FAA
Airport Safety and Standards
Airport Engineering Division

End-Around Taxiway Equations

The following equations appear in the video presentation, Section 8: End-Around Taxiways. This guide contains extra explanations of the End-Around Taxiway (EAT) equations for viewers with sight impairments. For more detailed information and illustrations, please see AC 150/5300-13, Airport Design. All dimensions on runways or taxiways refer to the centerline.

Finding the half-width of the EAT screen

The half width of the screen is the distance from the runway to the hold line, multiplied by the sum of the distance from the stop end of the runway to the screen divided by 40% of the runway length plus one.

$$\frac{D_e}{2} = D_h\left(\frac{D_s}{D_v} + 1\right)$$

Equation 1. Half-width of the EAT screen

In this equation:

- D_e is the full width of the EAT visual screen
- D_h is the distance from the runway to the hold line
- D_s is the distance from the stop end of the runway to the screen
- D_v is 40% of the runway length

Finding the elevation of a pilot's eye at the V_1 point

The elevation of the pilot's eye at the V_1 point is equal to the runway elevation at the V_1 point plus the height of the pilot's eye. Tables in AC 150/5300-13 provide pilot eye heights for Airport Design Groups ADG-III to ADG-VI.

$$ELEV_{EYE} = ELEV_{V1} + H_{EYE}$$

Equation 2. Elevation of a pilot's eye at the V_1 point

In this equation:

- $ELEV_{EYE}$ is the elevation of the pilot's eye at the V_1 point
- $ELEV_{V1}$ is the elevation of the runway at the V_1 point, which is 40% of the length of the runway from the stop end of the runway
- H_{EYE} is the height of the pilot's eye above the runway

Finding the elevation of the top of the engine nacelle

The elevation of the top of the engine nacelle equals the elevation of the EAT plus the height of the engine nacelle above the taxiway.

$$ELEV_{NACELLE} = ELEV_{EAT} + H_{NACELLE}$$

Equation 3. Elevation of the top of the engine nacelle

In this equation,

- $ELEV_{NACELLE}$ is the elevation of the top of the engine nacelle
- $ELEV_{EAT}$ equals the elevation of the EAT
- $H_{NACELLE}$ is the height of the engine nacelle above the EAT

Finding the slope from the pilot's eye to the top of the screen

The slope of the imaginary line from the pilot's eye to the top of the EAT screen is equal to the sum of the elevation of the runway at the V_1 point and the height of the pilot's eye above the point, minus the sum of the elevation of the EAT at the extended runway and the height of the engine nacelle above that point; all divided by the sum of the distance from the runway end to the EAT and 40% of the runway length.

$$SLOPE = \frac{(ELEV_{V1} + H_{EYE}) - (ELEV_{EAT} + H_{NACELLE})}{(D_{EAT} + D_v)}$$

Equation 4. Slope from the pilot's eye to the top of the screen

In this equation,

- $ELEV_{V1}$ is the elevation of the runway at the V_1 point, which is 40% of the length of the runway from the stop end of the runway
- H_{EYE} is the height of the pilot's eye above the runway
- $ELEV_{EAT}$ is the elevation of the EAT
- $H_{NACELLE}$ is the height of the engine nacelle above the EAT
- D_{EAT} is the distance from the stop end of the runway to the EAT
- D_v is 40% of the runway length

Finding the elevation of the top of the EAT screen

The elevation of the top of the EAT screen is equal to the slope from the pilot's eye to the top of the screen times the result of the distance from the stop end of the runway to the EAT minus the distance from the stop end of the runway to the screen all added to the elevation of the top of the engine nacelle.

$$ELEV_{TOS} - ELEV_{NACELLE} = SLOPE \times (D_{EAT} - D_S)$$

Equation 5. Elevation of the top of the EAT screen

In this equation,

- $ELEV_{TOS}$ is the elevation of the top of the EAT screen
- SLOPE is the slope between the pilot's eye at the V_1 point and the top of the EAT screen
- D_{EAT} is the distance from the stop end of the runway to the EAT
- D_s is the distance from the stop end of the runway to the screen
- $ELEV_{NACELLE}$ is the elevation of the top of the engine nacelle

Height of the screen above grade

The height of the EAT screen above grade is the elevation of the top of the screen less the elevation of the ground at the screen.

$$H_S = ELEV_{TOS} - ELEV_{GAS}$$

Equation 6. Height of the screen above grade

In this equation,

- H_S is the height of the EAT screen above grade
- $ELEV_{TOS}$ is the elevation of the top of the EAT screen
- $ELEV_{GAS}$ is the elevation of the ground at the screen

To calculate the required height of the screen above grade find the height that is equal to the elevation of the runway V_1 point plus the height of the pilot's eye at the V_1 point minus the elevation of the EAT minus the height of the nacelle above the EAT; all times the difference between the distance between the runway end and the EAT and the distance between the runway end and the screen; all divided by the sum of the distance between the runway end and the EAT and 0.4 times the runway length; all plus the height of the nacelle above the EAT plus the elevation of the EAT minus the elevation of the ground at the screen.

$$H_S = \frac{(ELEV_{V1} + H_{EYE} - ELEV_{EAT} - H_{NACELLE}) \times (D_{EAT} - D_S)}{D_{EAT} + D_V} + H_{NACELLE} + ELEV_{EAT} - ELEV_{GAS}$$

Equation 7. Height of the screen above grade, full equation

In this equation,

- H_S is the height of the EAT screen above grade
- $ELEV_{V1}$ is the elevation of the runway at the V_1 point, which is 40% of the length of the runway from the stop end of the runway
- H_{EYE} is the height of the pilot's eye above the runway
- $ELEV_{EAT}$ is the elevation of the EAT
- $H_{NACELLE}$ is the height of the engine nacelle above the taxiway
- D_{EAT} is the distance from the stop end of the runway to the EAT
- D_s is the distance from the stop end of the runway to the screen
- D_v is 40% of the runway length
- $ELEV_{GAS}$ is the elevation of the ground at the screen