Question #61083, Physics / Mechanics | Relativity

the required takeoff speed for a large airplane is 180 mi/hr (roughly 80 m/s). the plane is capable of acceleration at a rate of 4m/s2. assume the plane starts at rest.

a). determine the minimum runway length required for this plane to safely take off.

b). a smaller airplane requires a takeoff speed that is half as much as the large airplane. Determine the minimum runway length required for this smaller plane to safely takeoff.

Solution

a) $d = \frac{v_f^2 - v_0^2}{2a}$;

$$d = \frac{80^2 - 0^2}{2 \times 4} = 800 \text{ m}$$

b) Assuming the small airplane is capable of the same acceleration.

$$d = \frac{40^2 - 0^2}{2 \times 4} = 200 \text{ m}$$

Answer: 800 m, 200 m.