Answer on Question #69396-Physics / Other

A Cessna aircraft has a liftoff speed of $v = 120\frac{\text{km}}{\text{hr}} = 33.3\frac{\text{m}}{\text{s}}$.

a.) What minimum constant acceleration does the aircraft require if it is to be airborne after a takeoff run of $S = 240$ m?

b.) How long does to take the aircraft to become airborne?

Solution:

a)

$$S = \frac{v^2 - u^2}{2a}.$$

u- initial velocity, v- final velocity, a- acceleration, S- distance.

So

$$a = \frac{v^2 - u^2}{2S} = \frac{33.3^2 - 0^2}{2 \times 240} = 2.3\ \frac{\text{m}}{\text{s}^2}.$$

b)

$$a = \frac{v - u}{t}, \qquad t = \frac{v - u}{a} = \frac{33.3 - 0}{2.3} = 14.4\ \text{s}.$$

Answer $a = 2.3\ \frac{\text{m}}{\text{s}^2}$; $\text{t} = 14.4$ s.