Descent Planning: Top of Descent Distance and Rate of Descent

Distance from the top of descent, rate of descent and time for an aircraft to lose a given height on a chosen descent angle at a ground speed.

Method: Descent geometry and the 3:1 rule

Input parameters

Unit system: SI

Parameter	Value	Unit
Height to lose	9,000.0	ft
Ground speed in the descent	160.00	kn
Descent (flight path) angle	3.0000	°

Calculated results

Parameter	Value	Unit
Distance to start descent	28.263	nmi
Rate of descent	849.16	ft/min
Time to descend	10.599	min
Rule-of-thumb distance (3 NM per 1,000 ft)	27.000	nmi
Rule-of-thumb rate (5 × ground speed in knots, ft/min)	800.00	ft/min

Notes for this case

• Straight descent geometry: distance Δh/tan γ and rate V_g tan γ. The 3:1 and 5 × ground speed rules approximate a 3° path (tan 3° = 0.0524 ≈ 1/19).

Formula and method

$$d = \frac{\Delta h}{\tan \gamma}, \quad ROD = V_g \tan \gamma, \quad t = \frac{\Delta h}{ROD}$$

Variables

Δh	Height to lose	m
V_g	Ground speed in the descent	m/s
γ	Descent (flight path) angle	rad
d_{TOD}	Distance to start descent	m
ROD	Rate of descent	m/s
t	Time to descend	s
d_{rule}	Rule-of-thumb distance (3 NM per 1,000 ft)	m
ROD_{rule}	Rule-of-thumb rate (5 × ground speed in knots, ft/min)	m/s

Method and standards

Descent path geometry.

Assumptions and limits

- Constant angle and ground speed.

References

Descent geometry and the 3:1 rule

Report details

Report reference	FCC-YFFA-VS02 (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Descent Planning: Top of Descent Distance and Rate of Descent
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

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/descent-planning

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.