1. Two planes are separated by 500 m. If your RADAR has a pulse width of 1 µs, can you see both planes?

$\Delta R =$ 150m, Yes

2. Two planes are separated by 500 m. If your RADAR has a pulse width of 10 µs, can you see both planes?

$\Delta R =$ 1.5km, No

3. A RADAR that has a PRF of 10kHz is trying to detect an object 25 km away. Will it be able to unambiguously detect the range?

$R_{unamb} =$ 15km, No

4. An aircraft is approaching a RADAR using an approach angle of 20o. The aircraft is traveling at a speed of 200 mph. The RADAR emits its signal at a frequency of 200 MHz. What is the frequency of the return signal?

$f =$ 200.0001121 MHz

5. An airplane is flying overhead with an approach angle of 60°. If a RADAR transmits a signal at 300 MHz and it returns at 300.000125 MHz, how fast is the airplane traveling?

$v =$ 125 m/s

6. A squadron of planes is approaching a RADAR installation. The squadron has the following characteristics:

   (a) What is the PRI?

   $PRI =$ $166.7\mu s$

   (b) If you are 28 km from the SAM site, does it know where you are (without additional processing)?

   $R_{unamb} =$ 25 km

   (c) If you are ingressing as a two-ship with 10 m spacing, will the SAM be able to tell there are two of you?

   $\Delta R =$ 45 m, No

7. A squadron of planes is approaching a RADAR installation. The squadron has the following characteristics:

$\sigma = 6\text{m}^2$
$G_R = 3.2$
$P_{r,\text{min, RWR}} = 2\mu\text{W}$
altitude = 1000ft, AGL

The RADAR installation has the following characteristics:

$f = 1\text{GHz}$
$G_T = 300$
$P_T = 400\text{kW}$
$P_{r,\text{min,RADAR}} = 300\text{fW}$
altitude = 300ft, AGL

(a) For the RADAR installation, what is the PRF required to unambiguously detect the squadron (consider the lead aircraft) out to 180km?

PRF = 833 Hz

(b) The incoming squadron will have 350ft between each plane – what is the maximum RADAR pulse width required to distinguish the planes?

τ = 711 ns

(c) For the conditions specified, what will be the maximum line of sight distance between the RADAR and the lead aircraft?

R_{LOS} = 111 km

(d) What is the maximum distance from which the RADAR will detect the planes?

R_{RADAR} = 75.6 km

(e) What is the maximum distance from which the lead aircraft's RWR will detect the RADAR?

R_{RWR} = 331 km

(f) Who will see who first, and at what range?

Answer = Planes at 111 km

(g) If the planes would like to reduce R_{LOS} to 80km, what altitude would they have to drop down to?

Altitude = 317 ft

(h) The RADAR's return frequency is 1.000000866 GHZ, and the approach angle of the planes is 25°. What is the speed of the planes, in mph.

Speed = 143 m/s