Aircraft Rate of Climb and Climb Angle from Excess Power

Rate of climb and climb angle of an aircraft from thrust, speed, weight and its drag polar, by excess power, with the maximum climb angle speed for a jet.

Method: Rate of climb from excess power

Input parameters

Unit system: SI

Parameter	Value	Unit
Aircraft weight	12,000	N
Wing area	16.200	m²
Thrust available at this speed	2,000.0	N
True airspeed	144.00	km/h
Zero-lift drag coefficient	0.027000	
Induced drag factor 1/(πeAR)	0.054000	
Altitude (ISA, geopotential)	1,000.0	m

Calculated results

Parameter	Value	Unit
Drag	928.73	N
Rate of climb (T − D)V/W	3.5709	m/s
Climb angle	5.1218	°
Rate of climb in feet per minute	702.93	
Speed for steepest climb (constant thrust)	156.29	km/h

Notes for this case

- Small-angle climb: lift taken equal to weight, R/C = (TV − DV)/W. For constant thrust the steepest climb is at the minimum-drag speed; propeller aircraft have their best angle at a lower speed.

Formula and method

$$R/C = \frac{(T-D)V}{W}, \quad \sin\gamma = \frac{T-D}{W}, \quad D = \frac{1}{2}\rho V^2 S\left(C_{D0} + kC_L^2\right)$$

Variables

W	Aircraft weight	N
S	Wing area	m²
T	Thrust available at this speed	N
V	True airspeed	m/s
C_{D0}	Zero-lift drag coefficient	-
k	Induced drag factor 1/(πeAR)	-
h	Altitude (ISA, geopotential)	m
D	Drag	N
R/C	Rate of climb (T − D)V/W	m/s
γ	Climb angle	rad
R/C_{fpm}	Rate of climb in feet per minute	-
V_x	Speed for steepest climb (constant thrust)	m/s

Method and standards

Climb performance from excess power.

Assumptions and limits

- Steady climb, lift ≈ weight, ISA.

References

Rate of climb from excess power

Report details

Report reference	FCC-E1Q0-7GMA (the same inputs always give the same reference)
Generated	23 November 2026, 17:51 UTC
Calculator	Aircraft Rate of Climb and Climb Angle from Excess Power
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/aircraft-rate-of-climb

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.