

33. We adopt the positive direction choices used in the textbook so that equations such as Eq. 4-22 are directly applicable. The coordinate origin is at ground level directly below the release point. We write  $\theta_0 = -30^\circ$  since the angle shown in the figure is measured clockwise from horizontal. We note that the initial speed of the decoy is the plane's speed at the moment of release:  $v_0 = 290 \text{ km/h}$ , which we convert to SI units:  $(290)(1000/3600) = 80.6 \text{ m/s}$ .

(a) We use Eq. 4-12 to solve for the time:

$$\Delta x = (v_0 \cos \theta_0) t \implies t = \frac{700}{(80.6) \cos -30^\circ} = 10.0 \text{ s} .$$

(b) And we use Eq. 4-22 to solve for the initial height  $y_0$ :

$$\begin{aligned} y - y_0 &= (v_0 \sin \theta_0) t - \frac{1}{2} g t^2 \\ 0 - y_0 &= (-40.3)(10.0) - \frac{1}{2} (9.8)(10.0)^2 \end{aligned}$$

which yields  $y_0 = 897 \text{ m}$ .