

62. (a) The pellets will have the same speed  $v$  but opposite direction of motion, so the *relative speed* between the pellets and satellite is  $2v$ . Replacing  $v$  with  $2v$  in Eq. 14-42 is equivalent to multiplying it by a factor of 4. Thus,

$$K_{\text{rel}} = 4 \left( \frac{GM_E m}{2r} \right) = \frac{2 (6.67 \times 10^{-11} \text{ m}^3/\text{kg} \cdot \text{s}^2) (5.98 \times 10^{24} \text{ kg}) (0.0040 \text{ kg})}{(6370 + 500) \times 10^3 \text{ m}} = 4.6 \times 10^5 \text{ J} .$$

- (b) We set up the ratio of kinetic energies:

$$\frac{K_{\text{rel}}}{K_{\text{bullet}}} = \frac{4.6 \times 10^5 \text{ J}}{\frac{1}{2}(0.0040 \text{ kg})(950 \text{ m/s})^2} = 2.6 \times 10^2 .$$