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Angle of Attack during Rate One Turns

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▼ Description

Description

This worksheet calculates the increase in angle of attack as an aircraft proceedes around a turn, relative to straight and level. This increase in angle of attack provides the increase in aerofoil lift required to supply the centripetal turning forces and, for a level turn, sets the aircraft bank angle (no side slip).

http://en.wikipedia.org/wiki/Angle_of_attack

http://en.wikipedia.org/wiki/Stall_(flight) for animated force diagram

http://en.wikipedia.org/wiki/ROT_(aviation)

▲ Description

▼ Maths

$$ROT := 3\frac{deg}{sec}$$
Rate One Turn

$$OV := 120 \text{knot}$$
Own ship Velcity

$$CI := \frac{1.0}{[4deg - (-5.5deg)]}$$
Lift Coefficient (per AoA)

$$CI = 0.105 \cdot deg^{-1}$$
Typical Value from Wiki articles

$$TurnRate := 1 \cdot ROT$$

$$Bank := atan\left(\frac{OV \cdot TurnRate}{g}\right)$$
$$Bank = 18.243 \cdot deg$$

$$Lift := \sqrt{g^2 + (OV \cdot TurnRate)^2}$$
$$Lift = 1.053 \cdot g$$

$$ExtraAoA := \left(\frac{Lift}{g} - 1\right) \cdot CI$$
$$ExtraAoA = 18.287 \cdot deg$$

▲ Maths

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▼ Summary, Recommendations, Conclusion

This worksheet actually shows that the Angle units would be of great benefit to users.

You did spot the mistake didn't you?

▲ Summary, Recommendations, Conclusion