Wind Triangle: Heading, Wind Correction Angle and Ground Speed

Heading to fly, wind correction angle and ground speed for a desired course from the true airspeed and the wind, with the time to fly a leg of given distance.

Method: Wind triangle (dead reckoning navigation)

Input parameters

Unit system: SI

Parameter	Value	Unit
True airspeed	120.00	kn
Desired course (track)	75.000	°
Wind direction (from)	330.00	°
Wind speed	25.000	kn
Leg distance	150.00	nmi

Calculated results

Parameter	Value	Unit
Wind correction angle (positive = right)	-11.609	°
Heading to fly	63.391	°
Ground speed	124.02	kn
Time for the leg	72.572	min
Crosswind component on the course	-24.148	kn

Notes for this case

• Wind triangle: the heading is turned into the wind by WCA = asin(V_w sin(θ_w − θ_c)/V) so the track equals the course; ground speed V cos WCA − V_w cos(θ_w − θ_c). Use true directions throughout, then apply variation.

Formula and method

$$WCA = \sin^{-1}\left[\frac{V_w \sin(\theta_w - \theta_c)}{V}\right], \quad \psi = \theta_c + WCA, \quad V_g = V\cos WCA - V_w \cos(\theta_w - \theta_c)$$

Variables

V	True airspeed	m/s
θ_c	Desired course (track)	rad
θ_w	Wind direction (from)	rad
V_w	Wind speed	m/s
d	Leg distance	m
WCA	Wind correction angle (positive = right)	rad
ψ	Heading to fly	rad
V_g	Ground speed	m/s
t	Time for the leg	s
V_{xw}	Crosswind component on the course	m/s

Method and standards

Velocity triangle of air and ground motion.

Assumptions and limits

- Steady wind, constant airspeed, flat earth over the leg.

References
Wind triangle (dead reckoning navigation)

Report details

Report reference	FCC-JR3J-H79R (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Wind Triangle: Heading, Wind Correction Angle and Ground Speed
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/wind-triangle-heading-groundspeed

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Reopens the calculator with the inputs of this report.