

- 3 (a) (i) Define *power*.

.....
..... [1]

- (ii) State what is meant by *gravitational potential energy*.

.....
..... [1]

- (b) An aircraft of mass 1200 kg climbs upwards with a constant velocity of 45 ms^{-1} , as shown in Fig. 3.1.

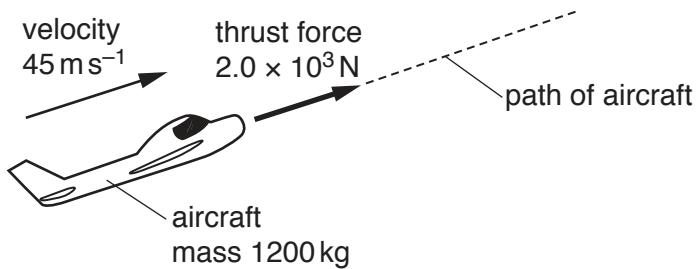


Fig. 3.1 (not to scale)

The aircraft's engine produces a thrust force of $2.0 \times 10^3 \text{ N}$ to move the aircraft through the air. The rate of increase in height of the aircraft is 3.3 ms^{-1} .

- (i) Calculate the power produced by the thrust force.

power = W [2]

- (ii) Determine, for a time interval of 3.0 minutes,
1. the work done by the thrust force to move the aircraft,

work done = J [2]

2. the increase in gravitational potential energy of the aircraft,

increase in gravitational potential energy = J [2]

3. the work done against air resistance.

work done = J [1]

- (iii) Use your answer in (b)(ii) part 3 to calculate the force due to air resistance acting on the aircraft.

force = N [1]

- (iv) With reference to the motion of the aircraft, state and explain whether the aircraft is in equilibrium.

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..... [2]

[Total: 12]