5.P.19 A helicopter is flying to the right (in the $+x$ direction) with a constant speed v, carrying a package of mass M suspended below it using a cable as shown in the figure (you can assume that H and L are not changing with time).

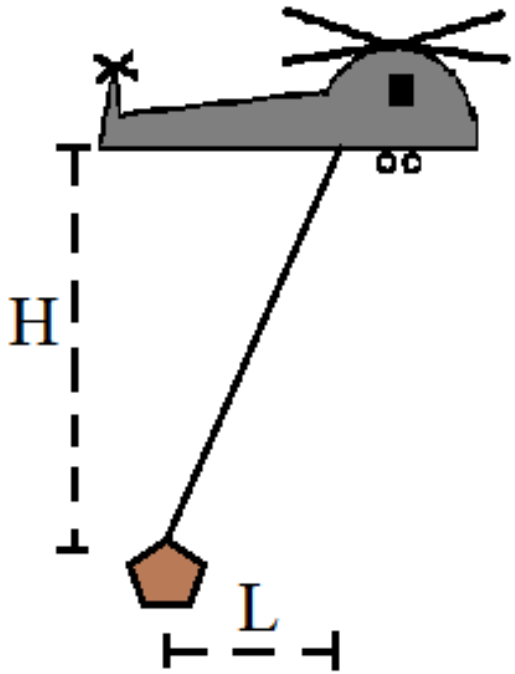
(a) Choose the package as your system. What is its rate of change of momentum?

(b) Represent the package as a dot. Draw a free-body diagram, showing all forces acting on it (using arrows with their tail on the package).

(c) Write the two (x and y) momentum-force equations for the package.

(d) From these, find the (vector) force due to the cable on the package.

(e) Calculate the force due to air resistance on the package.



5.X.22 The figure shows the Earth at two different times in its orbit around the Sun. As the orbit is nearly circular, its speed is nearly constant. (what about velocity?)

(a) At both A and B, draw a vector representing momentum of the earth $\vec{p}$, with its tail on the earth.

(b) At both points, draw a vector representing gravitational force $\vec{F}$ acting on the earth.

(c) At both points, draw a vector representing change in momentum $\Delta\vec{p}$ of the earth in the next hour (remember earth takes 365 days to go around the sun). Place its tail at the tip of the $\vec{p}$ vector.

(d) At both points, draw a vector representing the new momentum $\vec{p}'$ after the hour, with the tail on the earth.