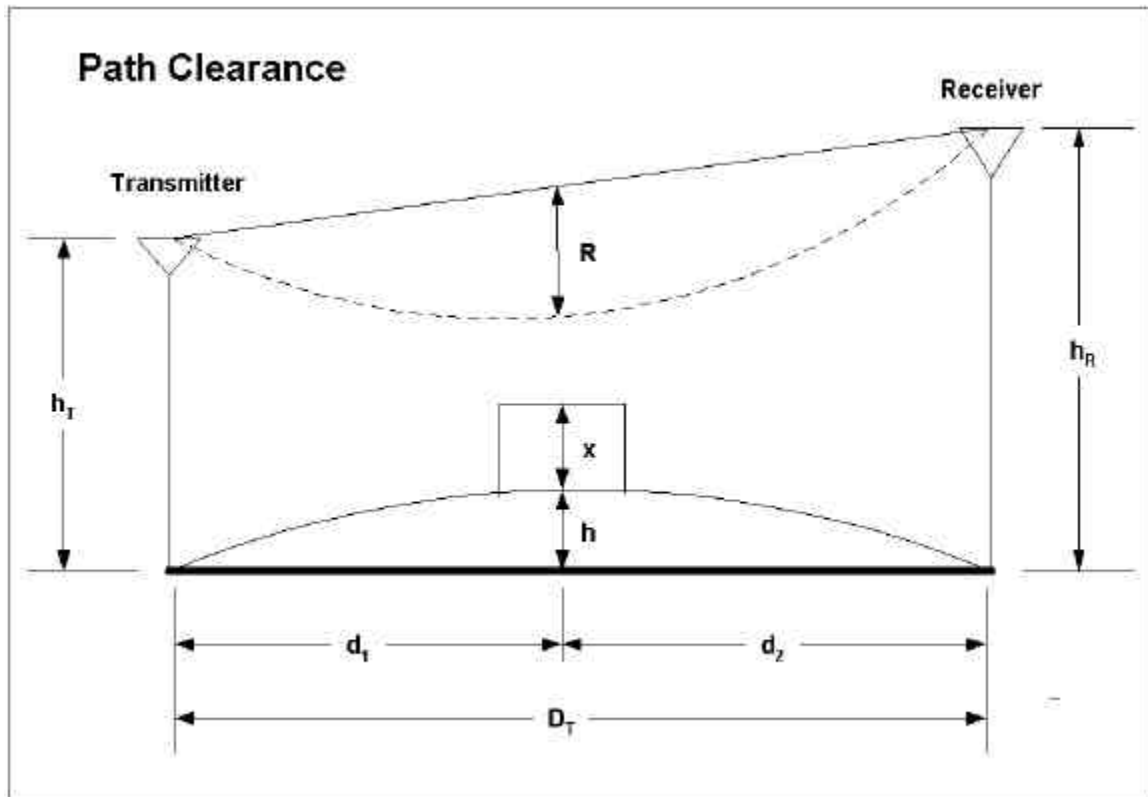


## Path Clearance



## Earth Curvature

$$h = d_1 * d_2 / 1.5 * K$$

where  $h$  is the earth curvature in feet

$d_1$  is the distance from first antenna, in miles

$d_2$  is the distance from second antenna, in miles

$K = 4/3$

Therefore,

$$h = d_1 * d_2 / 2$$

### First Fresnel Zone

$$R = 72 ((d_1 * d_2) / D_T * f)^{1/2}$$

where R is the first Fresnel zone in ft  
 $D_T$  is the total path length in miles  
 f is the frequency in GHz

### Reflection Point

The formula for calculating the position of the reflection point on a path is;

**For K = 4/3**       $h_T / d_1 - d_1 / 2 = h_R * d_2 - d_2 / 2$

**For K = 2/3**       $h_T / d_1 - d_1 = h_R * d_2 - d_2$

**For K = infinity**       $d_1 = D_T * h_T / (h_T + h_R)$

where  $h_T$  and  $h_R$  are the transmitter and receiver heights in feet  
 $d_1$ ,  $d_2$  and  $D_T$  are distances in miles  
 infinity is for worst-case flat Earth propagation conditions

### Fading Outages and Availability

The formula for calculating the Unavailability, U, of a path (due to multi-path fading) is;

$$U = a * b * 2.5 * 10^{-6} * f * D^3 * 10^{-F/10}$$

where a is Climate (0.1 to 0.5)  
 b is terrain (0.25 to 4)  
 f is Frequency in GHz  
 D is Path length in Miles  
 F is Fade margin in dB

The formula for calculating the availability, A, of a path is;

$$A = (1-U) * 100\%$$

where U is Unavailability of a path