**2** **(a)** Fig. 2.1 shows a helicopter of mass $4.98 \times 10^3$ kg and carrying a load of $4.0 \times 10^3$ kg. It is accelerating vertically upwards at $0.32$ m s$^{-2}$.

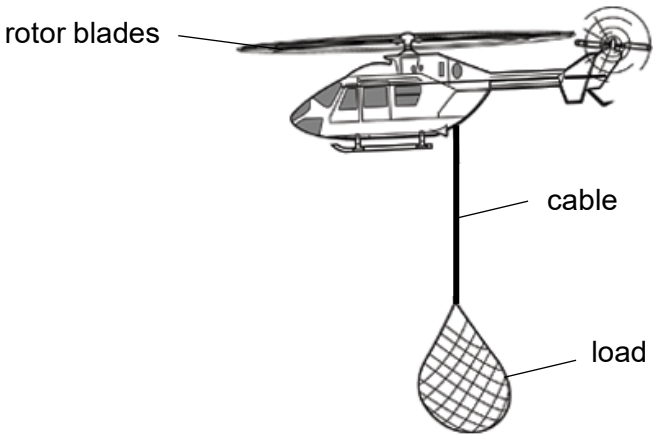


**Fig. 2.1**

**(i)** Determine the tension in the cable.

tension = ..... N [2]

**(ii)** The rotor blades generate a total thrust of $9.1 \times 10^4$ N by imparting a downward velocity $v$ to the air. The length of each rotor blade is 10 m and the density of air is 1.3 kg $m^{-3}$.

**1.** Show that the mass of air per unit time passing through the rotor is $410v$ kg $s^{-1}$, where $v$ is in m $s^{-1}$.

[2]

**2.** Calculate the value of $v$.

$v$ = ..... m $s^{-1}$ [2]

**(b)** The helicopter and its load are now travelling horizontally with a constant acceleration. Fig. 2.2 shows the cable making an angle of 65° to the vertical. The air resistance acting on the load is $6.0 \times 10^3$ N.

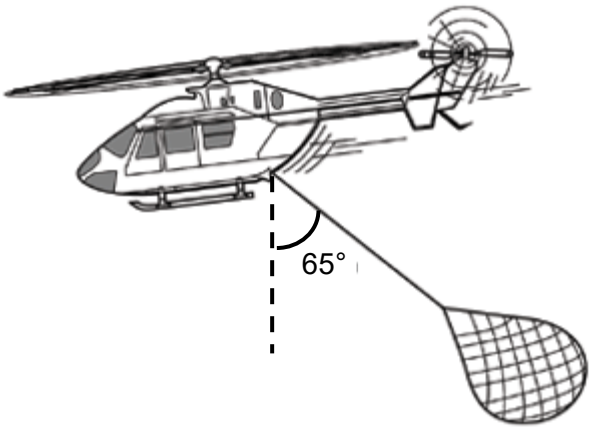

**Fig. 2.2**

Calculate the magnitude of the acceleration of the helicopter.

acceleration = ..... m $s^{-2}$ [2]