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# Pull Up and Pull Down Maneuver Formulas

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# List of 12 Pull Up and Pull Down Maneuver Formulas

## Pull Up and Pull Down Maneuver

### 1) Load Factor given Pull-Down Maneuver Radius

$$\text{fx } n = \left( \frac{V_{\text{pull-down}}^2}{R \cdot [g]} \right) - 1$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b\_img.jpg\)](#)

$$\text{ex } 1.199973 = \left( \frac{(797.71\text{m/s})^2}{29495.25\text{m} \cdot [g]} \right) - 1$$

### 2) Load Factor given Pull-Down Maneuver Rate

$$\text{fx } n = \left( \frac{V_{\text{pull-down}} \cdot \omega_{\text{pull-down}}}{[g]} \right) - 1$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d\_img.jpg\)](#)

$$\text{ex } 1.199993 = \left( \frac{797.71\text{m/s} \cdot 1.5496\text{degree/s}}{[g]} \right) - 1$$



### 3) Load Factor given Pull-UP Maneuver Radius

$$\text{fx } n = 1 + \left( \frac{V_{\text{pull-up}}^2}{R \cdot [g]} \right)$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235\_img.jpg\)](#)

$$\text{ex } 1.2 = 1 + \left( \frac{(240.52\text{m/s})^2}{29495.25\text{m} \cdot [g]} \right)$$

### 4) Load Factor given Pull-Up Maneuver Rate

$$\text{fx } n_{\text{pull-up}} = 1 + \left( V_{\text{pull-up}} \cdot \frac{\omega}{[g]} \right)$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0\_img.jpg\)](#)

$$\text{ex } 1.489704 = 1 + \left( 240.52\text{m/s} \cdot \frac{1.144\text{degree/s}}{[g]} \right)$$

### 5) Pull-down maneuver radius

$$\text{fx } R = \frac{V_{\text{pull-down}}^2}{[g] \cdot (n + 1)}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f\_img.jpg\)](#)

$$\text{ex } 29494.89\text{m} = \frac{(797.71\text{m/s})^2}{[g] \cdot (1.2 + 1)}$$




6) Pull-Down Maneuver Rate 

$$fx \quad \omega_{\text{pull-down}} = [g] \cdot \frac{1 + n}{V_{\text{pull-down}}}$$

Open Calculator 

$$ex \quad 1.549605 \text{degree/s} = [g] \cdot \frac{1 + 1.2}{797.71 \text{m/s}}$$

7) Pull-up maneuver radius 

$$fx \quad R = \frac{V_{\text{pull-up}}^2}{[g] \cdot (n - 1)}$$

Open Calculator 

$$ex \quad 29495.23 \text{m} = \frac{(240.52 \text{m/s})^2}{[g] \cdot (1.2 - 1)}$$

8) Pull-Up Maneuver Rate 

$$fx \quad \omega = [g] \cdot \frac{n_{\text{pull-up}} - 1}{V_{\text{pull-up}}}$$

Open Calculator 

$$ex \quad 1.142355 \text{degree/s} = [g] \cdot \frac{1.489 - 1}{240.52 \text{m/s}}$$



9) Velocity for given Pull-Down Maneuver Rate 

$$fx \quad V_{\text{pull-down}} = [g] \cdot \frac{1 + n}{\omega_{\text{pull-down}}}$$

Open Calculator 

$$ex \quad 797.7125\text{m/s} = [g] \cdot \frac{1 + 1.2}{1.5496\text{degree/s}}$$

10) Velocity for given Pull-Up Maneuver Radius 

$$fx \quad V_{\text{pull-up}} = \sqrt{R \cdot [g] \cdot (n - 1)}$$

Open Calculator 

$$ex \quad 240.5201\text{m/s} = \sqrt{29495.25\text{m} \cdot [g] \cdot (1.2 - 1)}$$

11) Velocity for given Turn Rate for High Load Factor 

$$fx \quad v = [g] \cdot \frac{n}{\omega}$$

Open Calculator 

$$ex \quad 589.3843\text{m/s} = [g] \cdot \frac{1.2}{1.144\text{degree/s}}$$

12) Velocity given Pull-down Maneuver Radius 

$$fx \quad V_{\text{pull-down}} = \sqrt{R \cdot [g] \cdot (n + 1)}$$

Open Calculator 

$$ex \quad 797.7149\text{m/s} = \sqrt{29495.25\text{m} \cdot [g] \cdot (1.2 + 1)}$$






## Variables Used

- **n** Load Factor
- **$n_{\text{pull-up}}$**  Pull-Up Load Factor
- **R** Turn Radius (Meter)
- **v** Velocity (Meter per Second)
- **$V_{\text{pull-down}}$**  Pull-Down Maneuver Velocity (Meter per Second)
- **$V_{\text{pull-up}}$**  Pull-Up Maneuver Velocity (Meter per Second)
- **$\omega$**  Turn Rate (Degree per Second)
- **$\omega_{\text{pull-down}}$**  Pull-Down Turn Rate (Degree per Second)



## Constants, Functions, Measurements used

- **Constant:** **[g]**, 9.80665  
*Gravitational acceleration on Earth*
- **Function:** **sqrt**, sqrt(Number)  
*A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.*
- **Measurement:** **Length** in Meter (m)  
*Length Unit Conversion* 
- **Measurement:** **Speed** in Meter per Second (m/s)  
*Speed Unit Conversion* 
- **Measurement:** **Angular Velocity** in Degree per Second (degree/s)  
*Angular Velocity Unit Conversion* 



## Check other formula lists

- [High Load Factor Maneuver Formulas](#) 
- [Pull Up and Pull Down Maneuver Formulas](#) 

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