Better Takeoffs & Landings

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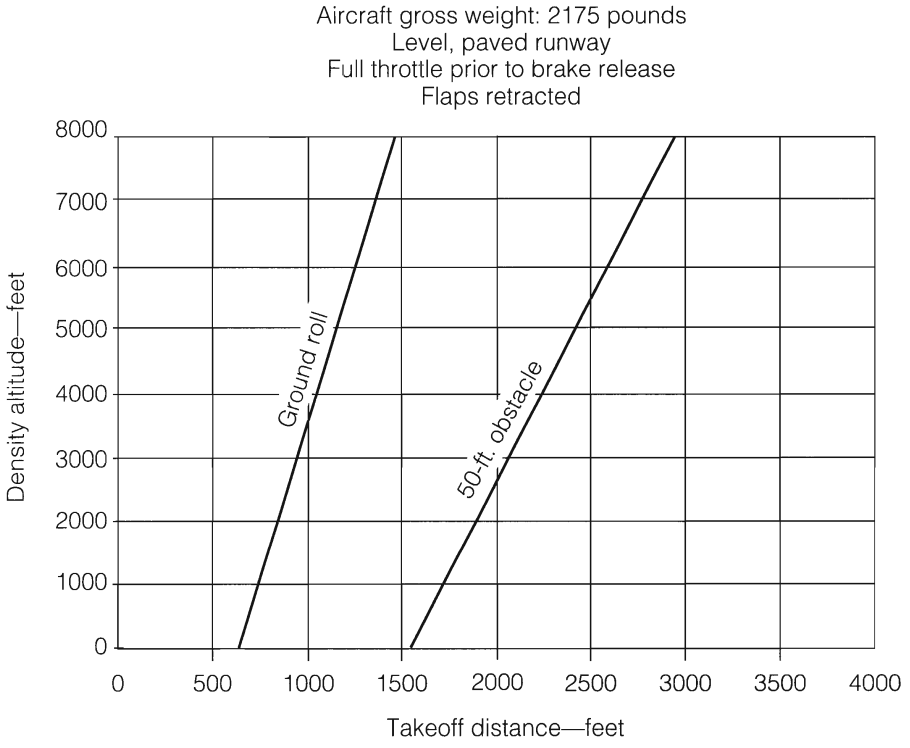

Fig. 6-2. *Takeoff-distance chart.*

2. Move horizontally from that point to the right until you intersect the ground-roll line or the 50-foot-obstacle line.
3. From the point of intersection, move down vertically to the bottom of the graph.

The corresponding value will be for the ground-roll or takeoff distance over a 50-foot obstacle.

Example 1

Find the ground roll and distance to takeoff over a 50-foot obstacle for the following conditions:

- Density altitude: 1500 ft
- Gross weight: 2175 lbs
- Headwind: 0 mph

In this case we start on the left side of the graph and find the midway point between 1000- and 2000-foot density altitude. We move right until we intersect the ground-roll line. To find the ground-roll distance, we then move down vertically to the bottom of the graph. Here we see the value is approximately 850 feet. To determine the distance to clear a 50-foot obstacle, we would have followed our horizontal line for 1500 feet past the ground-roll line until we intersect the 50-foot-obstacle line. We then move down vertically to the bottom of the graph to find that the distance is approximately 1875 feet.

Example 2

Find the ground roll and distance to clear a 50-foot obstacle for the following conditions:

- Density altitude: 5000 ft
- Gross weight: 2175 lbs
- Headwind: 0 mph

In this example we start on the left side of the graph at the 5000-foot density altitude value and move right horizontally until we intersect the ground-roll line.

At the point of intersection, we move down vertically to find that the ground-roll value is approximately 1200 feet. The 50-foot-obstacle-clearance value is found by following the 5000-foot line right until it intersects with the 50-foot-obstacle line, and again moving down vertically to the bottom of the chart. In this case the distance to clear a 50-foot obstacle is approximately 2625 feet.

This particular type of chart is accurate for only a specific set of conditions pertaining to gross weight, wind, and other factors. You can see by comparison to the column chart we just looked at that there is not as much flexibility in determining takeoff distances. Like the column chart, the graph chart might also have notations stating that differences from the noted conditions, like grass runways or headwind values, can reduce or increase the computed value by a given percentage. Again, this chart is not for a specific airplane and is used only for the purpose of explaining how this type of chart might be used. Follow the instructions laid out by the manufacturer of the plane you are flying. Now let's move on to landing-distance charts.

LANDING CHARTS

In this section we are going to look at landing-distance charts and how to use them. The chart formats will be similar to the ones we have used in our takeoff-distance examples. Like the takeoff charts, these are only examples and are not intended for use with a specific airplane you might be flying.

Figure 6-3 is composed of columns much like the takeoff-distance chart in Fig. 6-1. The headings consist of gross weight and airspeed on final, followed by ground-roll and distance-to-clear-a-50-foot-obstacle column, paired under four different alti-

		Hard-surface runway/Flaps at 40°/Power off							
		Sea level/59 F		2500 Ft./50 F		5000 Ft./41 F		7500/32 F	
Gross weight	Airspeed on final	Ground roll	50-Ft. obstacle	Ground roll	50-Ft. obstacle	Ground roll	50-Ft. obstacle	Ground roll	50-Ft. obstacle
2400	66	502	998	696	1315	874	1889	1032	2812
2650	69	523	1112	725	1476	921	2000	1231	3010
2900	72	606	1268	803	1611	1031	2205	1388	3320

**Decrease distances 10% for every 6 mph of headwind.

Fig. 6-3. *Landing-distance chart.*

tude headings ranging from sea level to 7500 feet. Notes on the chart indicate you should reduce landing distances by 10% for each 6 mph of headwind, and the distances are for power off and 40° of flaps. To determine the landing distance for a given set of circumstances, you will perform the following steps:

1. Select the gross weight of the aircraft under the gross-weight column.
2. Move right to the approach-speed column, and it tells you what the correct approach speed should be for that gross weight.
3. Continue to move right until you are under the correct-altitude column.
4. Under that column is the ground roll needed for landing and the distance for landing required to clear a 50-foot obstacle.

If you have a headwind, you will reduce the distance required for landing by 10% for each 6 mph of headwind component. Now let's step through two examples using the chart.

Example 1

Determine the ground roll and distance to clear a 50-foot obstacle for the following conditions:

- Gross weight: 2650 lbs
- Pressure altitude: sea level
- Temperature: 59°F
- Headwind: 18 mph

We start in the gross weight column and find the 2650-pound row. Moving right, we see that the correct approach speed is 69 mph for this gross weight. We continue to move right until we are under the sea-level column pair. Here we find that the ground-

roll value is 523 feet, and the distance to clear a 50-foot obstacle and land is 1112 feet. These values are for calm conditions, and in this case we have an 18-mph headwind component. This means we will reduce the landing distance by 30%. As a result, the ground roll becomes 523 – 157 = 366 feet, and the distance to land over a 50-foot obstacle is reduced to 1112 – 334 = 778 feet. Strong headwinds can be very helpful in making short-field landings very short. (They can make it more difficult to try to glide to a runway when you lose your engine. More about my experiences with that in chapter 11 on emergency landings, though.)

Example 2

Determine the ground roll and distance to clear a 50-foot obstacle for the following conditions:

- Gross weight: 2400 lbs
- Pressure altitude: 7500 ft
- Temperature: 32°F
- Headwind: 6 mph

We again start in the gross-weight column, and this time find the 2400-pound row. Moving right, we see that the correct approach speed is 66 mph for this gross weight. We continue to move right until we are under the 7500-foot-altitude column pair. The ground roll value at this altitude is 1032 feet, and the distance to clear a 50-foot obstacle and land is 2812 feet. These values are again for calm conditions, and in this case we find we have a 6-mph headwind component. This means we will reduce the landing distance by 10%. As a result, the ground roll becomes 1032 – 103 = 929 feet, and the distance to land over a 50-foot obstacle is reduced to 2812 – 281 = 2531 feet.

Next we will cover a graph-type chart for landing distances. Figure 6-4 will be used in this example and, like its takeoff-distance counterpart, has a number of notations associated with it. It again specifies the gross weight for the aircraft, that the runway needs to be paved, level, and dry, that the landing is power off, and 40° of flaps are used. The chart, like the table graph, specifies the approach speed as well.

To use the graph, perform the following steps:

1. Find the correct density altitude on the left side of the graph.
2. Move right until you intersect either the ground roll or distance-to-clear-a-50-foot-obstacle line on the graph.
3. Move down vertically from the point of intersection with the appropriate line to the bottom of the graph. The value at the bottom of the graph is the corresponding ground roll or distance to land over a 50-foot obstacle.

Let's look at two examples for this type of landing chart.

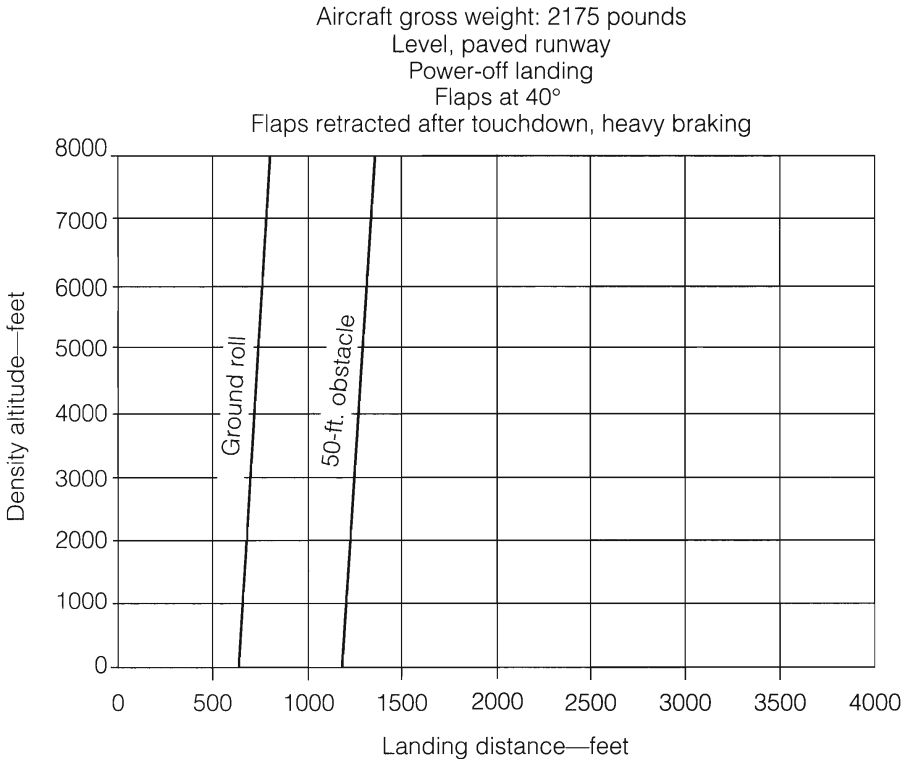

Fig. 6-4. *Landing-distance chart.*

Example 1

Find the ground roll and distance to clear a 50-foot obstacle for the following conditions:

- Density altitude: 5000 ft
- Gross weight: 2250 lbs
- Headwind: 0 mph

We start on the left side of the chart at the 5000-foot density-altitude value. From there we move right until we intersect the ground-roll line. Moving vertically down to the bottom of the graph, we find the ground-roll value to be approximately 725 feet. To determine the landing distance over a 50-foot obstacle, we would find the intersection point between the 5000-foot line and the 50-foot-obstacle line, then move down vertically to the bottom of the graph. In this case the distance is approximately 1295 feet. You can see that the results are not extremely accurate and are open to some interpretation, depending on how much detail the values of the graph contain. Someone else might look at the same situation and feel it reads 1290 feet.