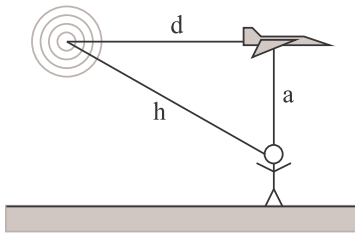


Chapter 14 Problem 63 †



Given

$$a = 5.2 \text{ km}$$

$$\theta = 35^\circ$$

$$v_s = 330 \text{ m/s}$$

Solution

Find the speed of the plane.

From trigonometry the distance to the apparent sound source is related to the distance travelled by the plane, d , by the relationship

$$\sin \theta = \frac{d}{h} \quad (1)$$

The distance the sound travels is the velocity of sound times the time it takes to get to the listener.

$$h = v_s t \quad (2)$$

During this same time the plane travels from the apparent sound source to directly overhead. This distance is the speed of the plane times the time.

$$d = v_p t \quad (3)$$

Substituting equations 2 and 3 into 1 gives

$$\sin \theta = \frac{v_p t}{v_s t} = \frac{v_p}{v_s}$$

Solving for the speed of the plane gives

$$v_p = v_s \sin \theta = (330 \text{ m/s}) \sin 35^\circ$$

$$v_p = 189 \text{ m/s}$$

†Problem from Essential University Physics, Wolfson