Important Aerodynamic Parameters Formulas PDF

Formulas
Examples
with Units

List of 11
Important Aerodynamic Parameters Formulas

1) Sideslip Angle for Aircraft Formula

Evaluate Formula

Formula

$$\beta = \alpha_v - \sigma$$

Example with Units

$$0.05\,\text{rad} = 0.117\,\text{rad} - 0.067\,\text{rad}$$

2) Sideslip Angle for given Moment Produced by Vertical Tail Formula

Evaluate Formula

Formula

$$\beta = \left(\frac{N_v}{l_v \cdot C_v \cdot Q_v \cdot S_v}\right) - \sigma$$

Example with Units

$$0.0499\,\text{rad} = \left(\frac{5.4\,\text{N*m}}{1.2\,\text{m} \cdot 0.7\,\text{rad}^{-1} \cdot 11\,\text{Pa} \cdot 5\,\text{m}^2}\right) - 0.067\,\text{rad}$$

3) SideSlip Angle for given Yawing Moment Coefficient Formula

Evaluate Formula

Formula

$$\beta = \left(\frac{C_n}{l_v \cdot S_v \cdot Q_v \cdot \frac{C_v}{S \cdot b \cdot Q_w}}\right) - \sigma$$

Example with Units

$$0.0498\,\text{rad} = \left(\frac{1.4}{1.2\,\text{m} \cdot 5\,\text{m}^2 \cdot 11\,\text{Pa} \cdot \frac{0.7\,\text{rad}^{-1}}{5.08\,\text{m}^2 \cdot 1.15\,\text{m} \cdot 0.66\,\text{Pa}}}\right) - 0.067\,\text{rad}$$

4) Sideslip Angle given Yawing Moment Coefficient and Tail Efficiency Formula

Evaluate Formula

Formula

$$\beta = \left(\frac{C_n}{V_v \cdot \eta_v \cdot C_v}\right) - \sigma$$

Example with Units

$$0.0507\,\text{rad} = \left(\frac{1.4}{1.02 \cdot 16.66 \cdot 0.7\,\text{rad}^{-1}}\right) - 0.067\,\text{rad}$$

5) Sidewash angle Formula

Evaluate Formula

Formula

$$\sigma = \alpha_v - \beta$$

Example with Units

$$0.067\,\text{rad} = 0.117\,\text{rad} - 0.05\,\text{rad}$$

6) Sidewash Angle for given Moment Produced by Vertical Tail Formula

Evaluate Formula

Formula

$$\sigma = \left(\frac{N_v}{l_v \cdot C_v \cdot Q_v \cdot S_v} \right) - \beta$$

Example with Units

$$0.0669\,\text{rad} = \left(\frac{5.4\,\text{N*m}}{1.2\,\text{m} \cdot 0.7\,\text{rad}^{-1} \cdot 11\,\text{Pa} \cdot 5\,\text{m}^2} \right) - 0.05\,\text{rad}$$

7) Sidewash Angle for given Yawing Moment Coefficient Formula

Evaluate Formula

Formula

$$\sigma = \left(\frac{C_n}{V_v \cdot \eta_v \cdot C_v} \right) - \beta$$

Example with Units

$$0.0677\,\text{rad} = \left(\frac{1.4}{1.02 \cdot 16.66 \cdot 0.7\,\text{rad}^{-1}} \right) - 0.05\,\text{rad}$$

8) Sidewash Angle given Yawing Moment Coefficient using Wingspan Formula

Evaluate Formula

Formula

$$\sigma = \left(C_n \cdot S \cdot b \cdot \frac{Q_w}{l_v \cdot S_v \cdot Q_v \cdot C_v} \right) - \beta$$

Example with Units

$$0.0668\,\text{rad} = \left(1.4 \cdot 5.08\,\text{m}^2 \cdot 1.15\,\text{m} \cdot \frac{0.66\,\text{Pa}}{1.2\,\text{m} \cdot 5\,\text{m}^2 \cdot 11\,\text{Pa} \cdot 0.7\,\text{rad}^{-1}} \right) - 0.05\,\text{rad}$$

9) Yawing Moment Coefficient for given Vertical Tail Lift Curve Slope Formula

Evaluate Formula

Formula

$$C_n = l_v \cdot S_v \cdot Q_v \cdot C_v \cdot \frac{\beta + \sigma}{S \cdot b \cdot Q_w}$$

Example with Units

$$1.4019 = 1.2\,\text{m} \cdot 5\,\text{m}^2 \cdot 11\,\text{Pa} \cdot 0.7\,\text{rad}^{-1} \cdot \frac{0.05\,\text{rad} + 0.067\,\text{rad}}{5.08\,\text{m}^2 \cdot 1.15\,\text{m} \cdot 0.66\,\text{Pa}}$$

10) Yawing Moment Coefficient for given Vertical Tail Volume Ratio Formula

Evaluate Formula

Formula

$$C_n = V_v \cdot \eta_v \cdot C_v \cdot (\beta + \sigma)$$

Example with Units

$$1.3917 = 1.02 \cdot 16.66 \cdot 0.7\,\text{rad}^{-1} \cdot (0.05\,\text{rad} + 0.067\,\text{rad})$$

11) Yawing Moment Coefficient using Wingspan Formula

Evaluate Formula

Formula

$$C_n = \frac{N_v}{Q_w \cdot S \cdot b}$$

Example with Units

$$1.4005 = \frac{5.4\,\text{N*m}}{0.66\,\text{Pa} \cdot 5.08\,\text{m}^2 \cdot 1.15\,\text{m}}$$

Variables used in list of Aerodynamic Parameters Formulas above

- **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)*
- Q_w Wing Dynamic Pressure *(Pascal)*
- **S** Reference Area *(Square Meter)*
- S_v Vertical Tail Area *(Square Meter)*
- V_v Vertical Tail Volume Ratio
- α_v Vertical Tail Angle of Attack *(Radian)*
- β Sideslip Angle *(Radian)*
- η_v Vertical Tail Efficiency
- σ Sidewash Angle *(Radian)*
- l_v Vertical Tail Moment Arm *(Meter)*

Constants, Functions, Measurements used in list of Aerodynamic Parameters Formulas above

- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  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

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