AIRCRAFT PERFORMANCE

Pressure Altitude And Density Altitude

Pressure altitude is indicated altitude corrected for nonstandard pressure. It is determined by setting 29.92 in the altimeter setting window and reading the indicated altitude it is used in most performance charts and computer solutions for density altitude. Pressure altitude is equal to true altitude (actual height above sea level) when standard conditions exist.

Density altitude is pressure altitude corrected for nonstandard temperature. It is greater (higher) than pressure altitude when the 'temperature is greater than standard. It is used to determine aircraft performance. If the density altitude is computed to be 5,000 feet, your airplane will perform as if it were at 5,000 MSL on a standard day (29.92 altimeter setting and standard temperature).

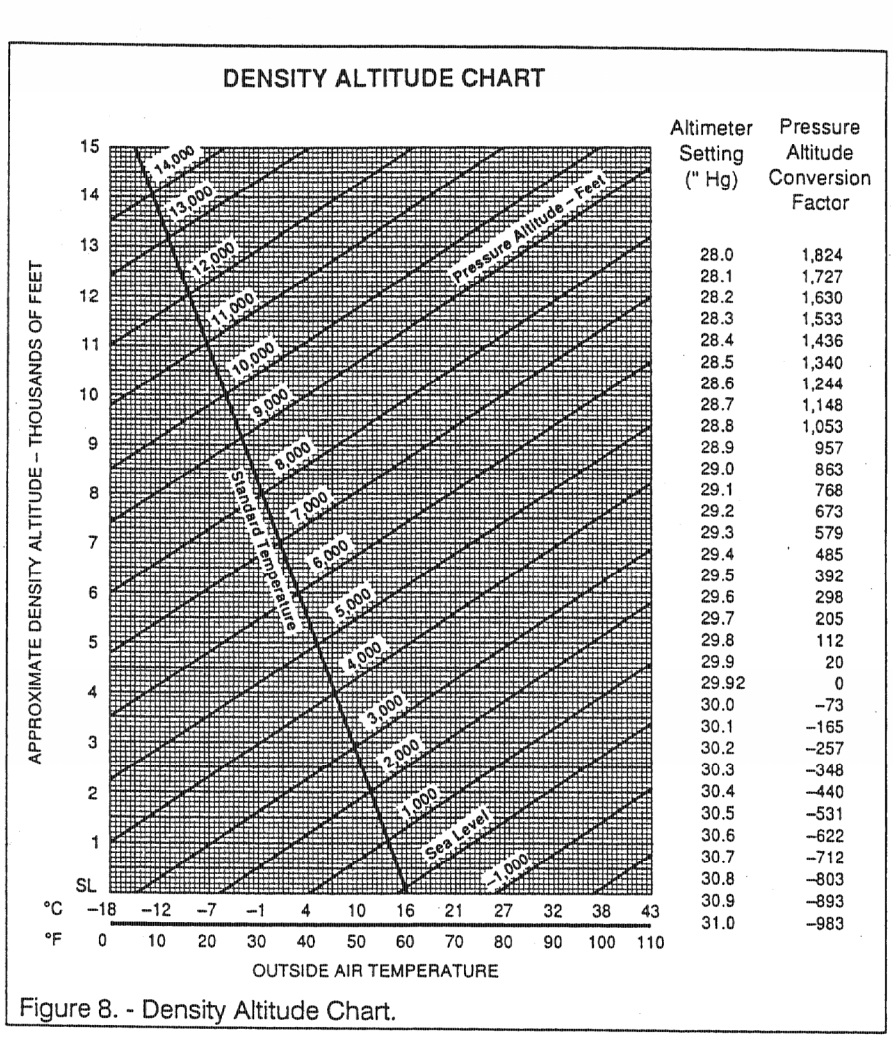

Figure 8. - Density Altitude Chart.

3258. H312
What is density altitude?
A) The height above the standard datum plane.
B) The pressure altitude corrected for nonstandard temperature.
C) The altitude read directly from the altimeter.

3259. H312
What is pressure altitude?
A) The indicated altitude corrected for position and installation error.
B) The altitude indicated when the barometric pressure scale is set to 29.92.
C) The indicated altitude corrected for nonstandard temperature and pressure.

3260. H931
Under what condition is indicated altitude the same as true altitude?
A) If the altimeter has no mechanical error.
B) When at sea level under standard conditions.
C) When at 18,000 feet MSL with the altimeter set at 29.92.

3289. H942
If the outside air temperature (OAT) at a given altitude is warmer than standard, the density altitude is
A) equal to pressure altitude.
B) lower than pressure altitude.
C) higher than pressure altitude.

3291. H945
What effect does high density altitude have on aircraft performance?
A) It increases engine performance.
B) It reduces climb performance.
C) It increases takeoff performance.

NOTE: CORRECT ANSWER IS IN BOLD ITALICS

3292. H946
(Refer to figure 8.) What is the effect of a temperature increase from 25 to 50 °F on the density altitude if the pressure altitude remains at 5,000 feet?
A) 1,200-foot increase.
B) 1,400-foot increase.
C) 1,650-foot increase.

3293. H945
(Refer to figure 8.) Determine the pressure altitude with an indicated altitude of 1,380 feet MSL with an altimeter setting of 28.22 at standard temperature.
A) 2,913 feet MSL.
B) 2,991 feet MSL.
C) 3,010 feet MSL.

3294. H946
(Refer to figure 8.) Determine the density altitude for these conditions:
Altimeter setting 29.25
Runway temperature +81 °F
Airport elevation 5,250 ft MSL
A) 4,600 feet MSL.
B) 5,877 feet MSL.
C) 8,500 feet MSL.

3295. H945
(Refer to figure 8.) Determine the pressure altitude at an airport that is 3,563 feet MSL with an altimeter setting of 29.96.
A) 3,527 feet MSL.
B) 3,556 feet MSL.
C) 3,639 feet MSL.

3296. H946
(Refer to figure 8.) What is the effect of a temperature increase from 30 to 50 °F on the density altitude if the pressure altitude remains at 3,000 feet MSL?
A) 900-foot increase.
B) 1,100-foot decrease.
C) 1,300-foot increase.

3297. H945
(Refer to figure 8.) Determine the pressure altitude at an airport that is 1,386 feet MSL with an altimeter setting of 29.97.
A) 1,341 feet MSL.
B) 1,451 feet MSL.
C) 1,562 feet MSL.

NOTE: CORRECT ANSWER IS IN BOLD ITALICS

3298. (Refer to figure 8.) Determine the density altitude for these conditions:
Altimeter setting 30.35
Runway temperature +25 °F
Airport elevation 3,894 ft MSL
A) 2,000 feet MSL.
B) 2,900 feet MSL.
C) 3,500 feet MSL.

3299. H945
(Refer to figure 8.) What is the effect of a temperature decrease and a pressure altitude increase on the density altitude from 90 °F and 1,250 feet pressure altitude to 55 °F and 1,750 feet pressure altitude?
A) 1,300-foot decrease.
B) 1,700-foot decrease.
C) 1,700-foot increase.

3300. H945
What effect, if any, does high humidity have on aircraft performance?
A) It increases performance.
B) It decreases performance.
C) It has no effect on performance.

3388. I22
Under which condition will pressure altitude be equal to true altitude?
A) When the atmospheric pressure is 29.92 inches Hg.
B) When standard atmospheric conditions exist.
C) When indicated altitude is equal to the pressure altitude.

3389. I22
Under what condition is pressure altitude and density altitude the same value?
A) At sea level, when the temperature is 0 °F.
B) When the altimeter has no installation error.
C) At standard temperature.

3394. I22
Which factor would tend to increase the density altitude at a given airport?
A) An increase in barometric pressure.
B) An increase in ambient temperature.
C) A decrease in relative humidity.

3678. H948
(Refer to figure 36.) Approximately what true airspeed should a pilot expect with 65 percent maximum continuous power at 9,500 feet with a temperature of 36 °F below standard?
A) 178 MPH.
B) 181 MPH.
C) 183 MPH.

CRUISE POWER SETTINGS

65% MAXIMUM CONTINUOUS POWER (OR FULL THROTTLE)
2800 POUNDS

PRESS ALT.	ISA –20 °C (–36 °F)								STANDARD DAY (ISA)								ISA +20 °C (+36 °F)							
	IOAT		ENGINE SPEED	MAN. PRESS	FUEL FLOW PER ENGINE		TAS		IOAT		ENGINE SPEED	MAN. PRESS	FUEL FLOW PER ENGINE		TAS		IOAT		ENGINE SPEED	MAN. PRESS	FUEL FLOW PER ENGINE		TAS	
FEET	°F	°C	RPM	IN HG	PSI	GPH	KTS	MPH	°F	°C	RPM	IN HG	PSI	GPH	KTS	MPH	°F	°C	RPM	IN HG	PSI	GPH	KTS	MPH
SL	27	-3	2450	20.7	6.6	11.5	147	169	63	17	2450	21.2	6.6	11.5	150	173	99	37	2450	21.8	6.6	11.5	153	176
2000	19	-7	2450	20.4	6.6	11.5	149	171	55	13	2450	21.0	6.6	11.5	153	176	91	33	2450	21.5	6.6	11.5	156	180
4000	12	-11	2450	20.1	6.6	11.5	152	175	48	9	2450	20.7	6.6	11.5	156	180	84	29	2450	21.3	6.6	11.5	159	183
6000	5	-15	2450	19.8	6.6	11.5	155	178	41	5	2450	20.4	6.6	11.5	158	182	79	26	2450	21.0	6.6	11.5	161	185
8000	-2	-19	2450	19.5	6.6	11.5	157	181	36	2	2450	20.2	6.6	11.5	161	185	72	22	2450	20.8	6.6	11.5	164	189
10000	-8	-22	2450	19.2	6.6	11.5	160	184	28	-2	2450	19.9	6.6	11.5	163	188	64	18	2450	20.3	6.5	11.4	166	191
12000	-15	-26	2450	18.8	6.4	11.3	162	186	21	-6	2450	18.8	6.1	10.9	163	188	57	14	2450	18.8	5.9	10.6	163	188
14000	-22	-30	2450	17.4	5.8	10.5	159	183	14	-10	2450	17.4	5.6	10.1	160	184	50	10	2450	17.4	5.4	9.8	160	184
16000	-29	-34	2450	16.1	5.3	9.7	156	180	7	-14	2450	16.1	5.1	9.4	156	180	43	6	2450	16.1	4.9	9.1	155	178

NOTES: 1. Full throttle manifold pressure settings are approximate.
2. Shaded area represents operation with full throttle.

Figure 36 - Airplane Power Setting Table

3679. H945
(Refer to figure 36.) What is the expected fuel consumption for a 1,000-nautical mile flight under the following conditions?
Pressure altitude 8,000 ft
Temperature 22 °C
Manifold pressure 20.8 inches Hg
Wind Calm
A) 60.2 gallons.
B) 70.1 gallons.
C) 73.2 gallons.

3680.
(Refer to figure 36.) What is the expected fuel consumption for a 500-nautical mile flight under the following conditions?
Pressure altitude 4,000 ft
Temperature +29 °C
Manifold pressure 21.3” Hg
Wind Calm
A) 31.4 gallons.
B) 36.1 gallons.
C) 40.1 gallons.

3681. H948
(Refer to figure 36.) What fuel flow should a pilot expect at 11,000 feet on a standard day with 65 percent maximum continuous power?
A) 10.6 gallons per hour.
B) 11.2 gallons per hour.
C) 11.8 gallons per hour.

3682. H948
(Refer to figure 36.) Determine the approximate manifold pressure setting with 2,450 RPM to achieve 65 percent maximum continuous power at 6,500 feet with a temperature of 36 °F higher than standard.
A) 19.8 inches Hg.
B) 20.8 inches Hg.
C) 21.0 inches Hg.

3683. H946
(Refer to figure 37.) What is the headwind component for a landing on Runway 18 if the tower reports the wind as 220° at 30 knots?
A) 19 knots.
B) 23 knots.
C) 26 knots.

3684. H946
(Refer to figure 37.) Determine the maximum wind velocity for a 45° crosswind if the maximum crosswind component for the airplane is 25 knots.
A) 25 knots.
B) 29 knots.
C) 35 knots.

3685. H946
(Refer to figure 37.) What is the maximum wind velocity for a 30° crosswind if the maximum crosswind component for the airplane is 12 knots?
A) 16 knots.
B) 20 knots.
C) 24 knots.

3686. H946
(Refer to figure 37.) With a reported wind of north at 20 knots, which runway (6, 29, or 32) is acceptable for use for an airplane with a 13 knot maximum crosswind component?
A) Runway 6.
B) Runway 29.
C) Runway 32.

NOTE: CORRECT ANSWER IS IN BOLD ITALICS

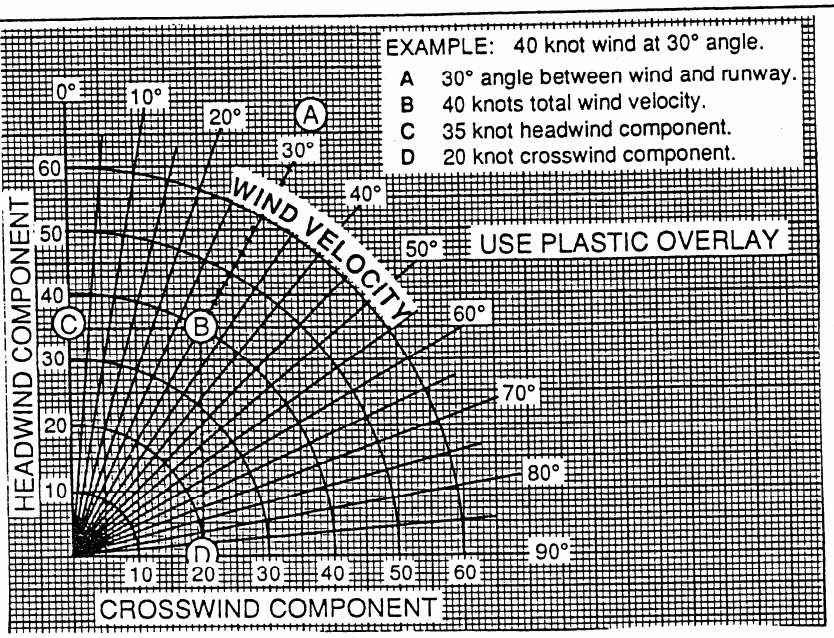

Figure 37 - Crosswind Component Graph

LANDING DISTANCE

ASSOCIATED CONDITIONS:

POWER	RETARDED TO MAINTAIN 900 FT/on FINAL APPROACH
FLAPS	DOWN
LANDING GEAR	DOWN
RUNWAY	PAVED, LEVEL, DRY SURFACE
APPROACH SPEED	IAS AS TABULATED
BRAKING	MAXIMUM

WEIGHT ~ POUNDS	SPEED AT 50 FT KNOTS	SPEED AT 50 FT MPH
2950	70	80
2800	68	78
2600	65	75
2400	63	72
2200	60	69

EXAMPLE:

OAT	25 °C (77 °F)
PRESSURE ALTITUDE	3965 FT
WEIGHT	2814 LB
WIND COMPONENT	9.0 KNOTS (HEADWIND)
GROUND ROLL	1080 FT
TOTAL OVER 50 FT OBSTACLE	1700 FT
APPROACH SPEED	68 KNOTS (78 MPH)

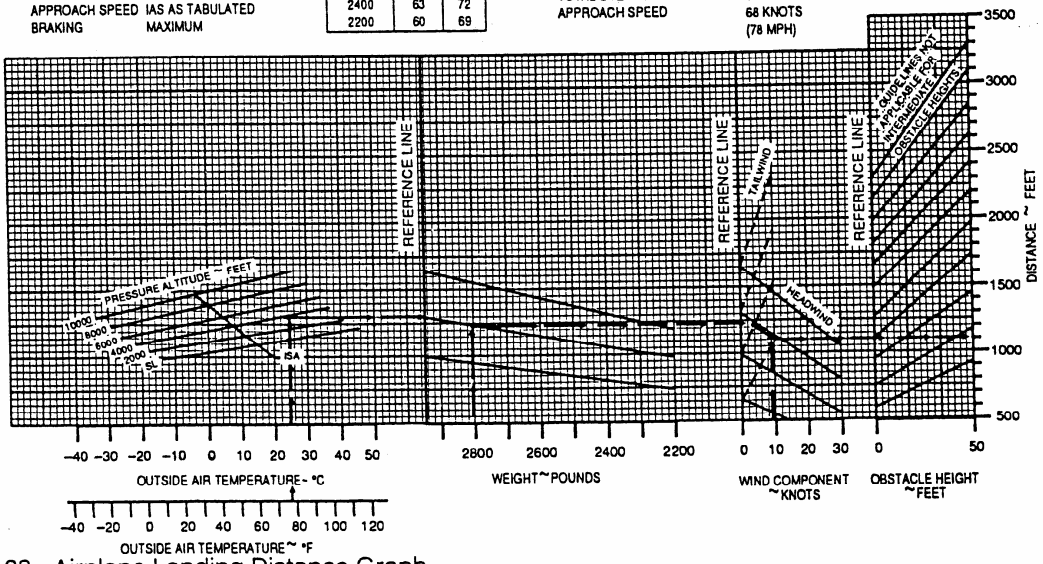

Figure 38 - Airplane Landing Distance Graph

LANDING DISTANCE

FLAPS LOWERED TO 40 ° - POWER OFF
HARD SURFACE RUNWAY - ZERO WIND

GROSS WEIGHT LB	APPROACH SPEED, IAS, MPH	AT SEA LEVEL & 59 °F GROUND ROLL	AT SEA LEVEL & 59 °F TOTAL TO CLEAR 50 FT OBS	AT 2500 FT & 50 °F GROUND ROLL	AT 2500 FT & 50 °F TOTAL TO CLEAR 50 FT OBS	AT 5000 FT & 41 °F GROUND ROLL	AT 5000 FT & 41 °F TOTAL TO CLEAR 50 FT OBS	AT 7500 FT & 32 °F GROUND ROLL	AT 7500 FT & 32 °F TOTAL TO CLEAR 50 FT OBS
1600	60	445	1075	470	1135	495	1195	520	1255

NOTES:
1. Decrease the distances shown by 10% for each 4 knots of headwind.
2. Increase the distance by 10% for each 60 °F temperature increase above standard.
3. For operation on a dry, grass runway, increase distances (both "ground roll" and "total to clear 50 ft obstacle") by 20% of the "total to clear 50 ft obstacle" figure.

Figure 39 - Airplane Landing Distance Table

3687. H946
(Refer to figure 37.) With a reported wind of south at 20 knots, which runway (10, 14, or 24) is appropriate for an airplane with a 13-knot maximum crosswind component?
A) Runway 10.
B) Runway 14.
C) Runway 24

3688. H946
(Refer to figure 37.) What is the crosswind component for a landing on Runway 18 if the tower reports the wind as 220° at 30 knots
A) 19 knots.
B) 23 knots.
C) 30 knots.

3689. H946
(Refer to figure 38.) Determine the total distance required to land.
OAT 32 °F
Pressure altitude 8,000 ft
Weight 2,600 lb
Headwind component 20 kts
Obstacle 50 ft
A) 850 feet.
B) 1,400 feet.
C) 1,750 feet.

3690.
(Refer to figure 38.) Determine the distance required to land.
OAT Std.
Pressure altitude 2,000 ft.
Weight 2,300 lbs.
Wind component Calm.
Obstacle 25ft.
A) 1,150 feet.
B) 1,450 feet.
C) 850 feet.

3691.
(Refer to figure 38.) Determine the total distance required to land.
OAT 90°F
Pressure altitude 3,000 ft.
Weight 2,900 lbs.
Headwind component 10 kts.
Obstacle 50 ft.
A) 1,450 feet.
B) 1,550 feet.
C) 1,725 feet.

NOTE: CORRECT ANSWER IS IN BOLD ITALICS

3692. H920
(Refer to figure 38.) Determine the approximate total distance required to land over a 50-foot obstacle.
OAT 90°F
Pressure altitude 4,000 ft.
Weight 2,800 lbs.
Headwind component 10 kts.
A) 1,525 feet.
B) 1,950 feet.
C) 1,775 feet.

3693.
(Refer to figure 39.) Determine the approximate landing ground roll distance.
Pressure altitude Sea level
Headwind 4 kts.
Temperature Std.
A) 356 feet.
B) 401 feet.
C) 490 feet.

3694.
(Refer to figure 39.) Determine the total distance required to land over a 50-foot obstacle.
Pressure altitude 7.500 ft.
Headwind 8 kts.
Temperature 32°F
Runway Hard surface
A) 1,205 feet.
B) 1,004 feet.
C) 1,506 feet.

3695.
(Refer to figure 39.) Determine the total distance required to land over a 50-foot obstacle.
Pressure altitude 5,000 ft.
Headwind 8 kts.
Temperature 41°F
Runway Hard surface
A) 837 feet.
B) 956 feet
C) 1,076 feet.

3696.
(Refer to figure 39.) Determine the approximate landing ground roll distance.
Pressure altitude 5,000 ft.
Headwind Calm.
Temperature 101°F
A) 445 feet.
B) 495 feet.
C) 545 feet.

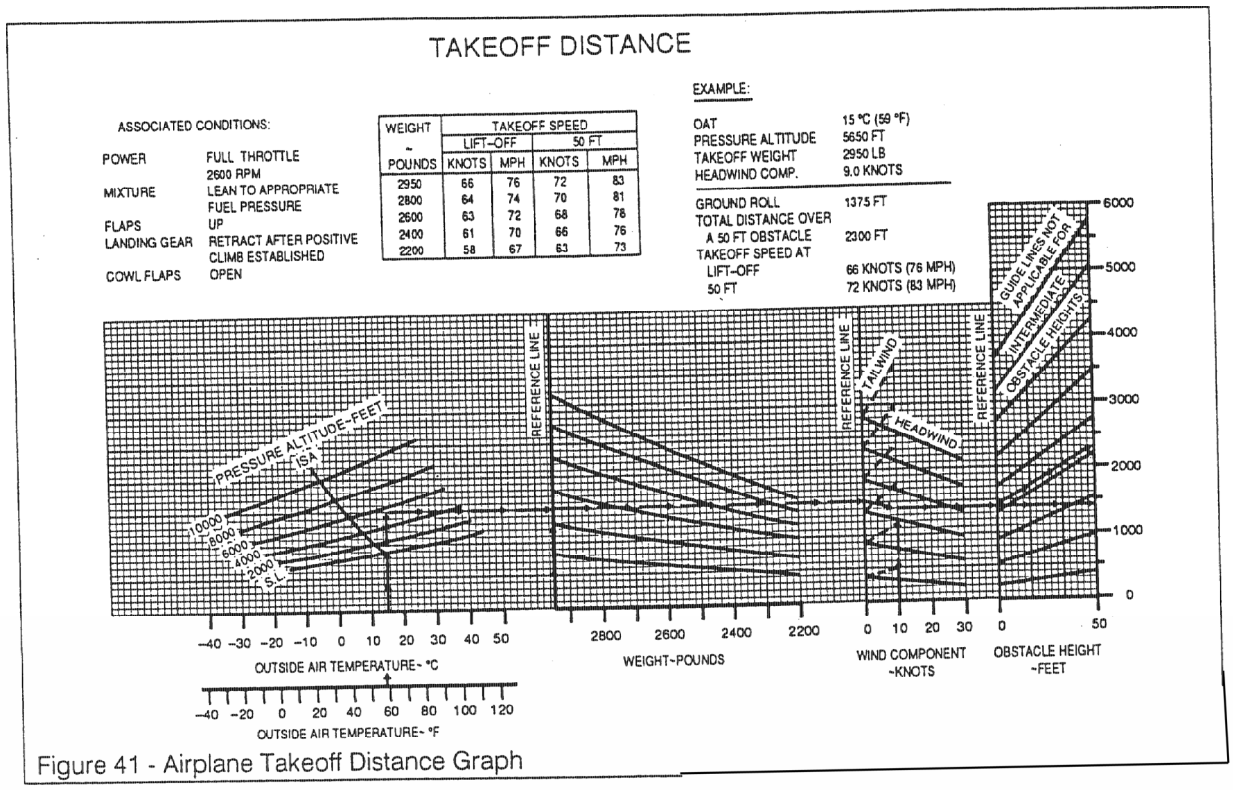

Figure 41 - Airplane Takeoff Distance Graph

3697. H317
(Refer to figure 39.) Determine the total distance required to land over a 50-foot obstacle.
Pressure altitude 3,750 ft
Headwind 12 kts
Temperature Std
A) 794 feet.
B) 816 feet.
C) 836 feet.

3698.
(Refer to figure 39.) Determine the approximate landing ground roll distance.
Pressure altitude 1,250 ft
Headwind 8 kts
Temperature Std
A) 275 feet.
B) 366 feet.
C) 470 feet.

3705. H946
(Refer to figure 41.) Determine the total distance required for takeoff to clear a 50-foot obstacle.
OAT Std
Pressure altitude 4,000 ft
Takeoff weight 2,800 lb
Headwind component Calm
A) 1,500 feet.
B) 1,750 feet.
C) 2,000 feet.

3706.
(Refer to figure 41.) Determine the total distance required for takeoff to clear a 50-foot obstacle.
OAT Std
Pressure altitude Sea level
Takeoff weight 2,700 lb
Headwind component Calm
A) 1,000 feet.
B) 1,400 feet.
C) 1,700 feet.

3707.
(Refer to figure 41.) Determine the approximate ground roll distance required for takeoff.
OAT 100
Pressure altitude 2,000 ft
Takeoff weight 2,750 lb
Headwind component Calm
A) 1,150 feet.
B) 1,300 feet.
C) 1,800 feet.

3708.
(Refer to figure 41.) Determine the approximate ground roll distance required for takeoff.
OAT 90°F
Pressure altitude 2,000 ft
Takeoff weight 2,500 lb
Headwind component 20 kts
A) 650 feet.
B) 850 feet.
C) 1,000 feet.