

37. 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  $\theta_0 = -37^\circ$  for the angle measured from  $+x$ , since the angle given in the problem is measured from the  $-y$  direction. We note that the initial speed of the projectile is the plane's speed at the moment of release.

(a) We use Eq. 4-22 to find  $v_0$  (SI units are understood).

$$y - y_0 = (v_0 \sin \theta_0) t - \frac{1}{2} g t^2$$
$$0 - 730 = v_0 \sin(-37^\circ) (5.00) - \frac{1}{2} (9.8) (5.00)^2$$

which yields  $v_0 = 202$  m/s.

(b) The horizontal distance traveled is  $x = v_0 t \cos \theta_0 = (202)(5.00) \cos -37.0^\circ = 806$  m.

(c) The  $x$  component of the velocity (just before impact) is  $v_x = v_0 \cos \theta_0 = (202) \cos -37.0^\circ = 161$  m/s.

(d) The  $y$  component of the velocity (just before impact) is  $v_y = v_0 \sin \theta_0 - g t = (202) \sin(-37^\circ) - (9.80)(5.00) = -171$  m/s.