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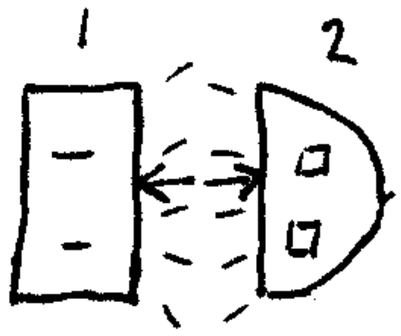
This is a problem involving momentum.

A space capsule separates into two parts as a result of detonating the explosive bolts holding the two parts together. The magnitude of impulse acting on each part is 350 N·s. If the masses of the two parts are 1300 kg and 1900 kg, what is the relative speed of separation of the two parts?

Solution:



$\longrightarrow +$

$|J_1| = |J_2| = 350\ N\cdot s$

$\overleftarrow{J_1}\quad \overrightarrow{J_2}$

For 1: $m_1(v_{1f} - v_{1i}) = J_1 = -350\ N\cdot s$ (1)

For 2: $m_2(v_{2f} - v_{2i}) = J_2 = 350\ N\cdot s$ (2)

$v_{1i} = v_{2i}$ (before the capsule separates)

From (1), $v_{1f} = -\frac{350}{m_1} + v_{1i}$

From (2), $v_{2f} = \frac{350}{m_2} + v_{2i}$

The relative speed of separation is: $v_{2f} - v_{1f} = 350\left(\frac{1}{m_2} + \frac{1}{m_1}\right)$

$\Rightarrow v_{2f} - v_{1f} = 350\left(\frac{1}{1300} + \frac{1}{1900}\right) = 0.45\ m/s$ (ans.)