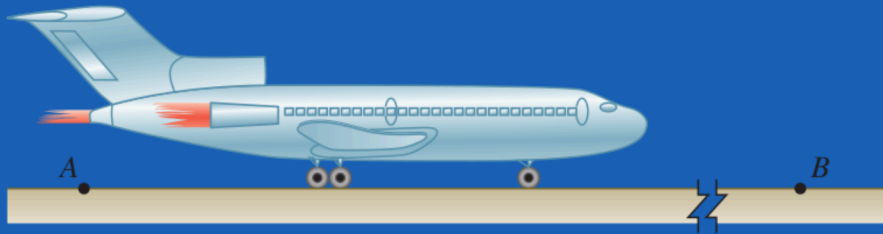


An airplane begins its take-off run at A with zero velocity and a constant acceleration  $a$ . Knowing that it becomes airborne 30 s later at B with a take-off velocity of 270 km/h, determine (a) the acceleration  $a$ , (b) distance AB.



$$V_0 = 0 \quad V = 270 \text{ km/h} \left( \frac{1000 \text{ m}}{1 \text{ km}} \right) \left( \frac{1 \text{ h}}{60 \text{ min}} \right) \left( \frac{1 \text{ min}}{60 \text{ s}} \right) = 75 \text{ m/s}$$

$$t = 30 \text{ s}$$

$$V = V_0 + at$$

$$V - V_0 = at$$

$$\frac{V - V_0}{t} = a$$

$$\frac{75 \text{ m/s} - 0 \text{ m/s}}{30 \text{ s}} = \boxed{2.5 \text{ m/s}^2 = a}$$

$$x = \cancel{v_0 t} + \cancel{v_0 t} + \frac{1}{2} at^2 = \frac{1}{2} at^2 = \frac{1}{2} 2.5 \text{ m/s}^2 (30 \text{ s})^2 = \boxed{1125 \text{ m} = AB}$$