4 **(a)** Explain qualitatively why a body travelling in a circle with constant speed experiences an acceleration towards the centre of the circle.

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..... [2]

(b) A toy plane with a mass of 0.40 kg, as shown in Fig 4.1, has a taut wire of length 5.0 m attached to it when it flies in a horizontal circle. The taut wire is inclined 60˚ to the horizontal and fixed to a point O. The wings of the toy plane are horizontal, creating a vertical upward lift on the plane.

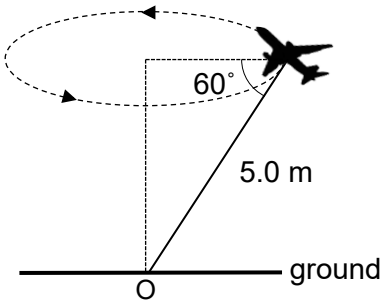

Fig 4.1

(i) If each revolution takes 3.5 s, show that the centripetal acceleration of the toy plane is 8.1 m s^{-2}.

[1]

(ii) Calculate the tension *T* in the taut wire.

T = ... N [2]

(iii) Hence calculate the upward lift *L* on the toy plane due to the air.

L = ... N [2]

(iv) In another arrangement, the taut wire is now fixed to a point O attached to the ceiling with the toy plane flying in a horizontal circle as shown in Fig. 4.2.

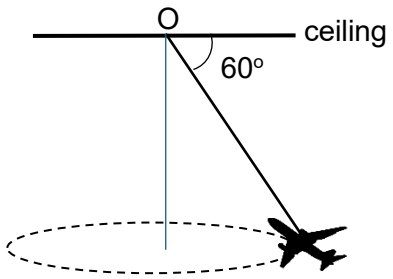

Fig. 4.2

Discuss how your answer to **(a)(iii)** will change if the wings of the toy plane are horizontal and the wire remaining at 60° to the horizontal with the time taken for each revolution unchanged.

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..... [2]