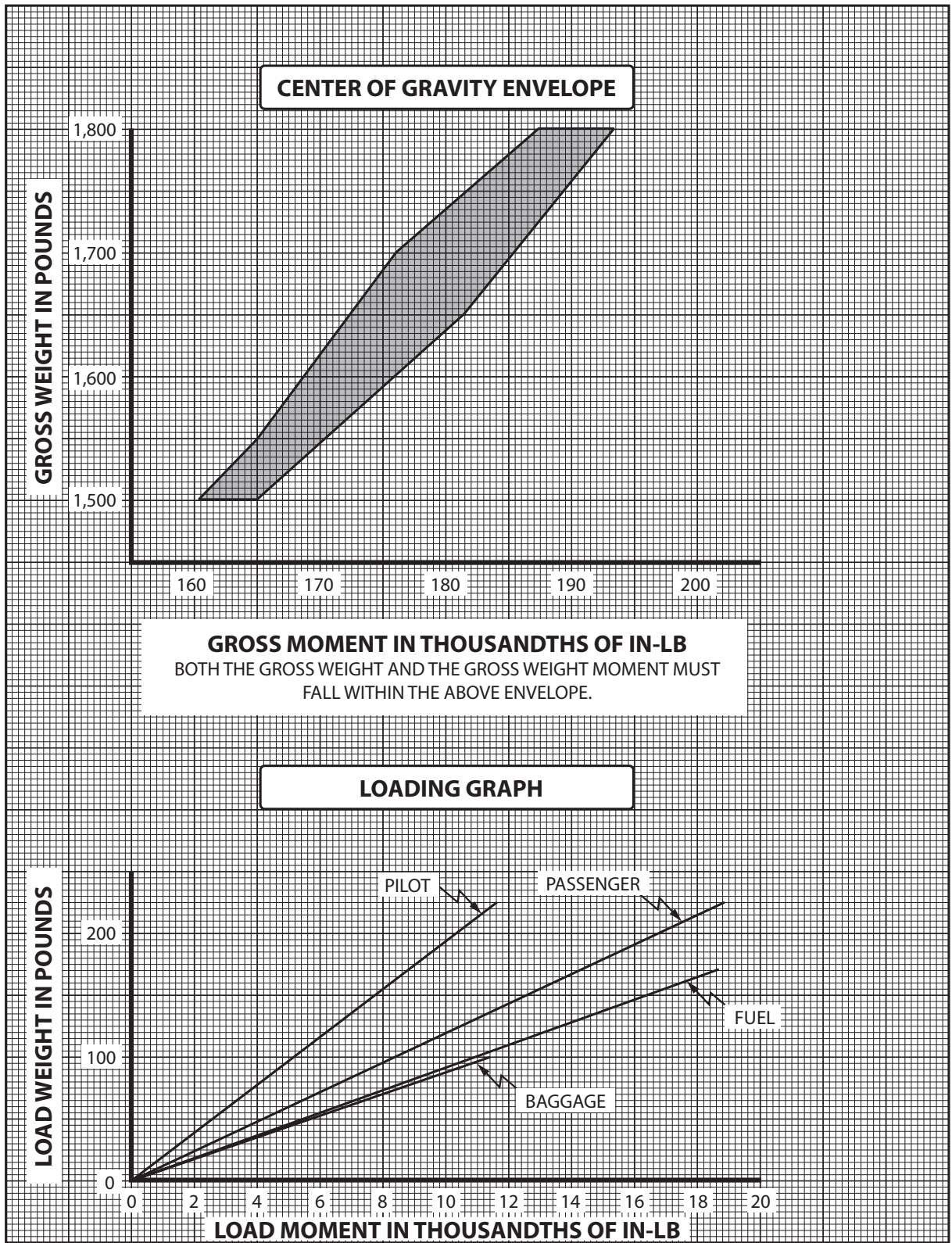


FIGURE 37.—Center of Gravity Envelope and Loading Graph.

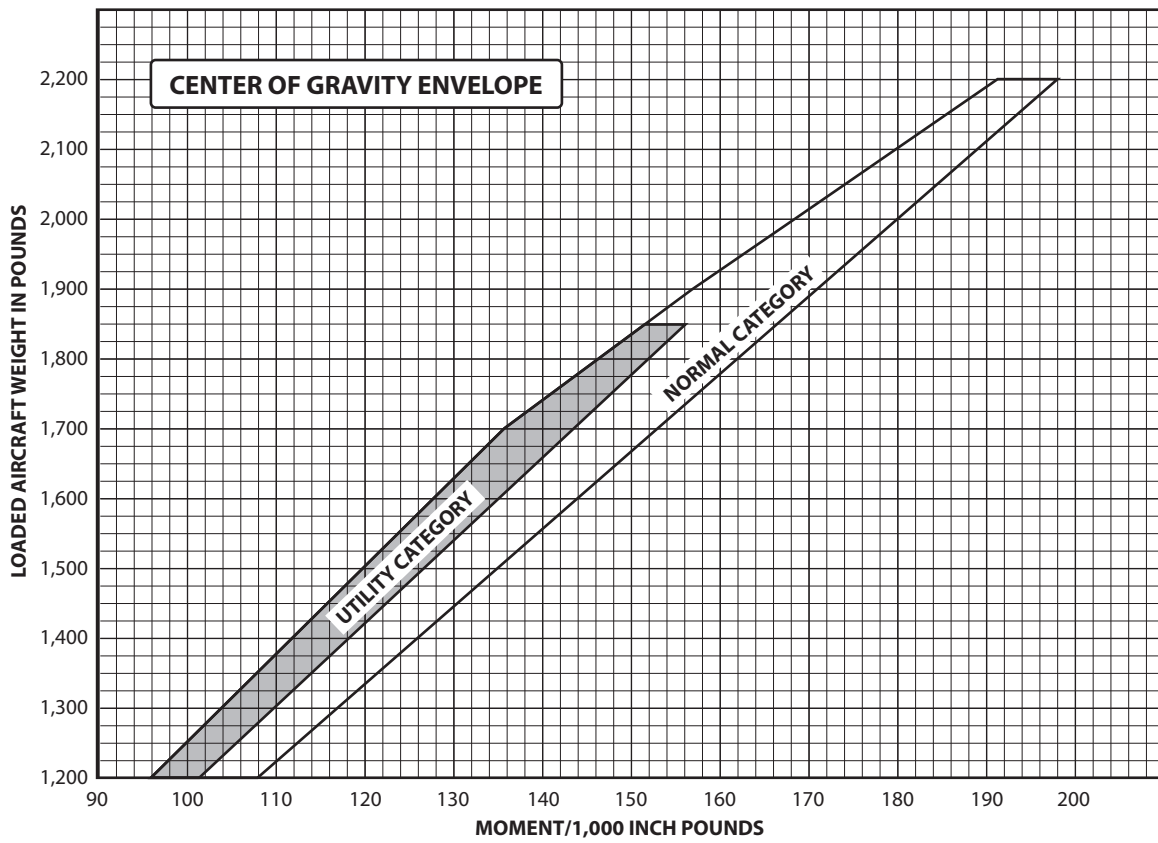
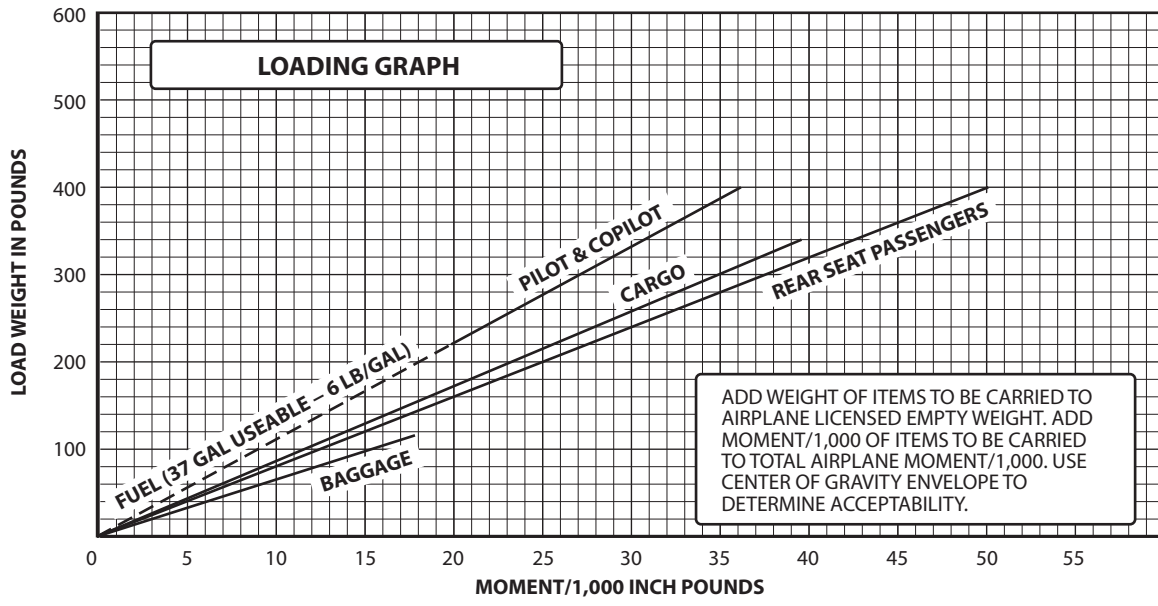


FIGURE 38.—Loading Graph and Center of Gravity Envelope.

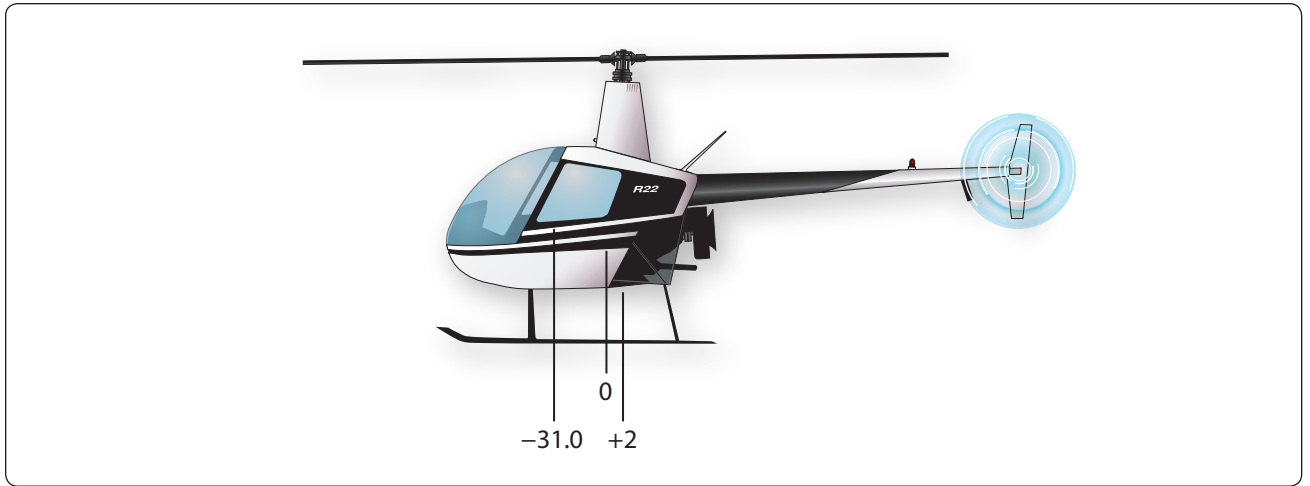


FIGURE 39.—Stations Diagram.

THE FOLLOWING CG LOCATIONS MAY BE USED WHEN DETERMINING THE HELICOPTER CG POSITION.

ITEM	LONG CG	LAT CG
PILOT & BAGGAGE UNDER "R" SEAT	79.0	+10.7
PASSENGER & BAGGAGE UNDER "L" SEAT	79.0	-9.3
MAIN FUEL	108.6	-11.0
AUX FUEL (OPTIONAL)	103.8	+11.2

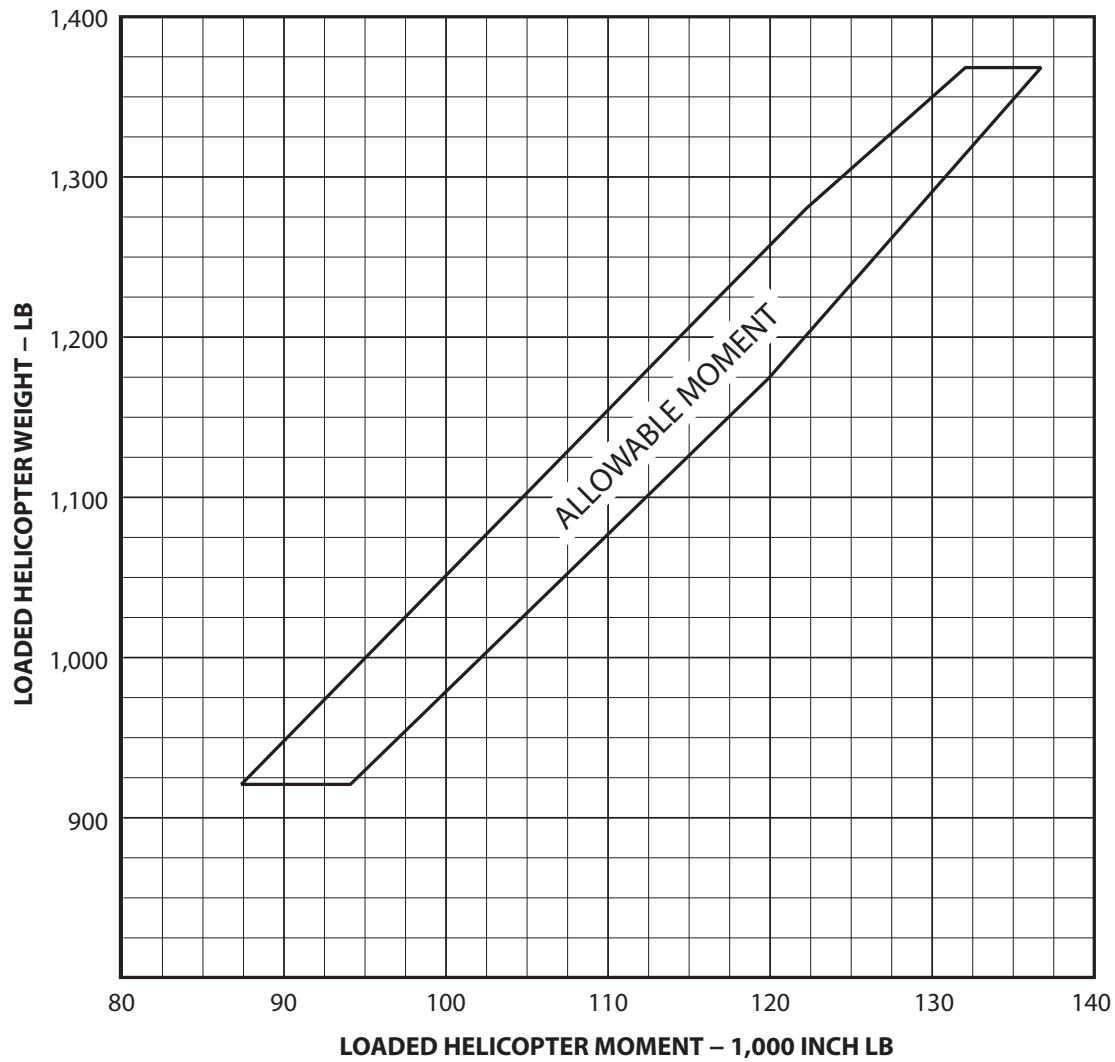


FIGURE 40.—Weight and Balance Chart.

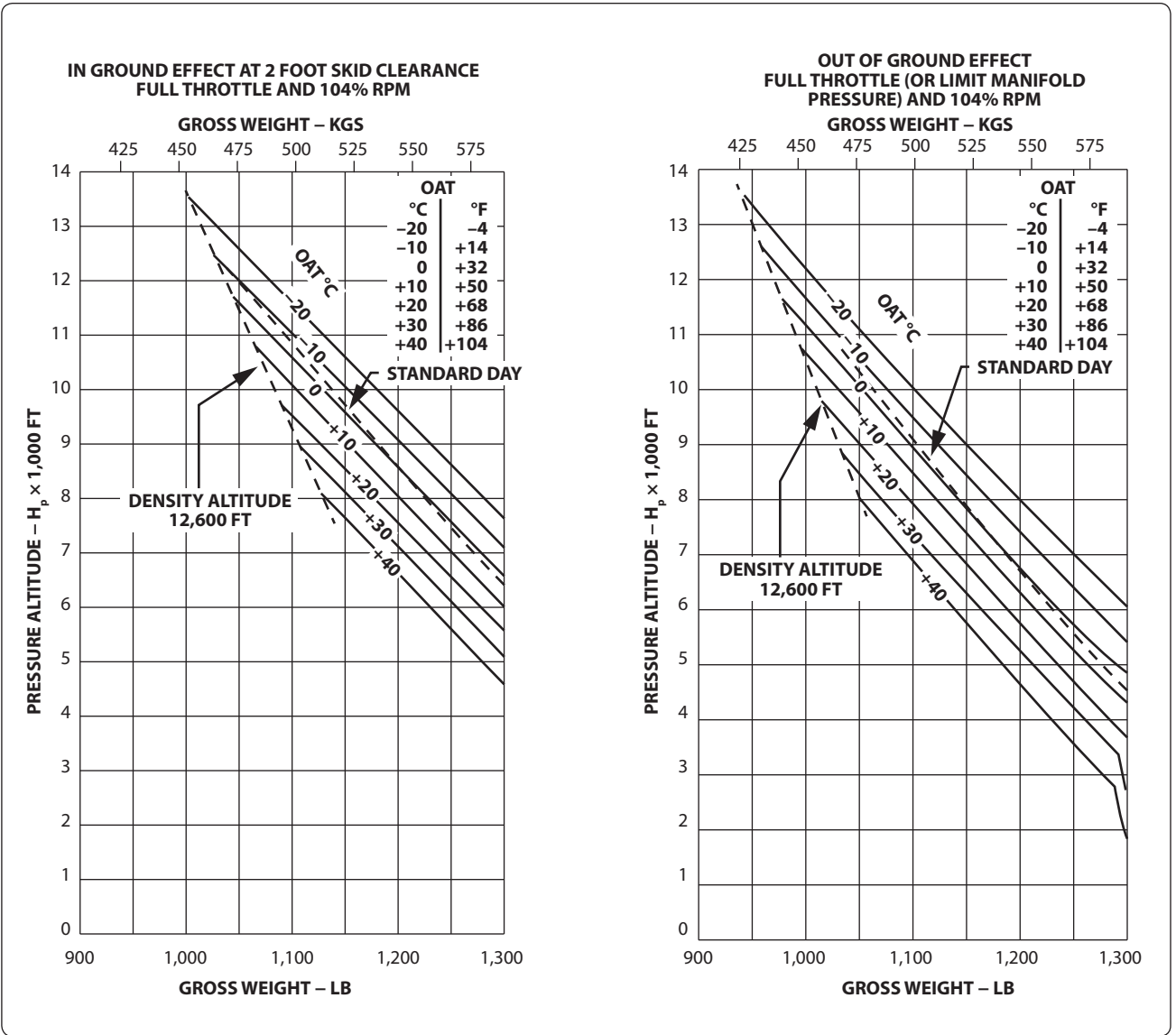


FIGURE 41.—Hover Ceiling vs. Gross Weight.

# FULL THROTTLE RATE OF CLIMB

WEIGHT — 1,400 LB

INDICATED AIRSPEED — 62 MPH

MIXTURE — RICH

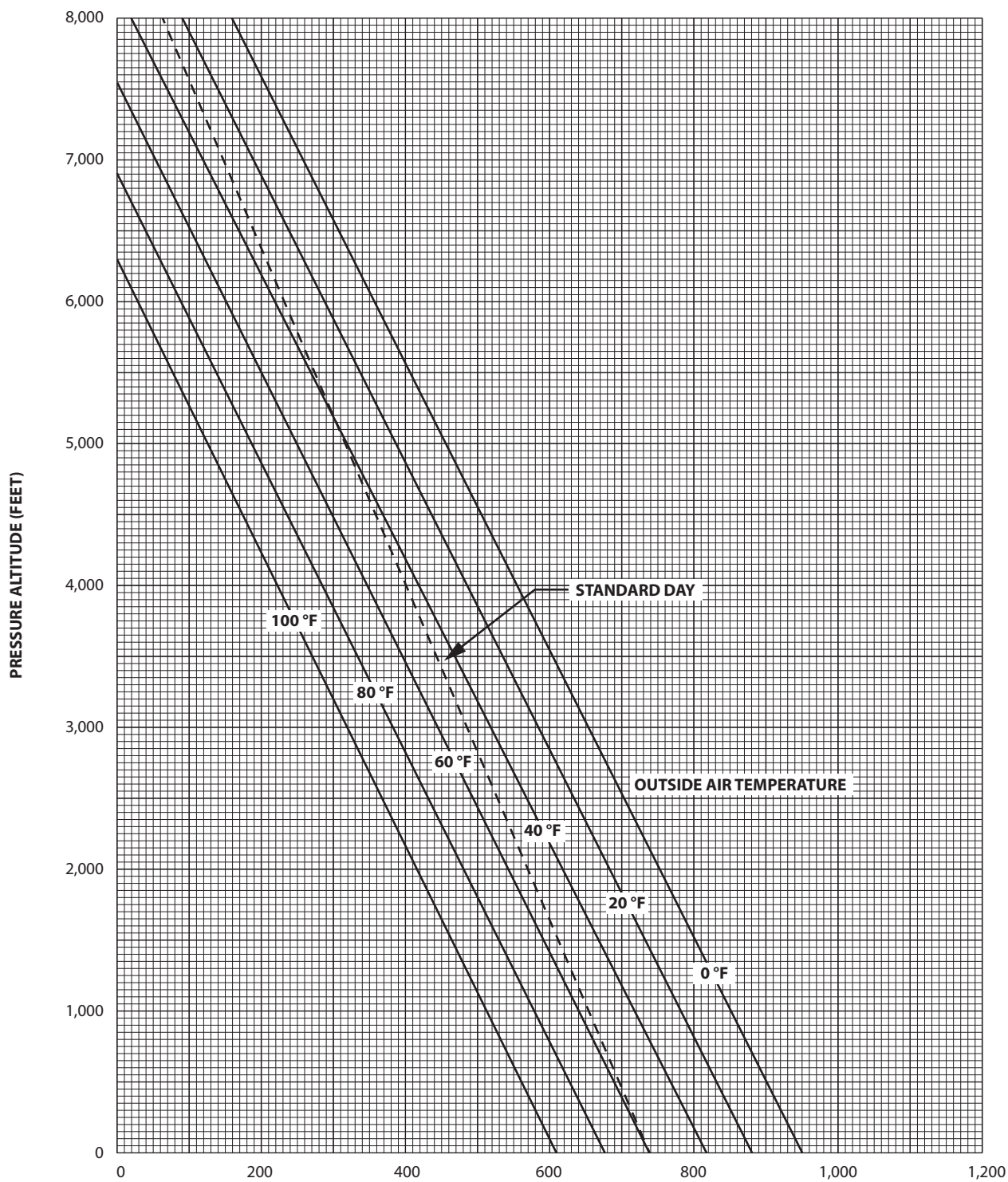


FIGURE 42.—Rate of Climb (FT/MIN).



**FULL THROTTLE — MAX RPM  
RATE OF CLIMB  
AT 64 MPH CAS  
1,800 GW  
BEST RATE OF CLIMB SPEED — 64 MPH CAS**

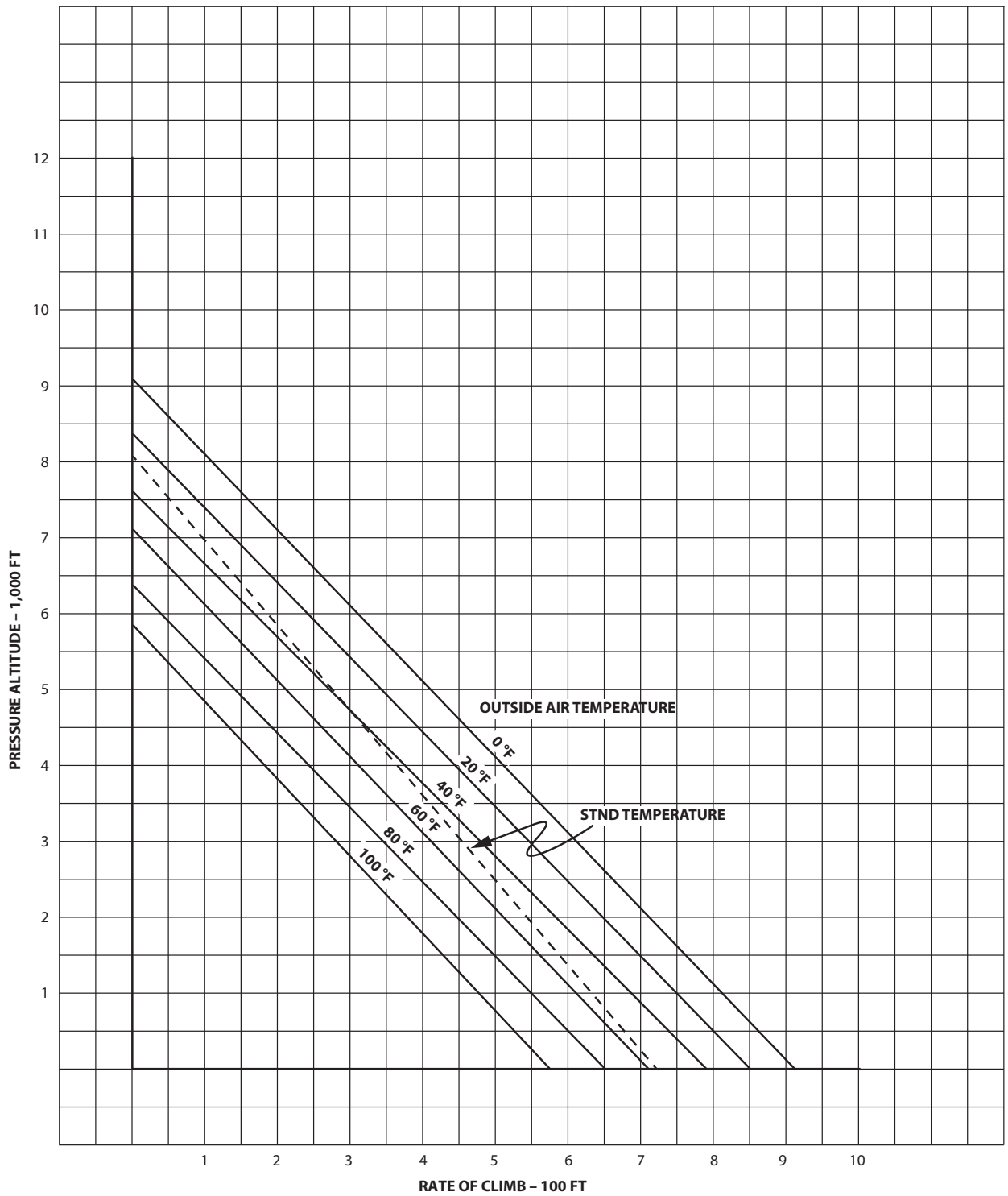


FIGURE 43.—Best Rate of Climb Speed.

**FULL THROTTLE — MAX RPM  
RATE OF CLIMB  
AT 64 MPH CAS  
1,600 GW**

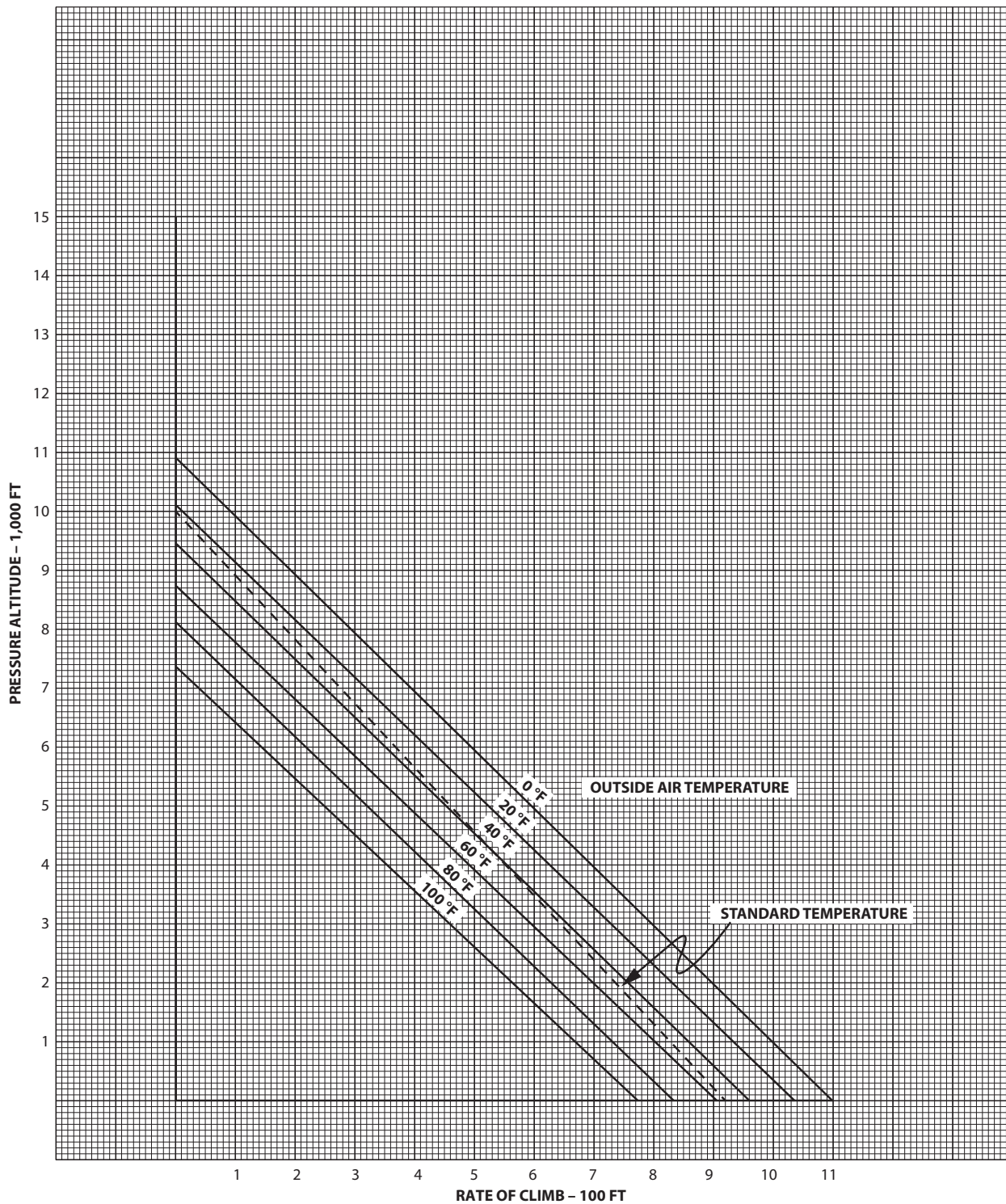


FIGURE 44.—Rate of Climb.

**TOTAL TAKEOFF DISTANCE TO CLEAR A 50 FT OBSTACLE  
 RUNNING TAKEOFF TO 30 MPH & CLIMB  
 OUT AT 50 MPH CAS – GROSS WEIGHT 1,800 LB**

**ZERO WIND  
 ROTOR PRE-ROTATED TO 370 RPM**

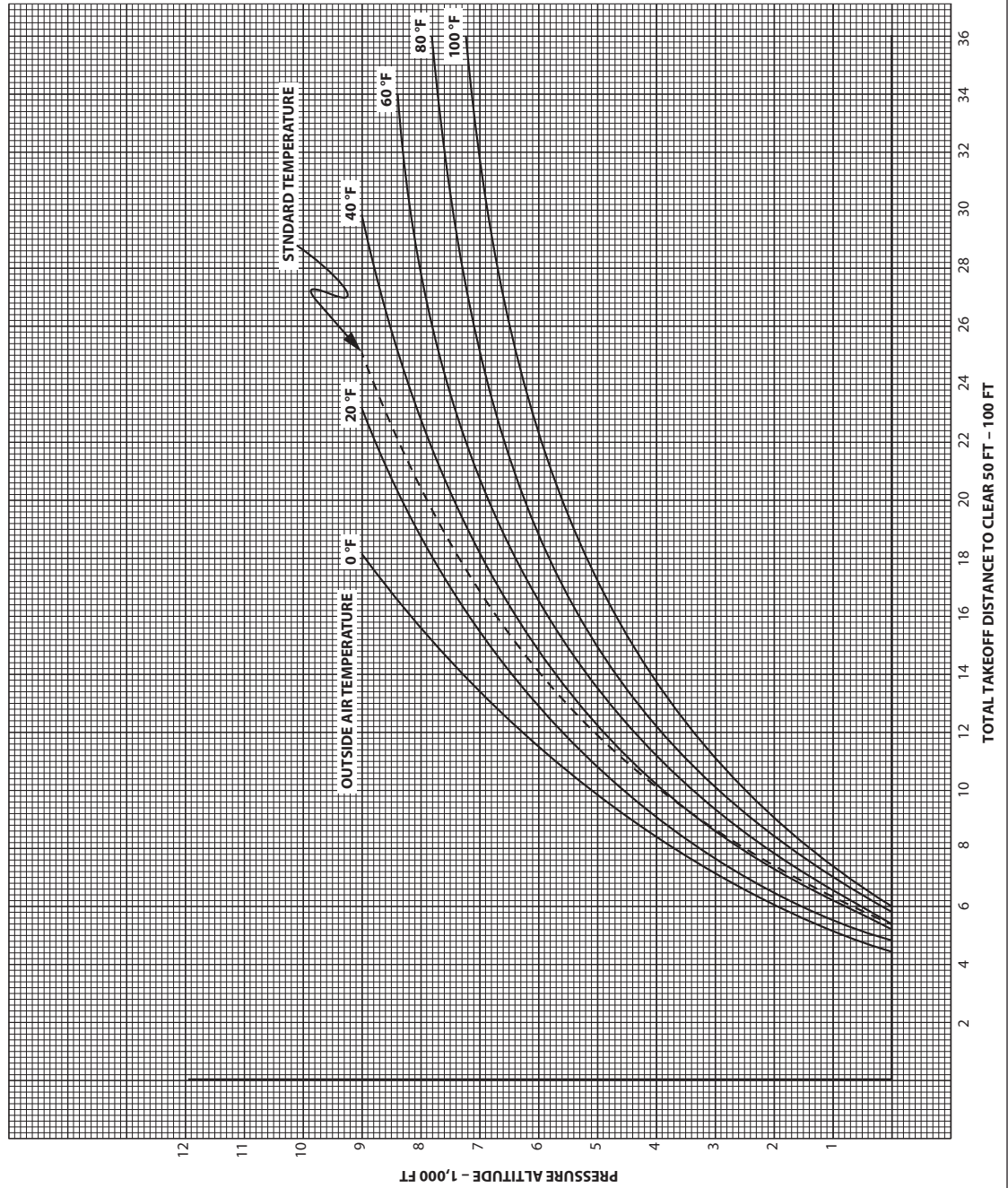


FIGURE 45.—Running Takeoff.

**TOTAL TAKEOFF DISTANCE TO CLEAR A 50 FT OBSTACLE  
JUMP TAKEOFF & CLIMB OUT AT 50 MPH CAS**

**GROSS WEIGHT 1,800 LB - ZERO WIND  
ROTOR PRE-ROTATED TO 370 RPM**

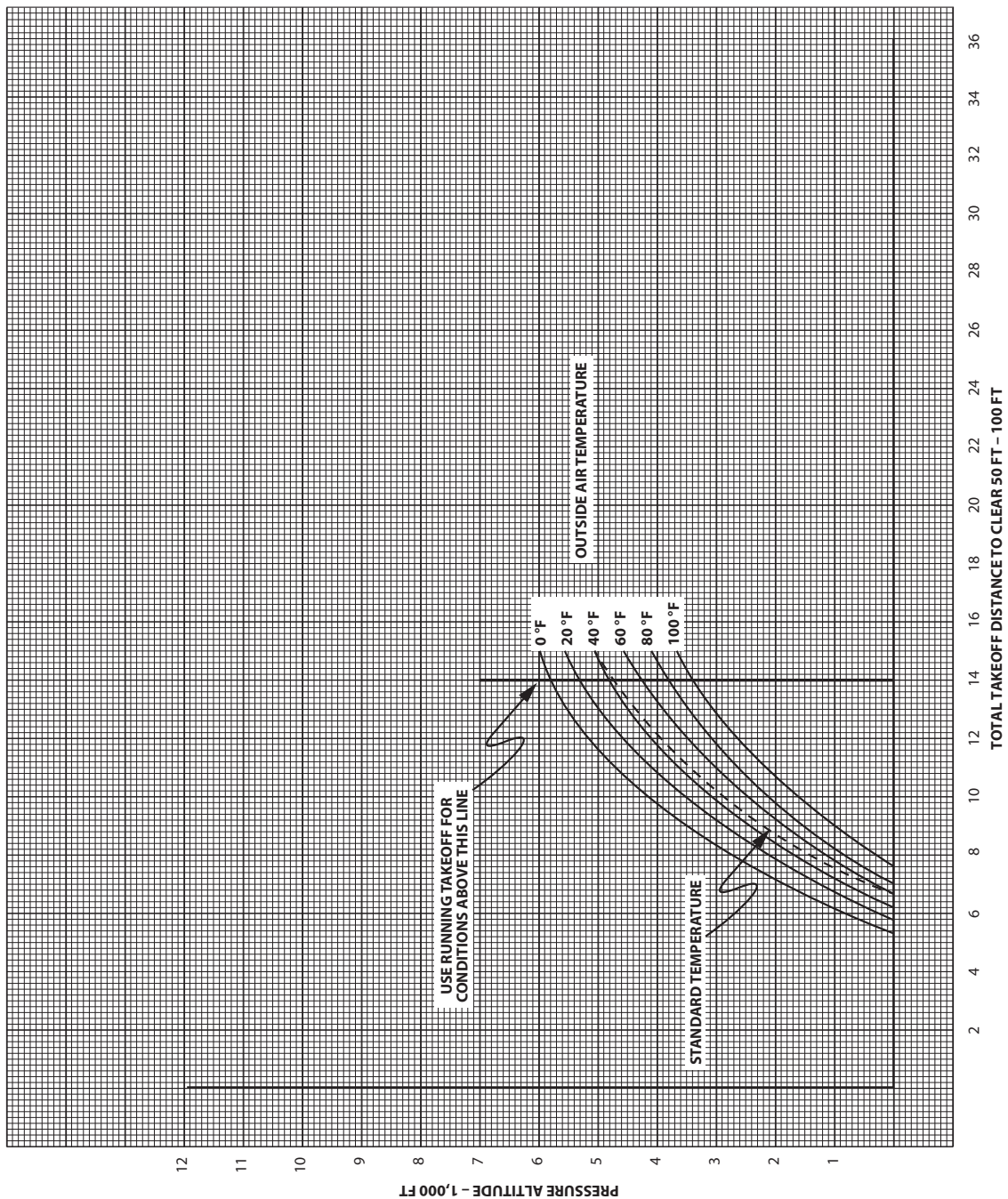


FIGURE 46.—Jump Takeoff.

**DESIGN DATA**

WING SPAN	51'	EMPTY WEIGHT	600 LB
LENGTH	25' 9"	GROSS WEIGHT	1,040 LB
HEIGHT	9' 3-1/2"	WING AREA	219.5 SQ FT
ASPECT RATIO	11.85	WING LOADING	4.74 PSF

**PERFORMANCE**

MAX SPEED	98 MPH	STALL (DUAL)	35 MPH
AIRPLANE TOW	98 MPH	L/D MPH (SOLO)	22.25 TO 1 AT 45
AUTO WINCH	69 MPH	L/D MPH (DUAL)	22.25 TO 1 AT 52
DRIVE BRAKE			
EXTEND. MAX	98 MPH	SINK SPEED (SOLO)	2.6 FPS AT 38
STALL (SOLO)	31 MPH	SINK SPEED (DUAL)	3.1 FPS AT 42

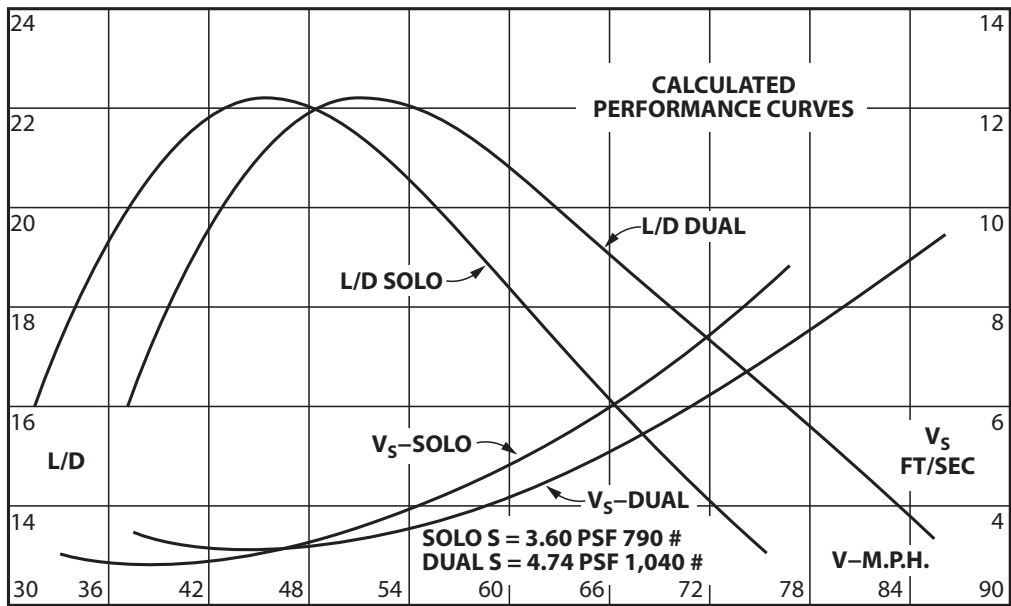


FIGURE 48.—Performance Curves Chart.

PERFORMANCE CURVES GROSS WEIGHT = 575 LB

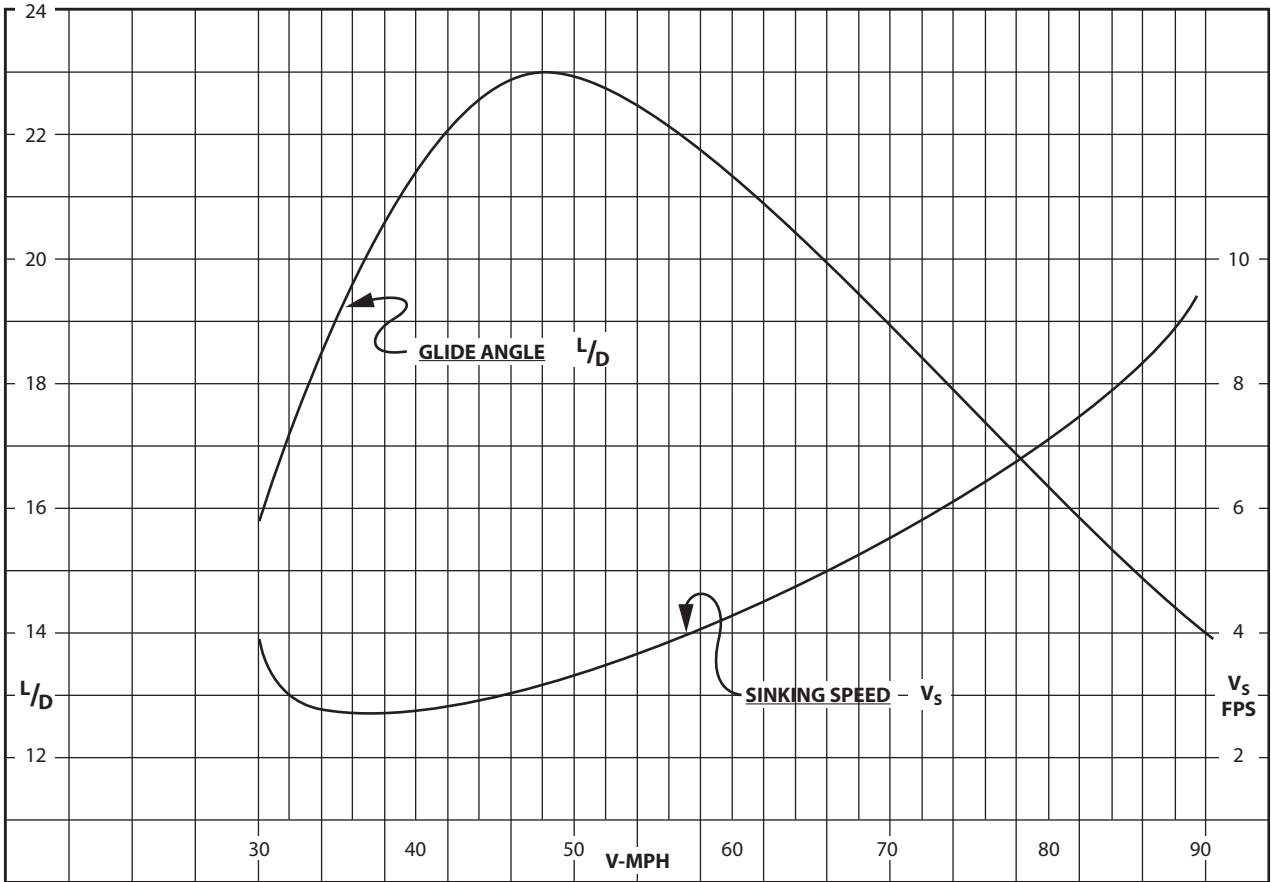


FIGURE 49.—Performance Curves Chart.

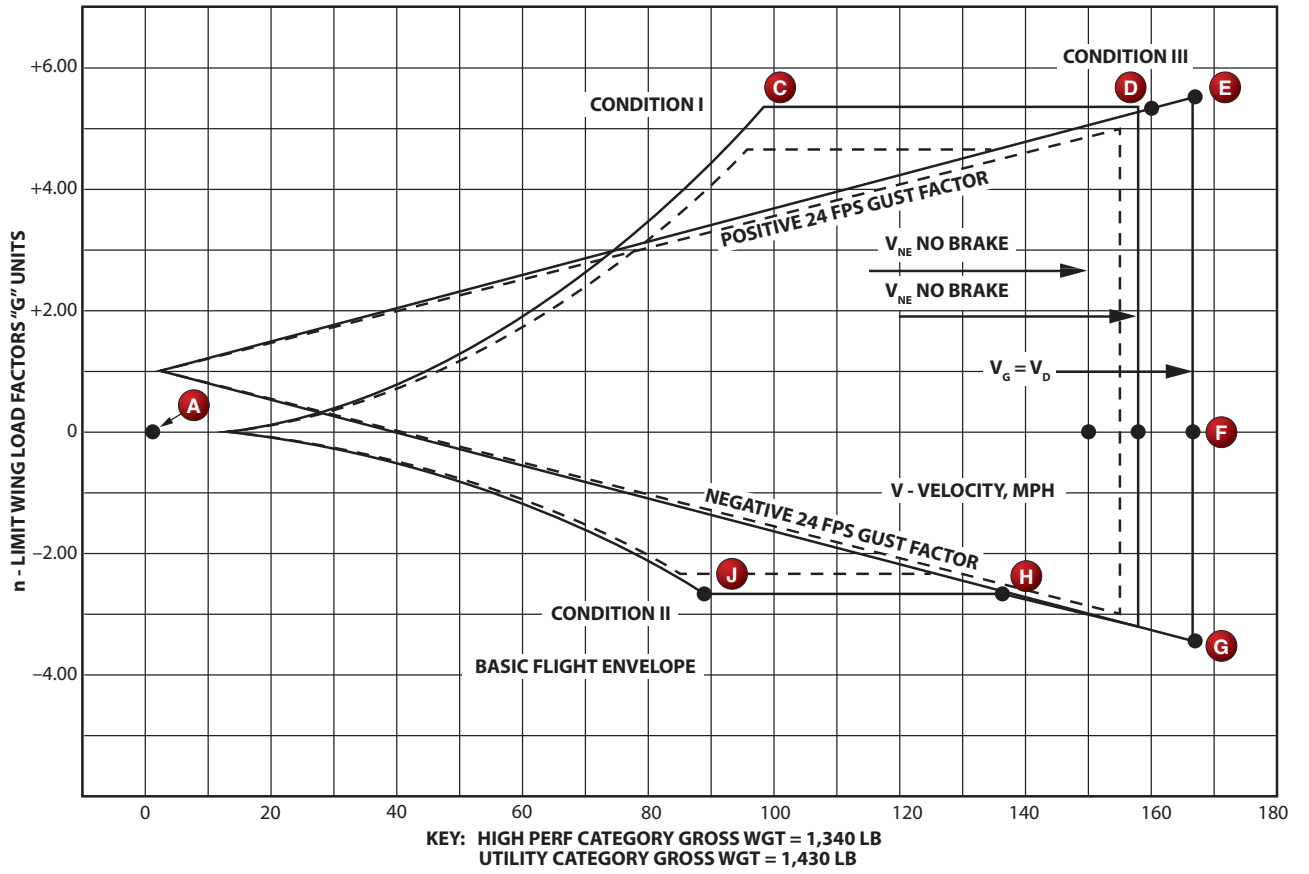


FIGURE 50.—Flight Envelope.

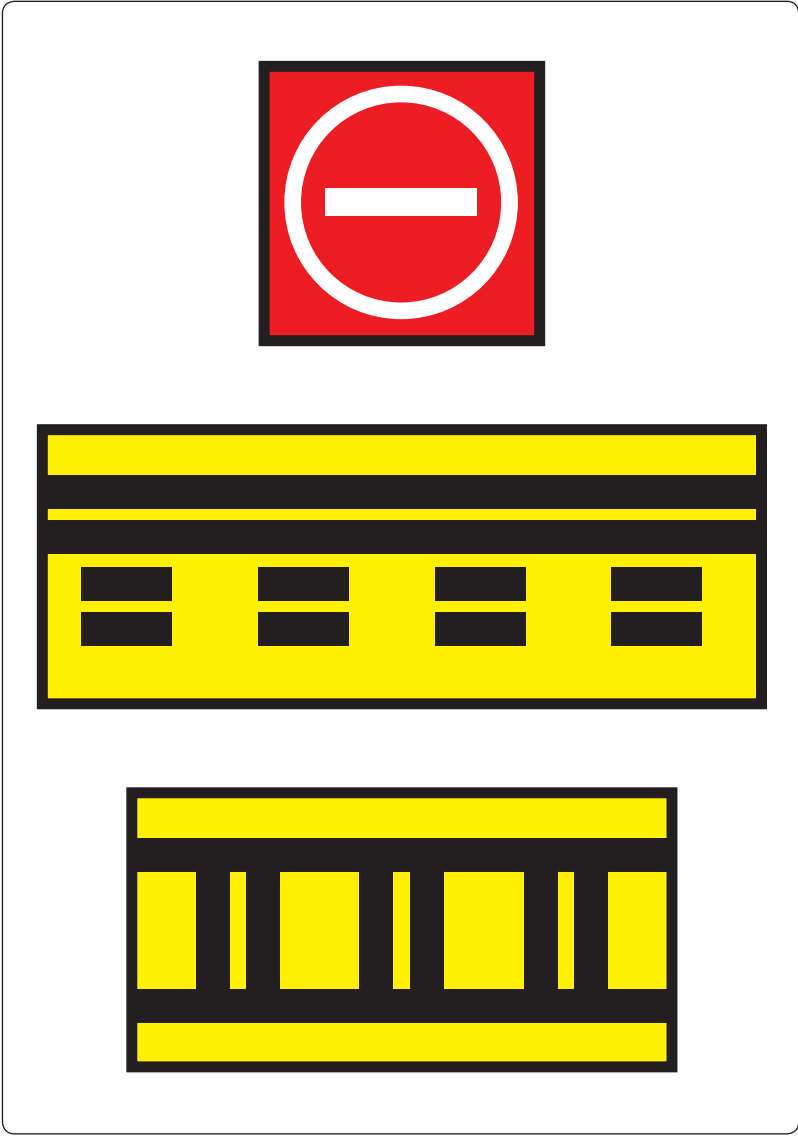


FIGURE 51.—Airport Signs.



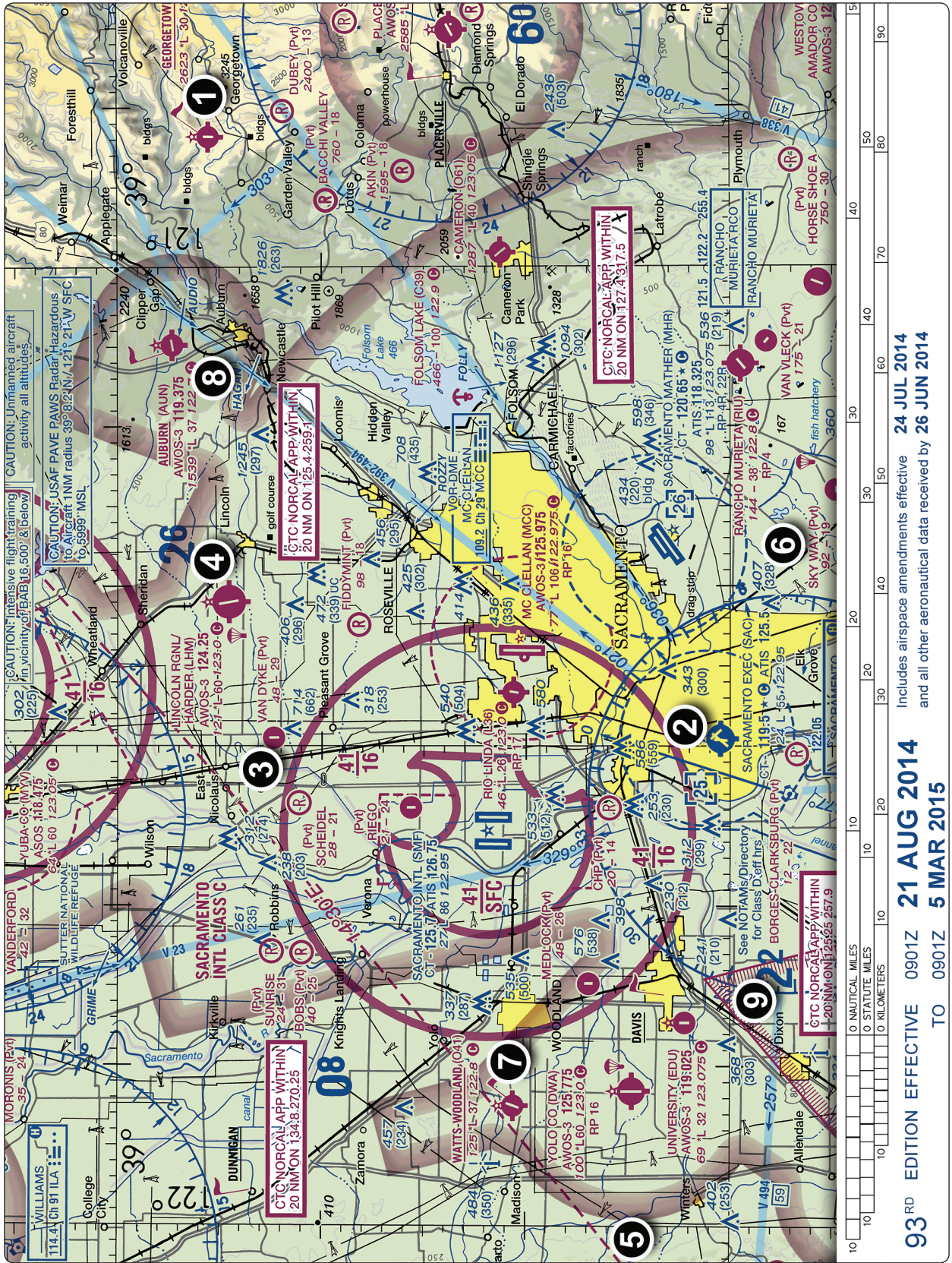


FIGURE 52.—Sectional Chart Excerpt.

NOTE: Chart is not to scale and should not be used for navigation. Use associated scale. Chart is for testing purposes only.

93<sup>RD</sup> EDITION EFFECTIVE 0901Z 21 AUG 2014 TO 0901Z 5 MAR 2015  
 Includes airspace amendments effective 24 JUL 2014  
 and all other aeronautical data received by 26 JUN 2014





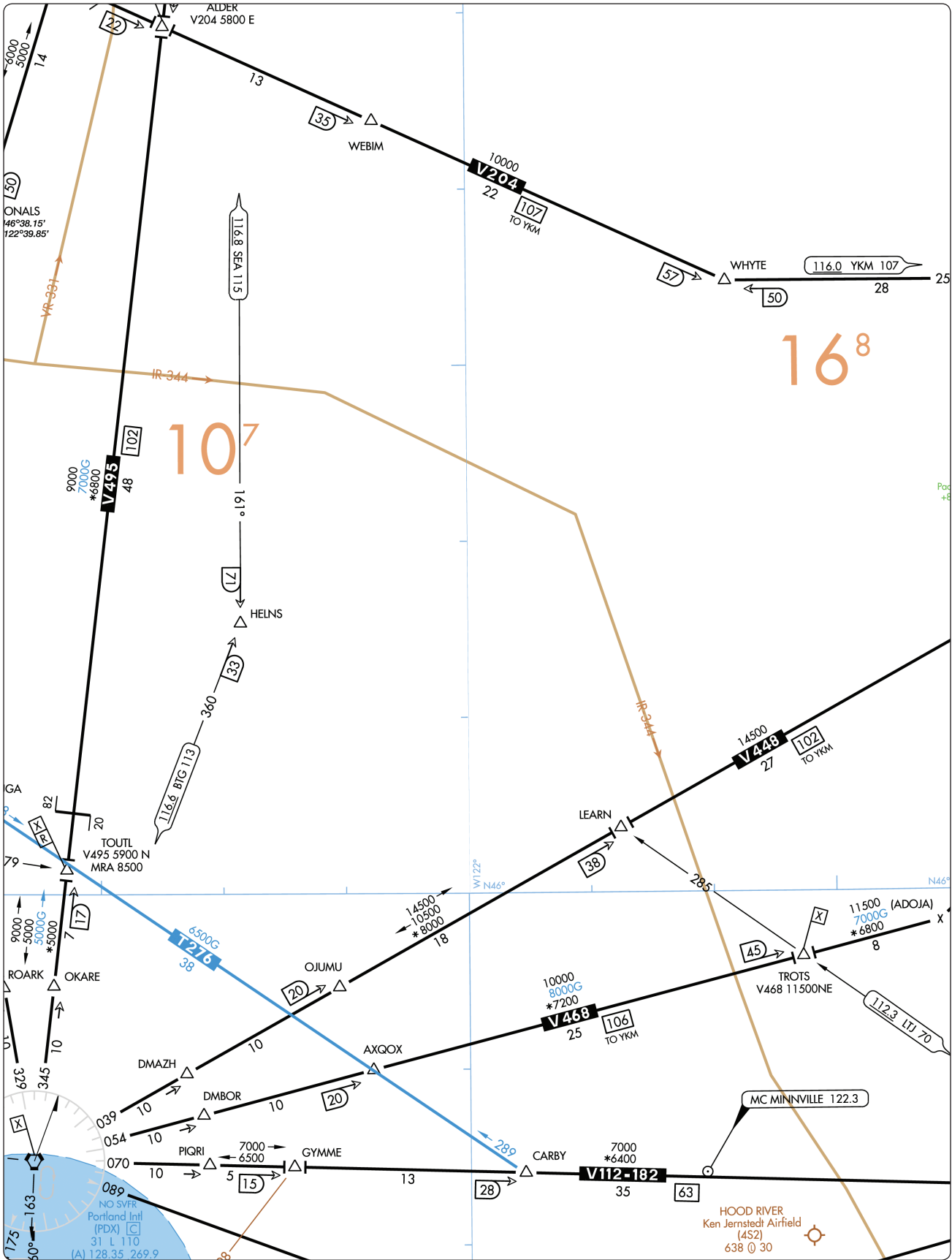




FIGURE 54.—Sectional Chart Excerpt.

NOTE: Chart is not to scale and should not be used for navigation. Use associated scale. Chart is for testing purposes only.





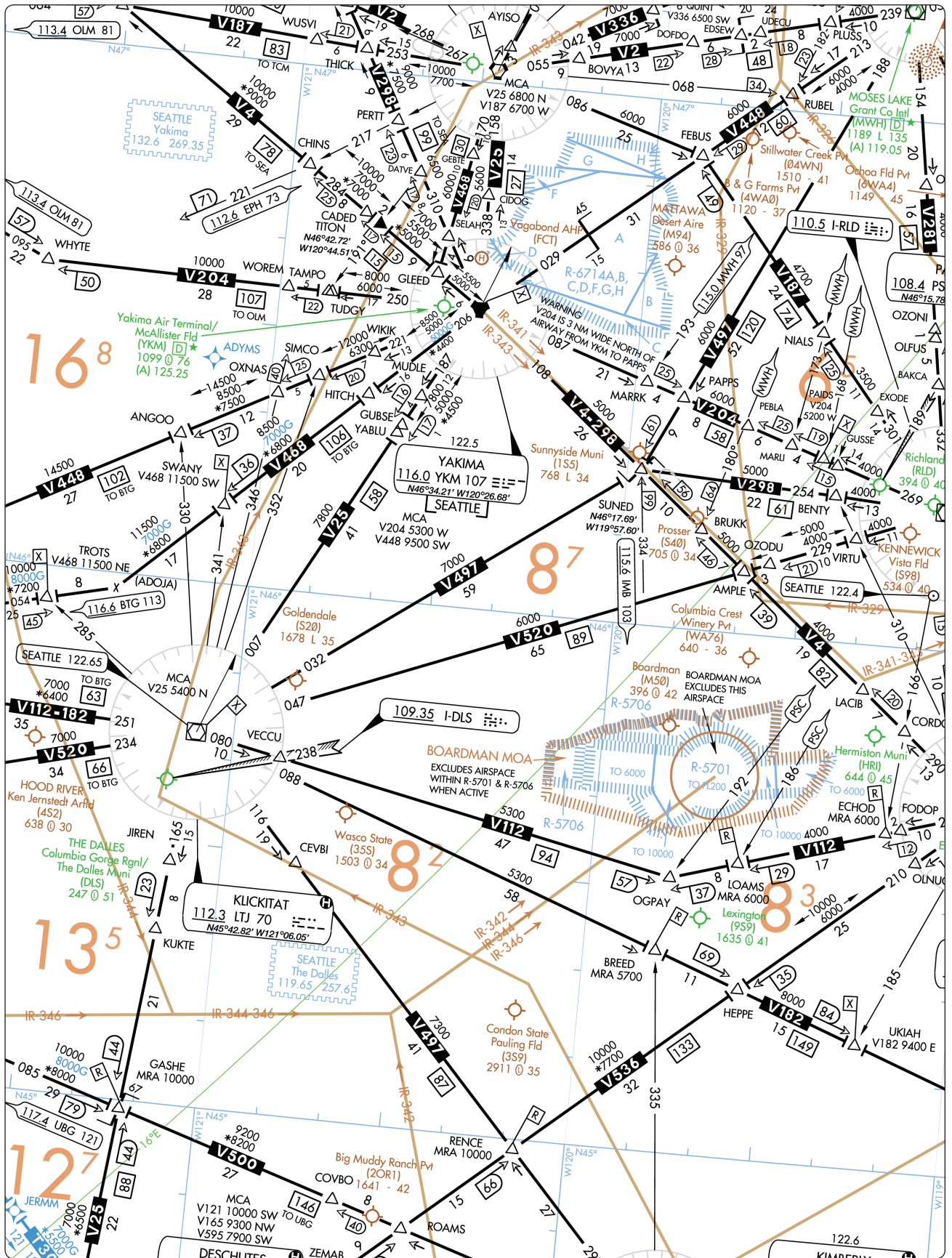


FIGURE 55A.—En Route Low Altitude Segment.

NOTE: Chart is not to scale and should not be used for navigation. Chart is for testing purposes only.



FIGURE 56.—Two signs.



FIGURE 57.—Sign.

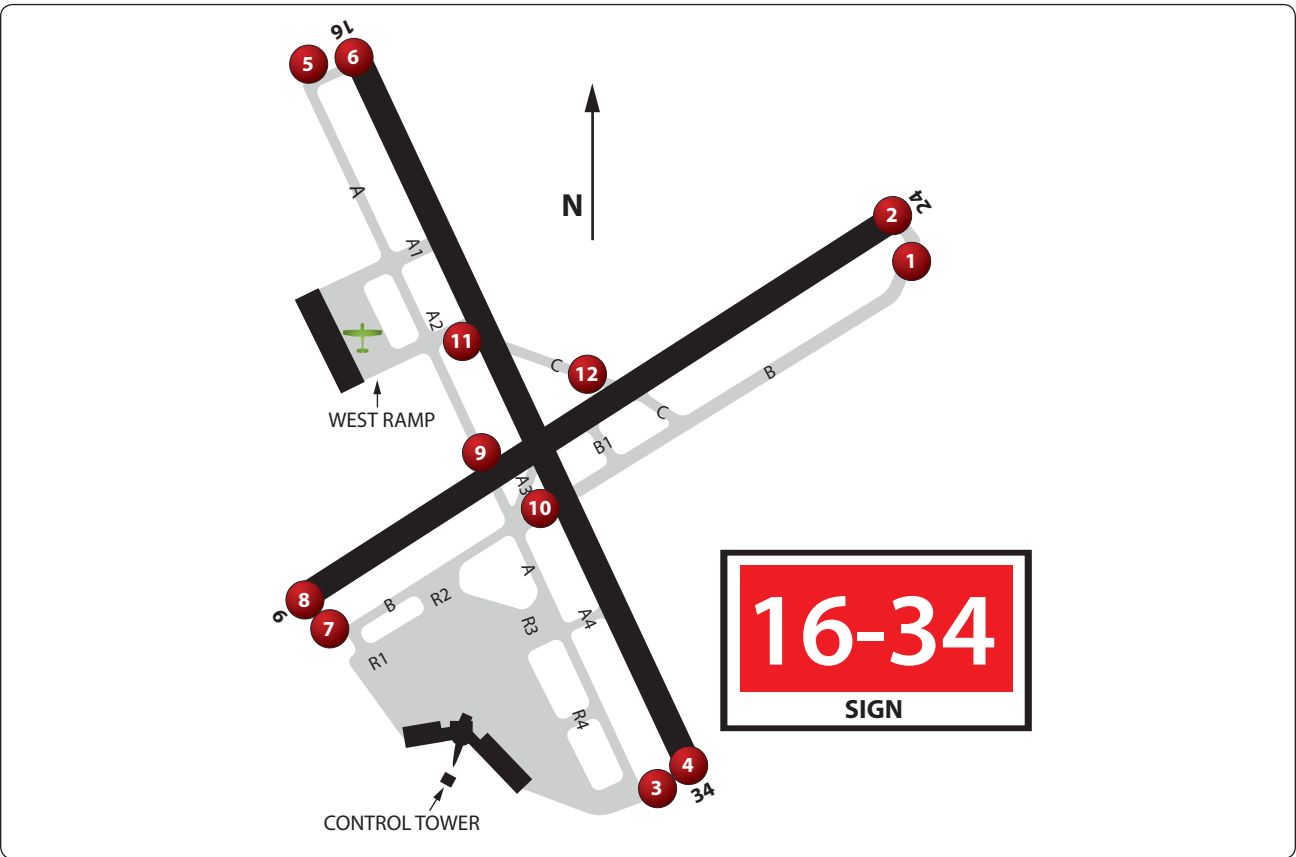


FIGURE 58.—Airport Diagram and Sign.

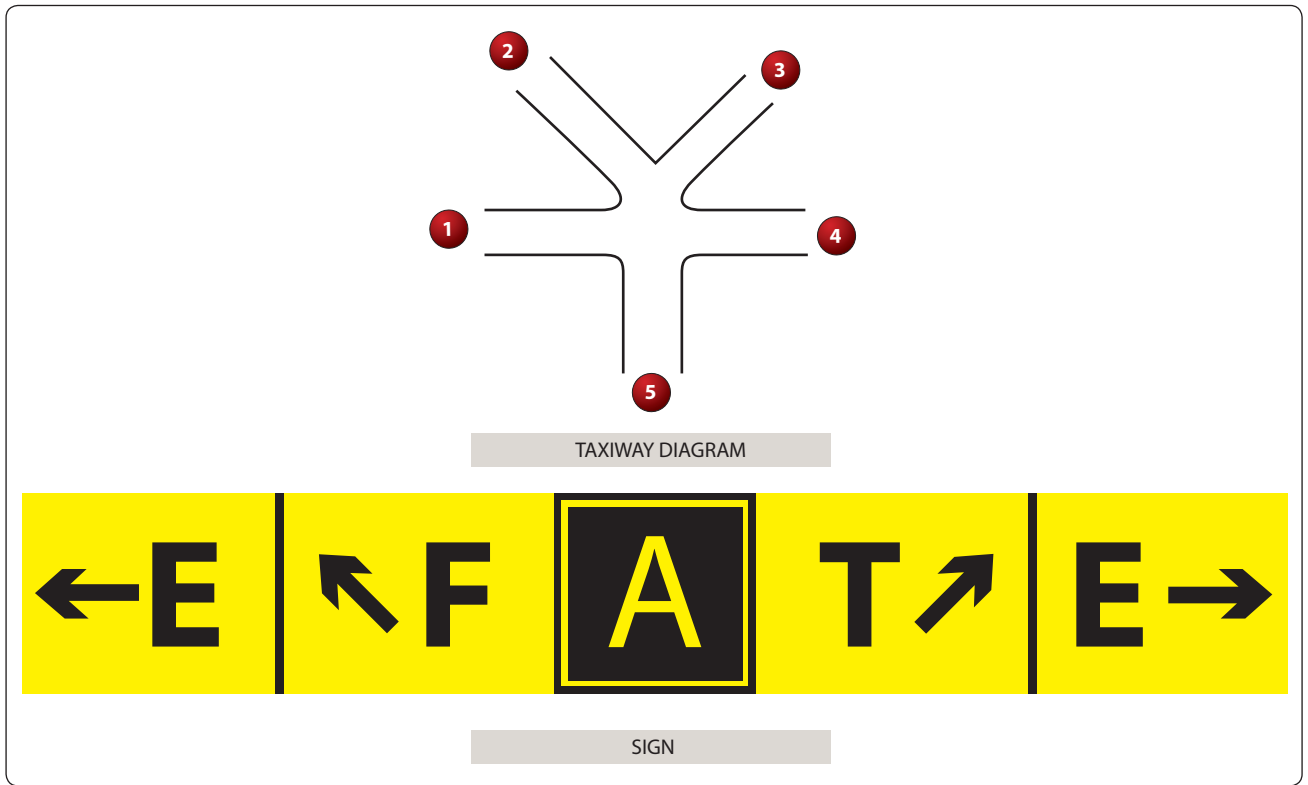


FIGURE 59.—Taxiway Diagram and Sign.

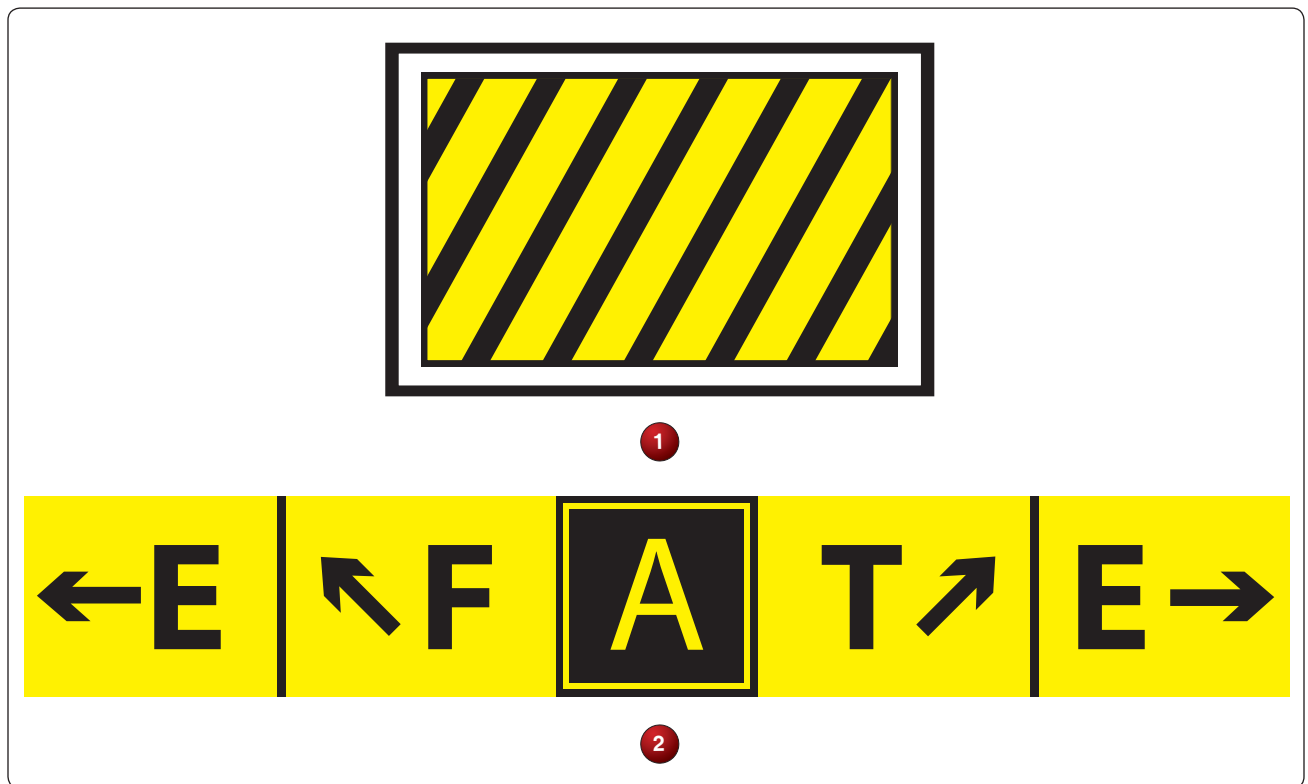


FIGURE 60.—Two Signs.



FIGURE 61.—Sign.



FIGURE 62.—Sign.

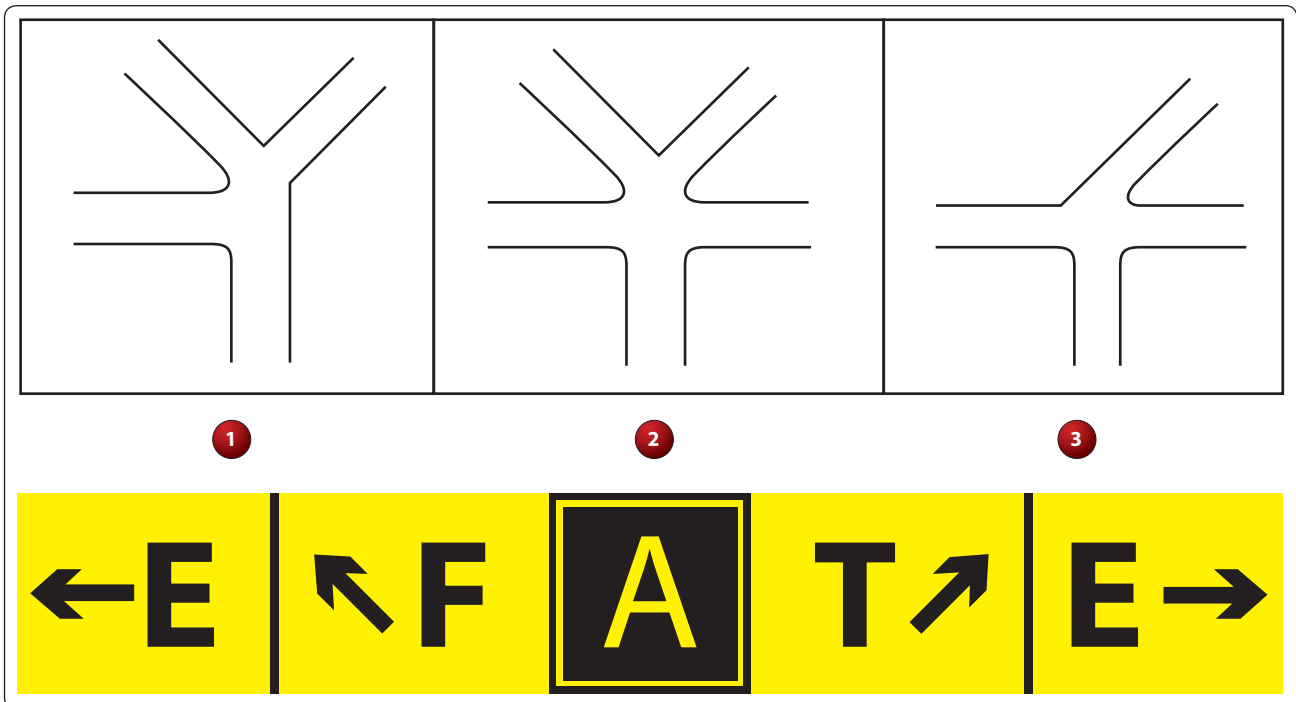


FIGURE 63.—Sign and Intersection Diagram.





FIGURE 64.—Sign.



FIGURE 65.—Sign.