\[ F_b = \rho_w V_{\text{submerged}} g \]

For vessel to float

\[ \Sigma F_y = F_b - F_g = 0 \]

Boyle's force due to displaced volume = weight

SSBN on surface

Displacement = 16,764 tonnes (1,000 t)

L = 170 m

Beam = 13 m

\[ V_{\text{submerged}} = \frac{m}{\rho_{\text{sw}}} = \frac{16,764 \times 10^3 \text{ kg}}{1024 \text{ kg/m}^3} = 1.64 \times 10^4 \text{ m}^3 \]

\[ V_{\text{total}} = \pi \left( \frac{8 \text{ m}}{2} \right)^2 L = 2.26 \times 10^4 \text{ m}^3 \]