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# Engine-Out Takeoff Case under Estimation of Runway Length Formulas

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# List of 26 Engine-Out Takeoff Case under Estimation of Runway Length Formulas

## Engine-Out Takeoff Case under Estimation of Runway Length

### Aborted Takeoff

#### 1) Distance to Accelerate and Stop given Full Strength Pavement Distance

fx $\mathrm{DAS} = \mathrm{FS} + \mathrm{SW}$ Open Calculator

ex $2500\mathrm{m} = 2000\mathrm{m} + 500\mathrm{m}$

#### 2) Field Length or Total Amount of Runway needed

fx $\mathrm{FL} = \mathrm{FS} + \mathrm{SW}$ Open Calculator

ex $2500\mathrm{m} = 2000\mathrm{m} + 500\mathrm{m}$

#### 3) Full Strength Pavement Distance for Aborted Takeoff

fx $\mathrm{FS} = \mathrm{DAS} - \mathrm{SW}$ Open Calculator

ex $2000\mathrm{m} = 2500\mathrm{m} - 500\mathrm{m}$

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### 4) Full Strength Pavement Distance given Field Length

Open Calculator

$$FS = FL - SW$$

$$2100\text{m} = 2600\text{m} - 500\text{m}$$

### 5) Stopway Distance given Field Length

Open Calculator

$$SW = FL - FS$$

$$600\text{m} = 2600\text{m} - 2000\text{m}$$

### 6) Stopway Distance given Full Strength Pavement Distance

Open Calculator

$$SW = DAS - FS$$

$$500\text{m} = 2500\text{m} - 2000\text{m}$$

## Continued Takeoff

### 7) Clearway Distance for Continued Takeoff

Open Calculator

$$CL = 0.5 \cdot (D_{35} - s_{LO})$$

$$545\text{m} = 0.5 \cdot (1600\text{m} - 510\text{m})$$

### 8) Clearway Distance given Field Length under Continued Takeoff

Open Calculator

$$CL = FL - FS$$

$$600\text{m} = 2600\text{m} - 2000\text{m}$$

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### 9) Clearway Distance given Takeoff Run

Open Calculator

fx $$\mathrm{CL} = \mathrm{D}_{35} - \mathrm{T}_{\mathrm{Clearway}}$$

ex $$600\mathrm{m} = 1600\mathrm{m} - 1000\mathrm{m}$$

### 10) Distance of 35 ft Obstacle given Takeoff Run

Open Calculator

fx $$\mathrm{D}_{35} = \mathrm{T}_{\mathrm{Clearway}} + \mathrm{CL}$$

ex $$1600\mathrm{m} = 1000\mathrm{m} + 600\mathrm{m}$$

### 11) Distance to clear 35 ft Obstacle for Clearway Distance for Continued Takeoff

Open Calculator

fx $$\mathrm{D}_{35} = \left(\frac{\mathrm{CL}}{0.5}\right) + \mathrm{s}_{\mathrm{LO}}$$

ex $$1710\mathrm{m} = \left(\frac{600\mathrm{m}}{0.5}\right) + 510\mathrm{m}$$

### 12) Field Length or Total Amount of Runway needed under Continued Takeoff

Open Calculator

fx $$\mathrm{FL} = \mathrm{FS} + \mathrm{CL}$$

ex $$2600\mathrm{m} = 2000\mathrm{m} + 600\mathrm{m}$$

### 13) Liftoff Distance given Clearway Distance for Continued Takeoff

Open Calculator

fx $$s_{LO} = -\left(\left(\frac{CL}{0.5}\right) - D_{35}\right)$$

ex $$400\text{m} = -\left(\left(\frac{600\text{m}}{0.5}\right) - 1600\text{m}\right)$$

### 14) Takeoff Run for Continued Takeoff

Open Calculator

fx $$T_{Clearway} = D_{35} - CL$$

ex $$1000\text{m} = 1600\text{m} - 600\text{m}$$

## Landing Distance under Estimation of Runway Length

### 15) Additional Distance required for Turns given Distance between Center lines

Open Calculator

fx $$d_R = d - 116$$

ex $$34\text{m} = 150\text{m} - 116$$

### 16) Distance between Center Lines of Runway and Parallel Taxiway

Open Calculator

fx $$d = 116 + d_R$$

ex $$150\text{m} = 116 + 34\text{m}$$

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### 17) Equation for Landing Distance

Open Calculator

fx $$LD = 1.667 \cdot SD$$

ex $$8.335\text{km} = 1.667 \cdot 5\text{km}$$

### 18) Stopping Distance given Landing Distance

Open Calculator

fx $$SD = \frac{LD}{1.667}$$

ex $$5.9988\text{km} = \frac{10\text{km}}{1.667}$$

## Normal Takeoff Cases under Estimation of Runway Length

### 19) Clearway Distance

Open Calculator

fx $$CL = 0.5 \cdot (TOD - (1.15 \cdot s_{LO}))$$

ex $$656.75\text{m} = 0.5 \cdot (1900\text{m} - (1.15 \cdot 510\text{m}))$$

### 20) Clearway Distance given Field Length

Open Calculator

fx $$CL = FL - FS$$

ex $$600\text{m} = 2600\text{m} - 2000\text{m}$$

## 21) Field Length

Open Calculator

$$FL = FS + CL$$

$$2600\text{m} = 2000\text{m} + 600\text{m}$$

## 22) Full Strength Pavement Distance

Open Calculator

$$FS = FL - CL$$

$$2000\text{m} = 2600\text{m} - 600\text{m}$$

## 23) Lift off Distance given Clearway Distance

Open Calculator

$$s_{LO} = -\left(\frac{\left(\frac{CL}{0.5}\right) - TOD}{1.15}\right)$$

$$608.6957\text{m} = -\left(\frac{\left(\frac{600\text{m}}{0.5}\right) - 1900\text{m}}{1.15}\right)$$

## 24) Takeoff Distance given Clearway Distance

Open Calculator

$$TOD = \left(\frac{CL}{0.5}\right) + (1.15 \cdot s_{LO})$$

$$1786.5\text{m} = \left(\frac{600\text{m}}{0.5}\right) + (1.15 \cdot 510\text{m})$$

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## 25) Takeoff Distance given Takeoff Run

Open Calculator

fx $\mathrm{T_{Distance}} = \mathrm{TOR} + \mathrm{CL}$

ex $3952\mathrm{m} = 3352\mathrm{m} + 600\mathrm{m}$

## 26) Takeoff Run

Open Calculator

fx $\mathrm{T_{Run}} = \mathrm{TOD} - \mathrm{CL}$

ex $1300\mathrm{m} = 1900\mathrm{m} - 600\mathrm{m}$

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## Variables Used

- **CL** Clearway Distance *(Meter)*
- **d** Distance between Centre lines *(Meter)*
- $D_{35}$ Distance to Clear 35 ft Obstacle *(Meter)*
- $d_R$ Additional Distance required for Turns *(Meter)*
- **DAS** Distance to Accelerate and Stop *(Meter)*
- **FL** Field Length *(Meter)*
- **FS** Full Strength Pavement Distance *(Meter)*
- **LD** Landing Distance *(Kilometer)*
- $s_{LO}$ Liftoff Distance *(Meter)*
- **SD** Stopping Distance *(Kilometer)*
- **SW** Stopway Distance *(Meter)*
- $T_{Clearway}$ Takeoff Run in Clearway *(Meter)*
- $T_{Distance}$ Takeoff Distance given takeoff run *(Meter)*
- $T_{Run}$ Takeoff Run given takeoff distance *(Meter)*
- **TOD** Takeoff Distance *(Meter)*
- **TOR** Takeoff Run *(Meter)*

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## Constants, Functions, Measurements used

- Measurement: **Length** in Meter (m), Kilometer (km)
  *Length Unit Conversion*

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