

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

$$\sigma = 8\text{m}^2$$

$$G_R = 3.2$$

$$P_{r,\min, \text{RWR}} = 400\text{nW}$$

$$\text{altitude} = 3500\text{ft, AGL}$$

The RADAR installation has the following characteristics:

$$f = 900\text{MHz}$$

$$G_T = 250$$

$$P_T = 9\text{kW}$$

$$P_{r,\min, \text{RADAR}} = 15\text{fW}$$

$$\text{altitude} = 175\text{ft, AGL}$$

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

$$R_{\text{LOS}} =$$

165 km

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

$$R_{\text{RWR}} =$$

113 km

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

$$R_{\text{RADAR}} =$$

64.0 km

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

$$\text{Answer} =$$

Planes at 113km

2. For the data given in Problem 1, what would be the planes' new altitude so that the line-of-sight distance matches the RWR detection distance?

Altitude =

1,310 ft

3. For the data given in Problem 1, what is the minimum RCS value ( $\sigma$ ) required for the RADAR to be able to detect the plane at the original LOS distance?

$\sigma =$

351  $m^2$

4. The RCS of a fighter is approximately 20 square meters. The RCS of a missile is approximately 0.2 square meters. How many times farther away can the fighter be detected than the missile?

$\sigma =$

3.16 times farther

5. During an exercise, a UAS is used to gather information on the red forces. The red team has deployed a mobile RADAR unit, with the following parameters:

RADAR unit	UAS
Frequency = 450 MHz	RCS = $0.4 \text{ m}^2$
Transmit Power = 1.5kW	Receive antenna gain = 3
Antenna gain = 200	Minimum power received = $1.25 \text{ } \mu\text{W}$
Minimum power received = 1 fW	

- (a) If the RADAR signal takes 133.3  $\mu\text{s}$  to return, how far away is the UAS?

$R_{\text{LOS}} =$

20.0 km

- (b) How much power is received by the RADAR if the UAS is 30 km from the RADAR?

$R_{\text{RWR}} =$

6.64 fW

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

$R_{\text{LOS}} =$

47.47 km

- (d) What is the maximum distance from which the UAS RWR will detect the RADAR?

$R_{\text{RWR}} =$

45.02 km

- (e) What is the maximum distance from which the RADAR will detect the UAS?

$R_{\text{RADAR}} =$

48.15 km

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

Answer =

UAS at 47.47km