Aircraft Landing Ground Roll Distance

Ground roll after touchdown from weight, wing area, maximum lift coefficient, braking, drag and reverse thrust, with forces taken at 0.7 of touchdown speed.

Method: Landing ground roll with forces averaged at 0.7 V_T

Input parameters

Unit system: SI

Parameter	Value	Unit
Landing weight	11,000	N
Wing area	16.200	m²
Maximum lift coefficient (landing flaps)	2.1000	
Reverse thrust (0 if none)	0	N
Braking friction coefficient (0.4 dry, 0.2 wet)	0.40000	
Lift coefficient during the roll (low with spoilers)	0.10000	
Zero-lift drag coefficient (gear and flaps down)	0.060000	
Induced drag factor with ground effect	0.040000	
Altitude (ISA, geopotential)	500.00	m

Calculated results

Parameter	Value	Unit
Stall speed (landing configuration)	84.735	km/h
Touchdown speed 1.3 V_s	110.16	km/h
Net decelerating force at 0.7 V_T	4,488.5	N
Landing ground roll	116.99	m

Notes for this case

- Ground roll s = V_T²/(2ā) with the forces averaged at 0.7 V_T and V_T = 1.3 V_s. The approach and flare over a 15 m obstacle add to the total landing distance.

Formula and method

$$s_L = \frac{1.69W^2}{g\rho S C_{L,max}\left[T_{rev} + D + \mu_r(W - L)\right]_{0.7V_T}}, \quad V_T = 1.3V_s$$

Variables

W	Landing weight	N
S	Wing area	m²
$C_{L,max}$	Maximum lift coefficient (landing flaps)	-
T_{rev}	Reverse thrust (0 if none)	N
μ_r	Braking friction coefficient (0.4 dry, 0.2 wet)	-
$C_{L,g}$	Lift coefficient during the roll (low with spoilers)	-
C_{D0}	Zero-lift drag coefficient (gear and flaps down)	-
k	Induced drag factor with ground effect	-
h	Altitude (ISA, geopotential)	m
V_s	Stall speed (landing configuration)	m/s
V_T	Touchdown speed 1.3 V_s	m/s

$F_{0.7}$	Net decelerating force at 0.7 V_T	N
s_L	Landing ground roll	m

Method and standards

Approximate landing ground roll.

Assumptions and limits

- Level runway, no wind, constant forces at their 0.7 V_T values, ISA.

References

Landing ground roll with forces averaged at 0.7 V_T

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/mechanical/aerospace/landing-ground-roll

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.