Homework Solutions
11/6/2007

Problems

17. Since the coating has a greater index of refraction than the air or the lens, there will only be a phase change for the light ray reflected at the air-coating boundary. So, in order for destructive interference to occur, the wave refracting through the coating and off the lens will need to travel a multiple of the wavelength of light.

$$2nt = m\lambda$$

$$\lambda = \frac{2nt}{m} = \frac{2(1.55)(177.4nm)}{1} = 550nm$$

19. There will be a phase change at the boundary between air and the coating and between the coating and the aircraft. Therefore, in order for destructive interference to occur the wave traveling in the coating must travel a multiple of a half wavelength farther.

$$2nt = \left(m + \frac{1}{2}\right)\lambda$$

$$t = \frac{\left(m + \frac{1}{2}\right)\lambda}{2n} = \frac{\frac{1}{2}(3.00cm)}{2(1.50)} = 0.500cm$$

63. Remember, reflection of a wave off a surface causes a half wavelength shift in phase.

$$c = \sqrt{a^2 + b^2} = \sqrt{(300m)^2 + (50m)^2} = 304.14m$$

$$2(304.14m) = 608.28m$$

$$608.28m - 600m = 8.28m$$

$$8.28m = \left(m + \frac{1}{2} \right) \lambda$$

$$8.28m = \left(\frac{1}{2} \right) \lambda$$

$$\lambda_{constructive} = 16.6m$$

$$8.28m = m\lambda$$

$$\lambda_{destructive} = 8.28m$$