Answer on Question #59559-Physics – Mechanics | Relativity

A space vehicle travelling at a velocity of 1000 ms−1 separates by a controlled explosion into two sections of mass 850 kg and 250 kg. The two parts carry on in the same direction with the heavier rear section moving 120 ms−1 slower than the lighter front section. Determine the final velocity of each section.

Solution

The velocity of lighter rear section is v_L and of heavier rear section is $v_H = v_L - \Delta v$.

According to the conservation of momentum principle:

$$(m_1 + m_2)V = m_1(v_L - \Delta v) + m_2 v_L$$

So,

$$v_L = \frac{(m_1 + m_2)V + m_1(\Delta v)}{(m_1 + m_2)} = V + \frac{m_1}{(m_1 + m_2)}\Delta v = 1000 + \frac{850}{(850 + 250)}120 = 1015\frac{m}{s}.$$

$$v_H = v_L - \Delta v = 1015 - 120 = 895\frac{m}{s}.$$