

\*Please note, this document is still be created and more information and examples will be added to over time. It was added as an aid to help students and other pilots learn how to calculate their takeoff and landing distances. If you notice any errors, please send them to [info@ontarioflightcentre.ca](mailto:info@ontarioflightcentre.ca) attention CFI.

For the purposes of this explanation, we will refer to table 5-4 on page 5-12 of your 1976 Cessna 172M POH. This is still the standard aircraft used in Transport Canada written exams.

Given:

- Runway 28 (Paved)
- Airport Elevation: 970'
- Current Altimeter setting: 29.89"Hg
- Wind: 300° @ 10 knots
- Temperature: 10°C
- Obstacle: None

**Question: Determine the take off ground roll using the above information.**

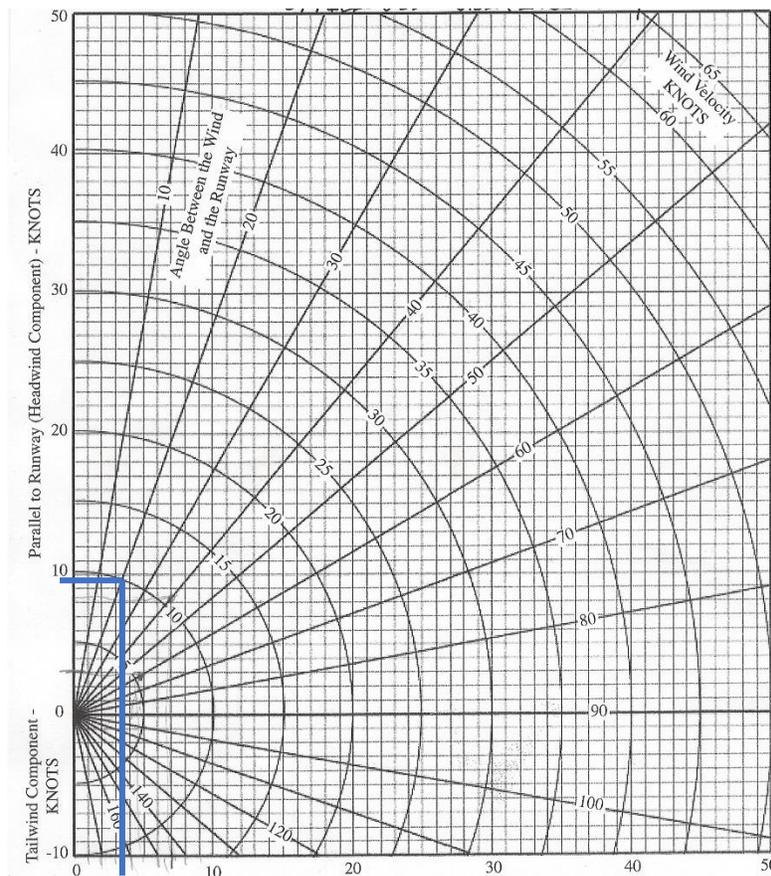
Step 1.

- If pressure altitude is not given, you will need to calculate it using the airport elevation and the altimeter setting
  - Formula:  $29.92 - \text{given setting} = \text{Pressure altitude}$
  - Take that number and multiple it by 1000. This answer is what needs to be applied to your airport elevation.
  - Remember, when using this formula, if you get a negative number, you subtract it from the airport elevation, a positive number and you add it.
- Example:
  - Airport Elevation: 870'
  - Altimeter setting: 29.70 "Hg
    - Pressure altitude: 
$$\begin{array}{r} 29.92 \\ -29.79 \\ \hline 0.13 \end{array}$$
 $0.13 \times 1000 = 130'$  $PA = 870' + 130' = 1000'$
    - This tells you which pressure altitude line you need to use on the table

Step 2.

- Calculate your headwind component using crosswind diagram
  - This diagram can be found in the Aeronautical Information Manual (AIM) AIR 2.2 Fig. 2.1
  - To do this you need to determine how many degrees off the runway the wind is
    - Example:
      - Active Runway is 28

- Winds are from 300° at 10 knots
- the winds are 20° off the runway at 10 knots.
- Using the chart, find the 10 knots arc on either the left or bottom.
- Follow the arc around until it intersects with the angle
- Draw a straight line across to find the headwind component
- Draw a straight line down to find the crosswind component
- For this question, we only need the headwind component. Write this number down, you will use it in a bit. You should have 9 knots



### Step 3.

- Determine the correct numbers from the appropriate chart
  - This might mean interpolating between 2 temperature, 2 altitudes or both
  - Do not round the numbers off at this point, keep working with the decimals
  - Using the table below, you can see that we would have a ground roll of 915' and a Total to clear a 50' obstacle distance of 1615' at 10°C and a pressure altitude of 1000'.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS								
2300	52	59	S.L.	775	1380	835	1475	895	1575	960	1685	1030	1795
			1000	850	1510	915	1615	980	1725	1050	1845	1125	1970
			2000	930	1650	1000	1770	1075	1895	1155	2030	1235	2170
			3000	1020	1815	1100	1945	1180	2085	1270	2235	1360	2395
			4000	1125	2000	1210	2145	1300	2305	1395	2475	1495	2655
			5000	1235	2210	1330	2375	1430	2555	1540	2750	1650	2960
			6000	1365	2450	1470	2640	1580	2850	1700	3070	---	---
			7000	1505	2730	1625	2955	1750	3190	---	---	---	---
			8000	1665	3065	1800	3320	---	---	---	---	---	---

## Step 4.

- Next we need to refer to the notes section at the top of the chart to see if any apply to our situation.
- Its worth noting at this point that Cessna assumes certain conditions in order to produce the numbers in this table. You can see them in the conditions section right under the title of the chart. The notes section tells us how to alter the numbers to fit our situation.

CONDITIONS:  
 Flaps Up  
 Full Throttle Prior to Brake Release  
 Paved, Level, Dry Runway  
 Zero Wind

- NOTES:
1. Maximum performance technique as specified in Section 4.
  2. Prior to takeoff from fields above 3000 feet elevation, the mixture should be leaned to give maximum RPM in a full throttle, static runup.
  3. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
  4. Where distance value has been deleted, climb performance after lift-off is less than 150 fpm at takeoff speed.
  5. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

- Note 1 simply states that for these numbers to be accurate you must the short take off technique.
  - Note 2 describes what to do when taking off from higher altitude airports.
  - Notes 3 and 5 are the ones that we are normally going to be most concerned with
  - We know from the information given as well as what we calculated in Step 2 that we have a 9 knot headwind.
  - Since we are taking off from a paved runway, note 5 does not apply in this case.
  - Since the question is only asking for our ground roll, we will be working with the 915' number.
  - $915 - 10\% = 823.5'$
  - **823.5' is our final answer for this question.**
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- If we had a grass runway, we would now have to increase the 823.5' by 15%
  - This would bring the final number to 947'