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 m s^{-1}, as shown in Fig. 3.1.

velocity
45 m s^{-1}

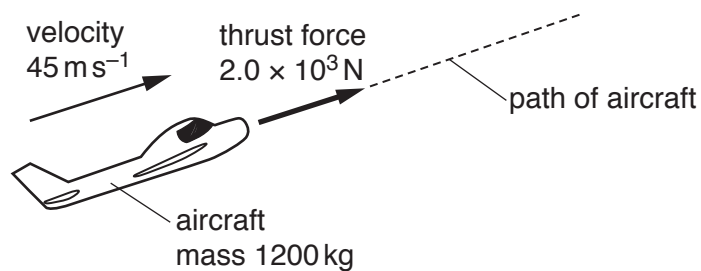thrust force
2.0 × 10^3 N

path of aircraft

aircraft
mass 1200 kg

Fig. 3.1 (not to scale)

The aircraft's engine produces a thrust force of 2.0 × 10^3 N to move the aircraft through the air. The rate of increase in height of the aircraft is 3.3 m s^{-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) 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.

....

....

.... [2]

[Total: 12]