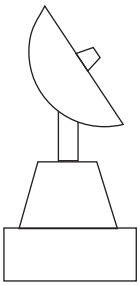
5 This question is about using radio waves to track an aeroplane.

aeroplane



aerial at airport

(a) Radio waves are emitted from an aerial at an airport, and are then reflected back to the aerial from an aeroplane.

The time taken between emitting the radio waves and receiving the waves back at the aerial is 1.9 milliseconds.

Show that the aeroplane is approximately 300 km away from the aerial.

[speed of radio waves = 3.0×10^5 km/s]

(3)

(b) As the aeroplane travels away from the airport, it sends a signal to the airport using radio waves with a wavelength of 1.2 m.

When the signal is received at the airport, the wavelength is 1.1×10^{-6} m longer than when it is emitted by the aeroplane.

Calculate the speed of the aeroplane using the formula

$$\frac{\text{change of wavelength}}{\text{wavelength}} = \frac{\text{speed of aeroplane}}{\text{speed of radio wave}}$$

[speed of radio waves = 3.0×10^{8} m/s]

(3)

speed of aeroplane = ... m/s

(Total for Question 5 = 6 marks)