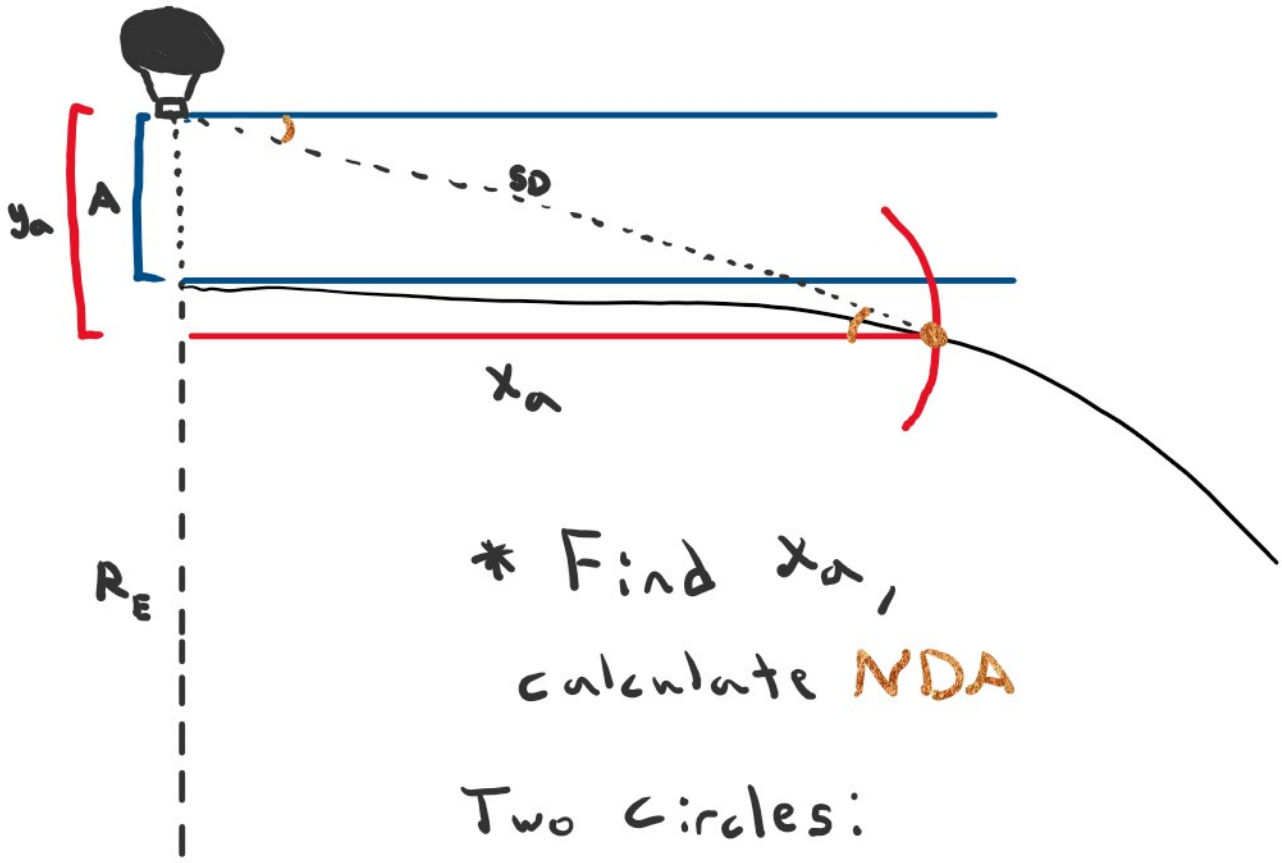
Lakehurst Test Plan

Tuesday, March 1, 2022 9:53 PM

Objectives:

1. For altitude(A), calculate nominal depression angle(NDA), so distance to target equals Slant Distance(SD) - Given: A and SD
2. Calculate ground coordinates for flight path (circle and hexagon(radius)) - Given: Target Coordinates



* Find x_a, calculate NDA

Two circles:

$$x_a^2 + y_a^2 = SD^2$$

$$x_a^2 + \left(R_E - (y_a - A)\right)^2 = R_E^2$$

↓ Find Intersection

Find Intersection

$$(SD^2 - y_a^2) + (R_E - y_a + A)^2 = R_E^2$$

$$SD^2 - y_a^2 + R_E^2 - R_E y_a + R_E A - 2R_E + 2y_a^2 - y_a A + A R_E - A y_a + A^2 = R_E^2$$

$$SD^2 + A^2 - 2R_E y_a + 2R_E A - 2y_a A = 0$$

$$2y_a(R_E + A) = SD^2 + A^2 + 2R_E A$$

$$y_a = \frac{SD^2 + A(A + 2R_E)}{2(R_E + A)}$$

$$x_a = \sqrt{SD^2 - \left(\frac{SD^2 + A(A + 2R_E)}{2(R_E + A)}\right)^2}$$

(1)

$$NDA = \cos^{-1}\left(\frac{x_a}{SD}\right)$$

or $$\sin^{-1}\left(y_a \div SD\right)$$

(2)

for a given target x_1, y_1 the ground

$$x_1 - x_a = x_2$$

for a given target x_1, y_1, the ground coordinate(x_2,y_2) for the radar would be:

$$x_1 - x_a - x_2$$

$$y_1 + (y_a - A) = y_2$$