



Wing-Tail Interaction Formulas

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Examples!

Conversions!

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List of 12 Wing-Tail Interaction Formulas

Wing-Tail Interaction

1) Dynamic Pressure at Vertical Tail for given Vertical Tail Efficiency 🗗

10.9956Pa = $16.66 \cdot 0.66$ Pa

fx $Q_v = \eta_v \cdot Q_w$

$$\mathbf{R} \mathbf{Q}_{\mathrm{v}} = \mathbf{C}_{\mathrm{n}} \cdot \mathbf{S} \cdot \mathbf{b} \cdot rac{\mathbf{Q}_{\mathrm{w}}}{oldsymbol{l}_{\mathrm{v}} \cdot \mathbf{S}_{\mathrm{v}} \cdot \mathbf{C}_{\mathrm{v}} \cdot (eta + \sigma)}$$

Open Calculator

Open Calculator

ex

$$10.98496 ext{Pa} = 1.4 \cdot 5.08 ext{m}^2 \cdot 1.15 ext{m} \cdot rac{0.66 ext{Pa}}{1.2 ext{m} \cdot 5 ext{m}^2 \cdot 0.7 ext{rad}^{-1} \cdot (0.05 ext{rad} + 0.067 ext{rad})}$$

3) Dynamic Pressure at Wing for given Vertical Tail Efficiency 🗗

$$\mathbf{f}\mathbf{x} \mathbf{Q}_{\mathrm{w}} = rac{\mathbf{Q}_{\mathrm{v}}}{\mathbf{\eta}_{\mathrm{v}}}$$

Open Calculator

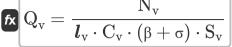
4) Dynamic Pressure at Wing for given Yawing Moment Coefficient

$$\left[\mathbf{Q}_{\mathrm{w}} = oldsymbol{l}_{\mathrm{v}} \cdot \mathrm{S}_{\mathrm{v}} \cdot \mathrm{Q}_{\mathrm{v}} \cdot \mathrm{C}_{\mathrm{v}} \cdot rac{eta + \sigma}{\mathrm{S} \cdot \mathrm{b} \cdot \mathrm{C}_{\mathrm{n}}}
ight]$$





5) Vertical Tail Dynamic Pressure for given Moment



Open Calculator

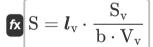
6) Wing Area for given Moment Produced by Vertical Tail

$$\mathbf{K} = rac{N_{\mathrm{v}}}{C_{\mathrm{n}} \cdot Q_{\mathrm{w}} \cdot \mathbf{b}}$$

Open Calculator

$$= \frac{5.4 \text{N*m}}{1.4 \cdot 0.66 \text{Pa} \cdot 1.15 \text{m}}$$

7) Wing Area for given Vertical Tail Volume Ratio



Open Calculator 🗗

$$\mathbf{ex} = 5.11509 \mathrm{m}^2 = 1.2 \mathrm{m} \cdot rac{5 \mathrm{m}^2}{1.15 \mathrm{m} \cdot 1.02}$$

8) Wing Area for given Yawing Moment Coefficient

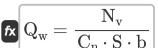
$$\mathbf{S} = oldsymbol{l}_{\mathrm{v}} \cdot \mathrm{S}_{\mathrm{v}} \cdot \mathrm{Q}_{\mathrm{v}} \cdot \mathrm{C}_{\mathrm{v}} \cdot rac{eta + \sigma}{\mathrm{C}_{\mathrm{n}} \cdot \mathrm{b} \cdot \mathrm{Q}_{\mathrm{w}}}$$

Open Calculator

$$= 1.2 \text{m} \cdot 5 \text{m}^2 \cdot 11 \text{Pa} \cdot 0.7 \text{rad}^{-1} \cdot \frac{0.05 \text{rad} + 0.067 \text{rad}}{1.4 \cdot 1.15 \text{m} \cdot 0.66 \text{Pa}}$$



9) Wing Dynamic Pressure for given Yawing Moment Coefficient



Open Calculator

10) Wingspan for given Vertical Tail Volume Ratio

$$\mathbf{b} = oldsymbol{l}_{ ext{v}} \cdot rac{ ext{S}_{ ext{v}}}{ ext{S} \cdot ext{V}_{ ext{v}}}$$

Open Calculator

$$= 1.157943 m = 1.2 m \cdot \frac{5m^2}{5.08m^2 \cdot 1.02}$$

11) Wingspan for given Yawing Moment Coefficient

$$\mathbf{b} = rac{\mathrm{N_v}}{\mathrm{C_n \cdot S \cdot Q_w}}$$

Open Calculator

$$\boxed{1.150424 m = \frac{5.4 N^* m}{1.4 \cdot 5.08 m^2 \cdot 0.66 Pa}}$$

12) Wingspan for Yawing Moment Coefficient given Sideslip Angle and Sidewash Angle

$$\mathbf{b} = oldsymbol{l}_{\mathrm{v}} \cdot \mathrm{S}_{\mathrm{v}} \cdot \mathrm{Q}_{\mathrm{v}} \cdot \mathrm{C}_{\mathrm{v}} \cdot rac{eta + \sigma}{\mathrm{S} \cdot \mathrm{C}_{\mathrm{n}} \cdot \mathrm{Q}_{\mathrm{w}}}$$

Open Calculator 🗗



Variables Used

- **b** Wingspan (Meter)
- C_n Yawing Moment Coefficient
- C_v Vertical Tail Lift Curve Slope (1 per Radian)
- N_v Vertical Tail Moment (Newton Meter)
- Q_v Vertical Tail Dynamic Pressure (Pascal)
- Qw Wing Dynamic Pressure (Pascal)
- S Reference Area (Square Meter)
- Sv Vertical Tail Area (Square Meter)
- V_v Vertical Tail Volume Ratio
- β Sideslip Angle (Radian)
- η_V Vertical Tail Efficiency
- **o** Sidewash Angle (Radian)
- l_v Vertical Tail Moment Arm (Meter)





Constants, Functions, Measurements used

- Measurement: Length in Meter (m)
 Length Unit Conversion
- Measurement: Area in Square Meter (m²)

 Area Unit Conversion
- Measurement: Pressure in Pascal (Pa)
 Pressure Unit Conversion
- Measurement: Angle in Radian (rad)

 Angle Unit Conversion
- Measurement: Moment of Force in Newton Meter (N*m)

 Moment of Force Unit Conversion
- Measurement: Reciprocal Angle in 1 per Radian (rad-1)

 Reciprocal Angle Unit Conversion





Check other formula lists

- Aerodynamic Parameters
 Formulas
- Vertical Tail Contribution Formulas
- Wing-Tail Interaction Formulas

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