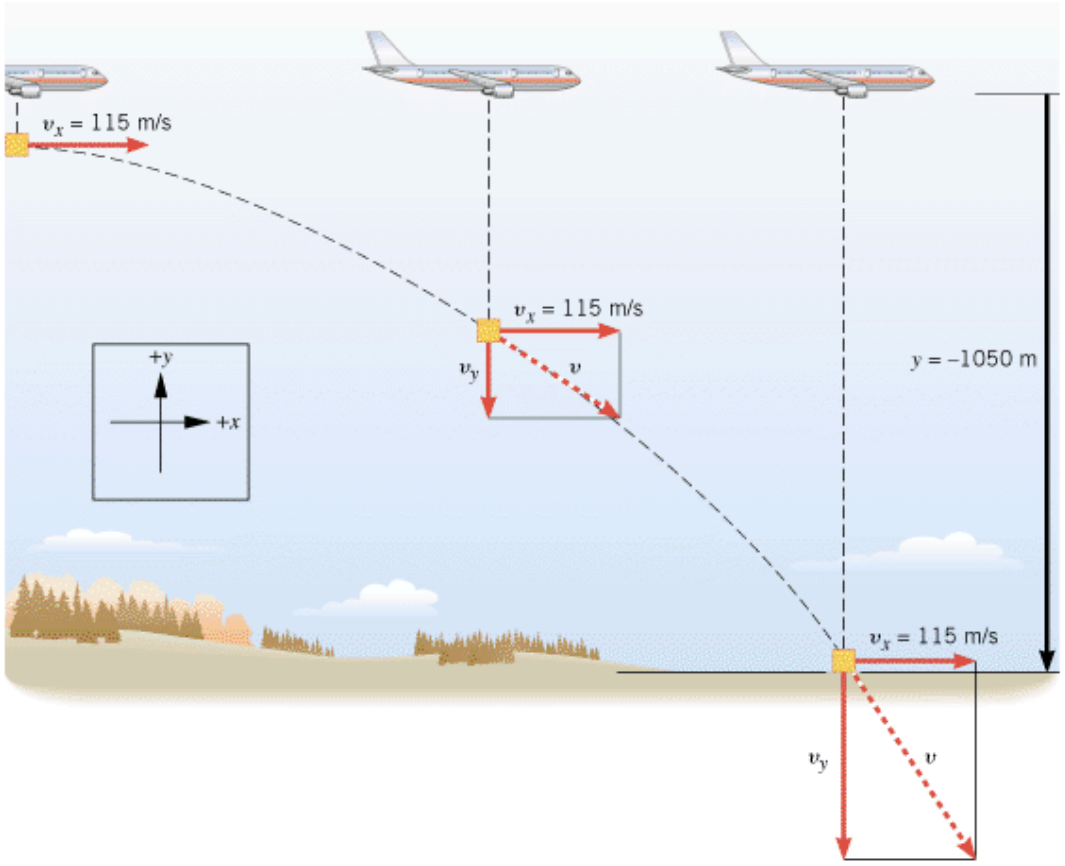
A Falling Care Package

Figure below shows an airplane moving horizontally with a constant velocity of +115 m/s at an altitude of 1050 m. The plane releases a "care package" that falls to the ground along a curved trajectory. Ignoring air resistance, determine the time required for the package to hit the ground.



The time required for the package to hit the ground is the time it takes for the package to fall through a vertical distance of 1050 m. In falling, it moves to the right, as well as downward. These two parts of the motion occur independently.

y-Direction Data				
y	a_y	v_y	v_{0y}	t
–1050 m	–9.80 m/s^2		0 m/s	?

With these data, Equation 3.5b ($y = v_{0y}t + \frac{1}{2}a_y t^2$) can be used to find the fall time.

Solution Since $v_{0y} = 0$ m/s, it follows from Equation 3.5b that $y = \frac{1}{2}a_y t^2$ and

$$t = \sqrt{\frac{2y}{a_y}} = \sqrt{\frac{2(-1050\text{ m})}{-9.80\text{ m/s}^2}} = \boxed{14.6\text{ s}}$$

Find the speed of package B and the direction of the velocity vector just before package B hits the ground.

$$V_y = V_{oy} + g\,t$$

$$= 0 + (-9.8)\,(14.6) = -143 \text{ m/s}$$

Find the range X:

$$X = V_{ox}\,t$$

$$= 115 \times 14.6 = 1{,}679 \text{ m.}$$

Package A and package B are released simultaneously at the same height and strike the ground at the same time because their y variables (y, a_y, and v_{0y}) are the same.