

Answer on Question #48648, Physics, Other

A submarine is shaped as a long cylinder, which has a radius of $r = 1.26\text{m}$ and a length of $L = 13.2\text{m}$. The submarine is able to produce a Max Thrust of $16,000\text{ N}$. If the submarine turned the corner at terminal velocity (10.8 m/s), (following a circular path with radius of curvature $R = 120\text{m}$ at constant elevation), what would the perceived increase in gravity be for those inside the submarine?

Solution:

Perceived gravity is just the definition of weight in the submarine frame of reference.

$$g_p = a_r$$

Centripetal acceleration is part of moving in a circular path. Centripetal acceleration points toward the center of the circular path of the submarine, but is felt by passengers as a force pushing them to the outer edge of the circular path.

The equation for centripetal acceleration is:

$$a_r = \frac{v^2}{r}.$$

Where a_r is centripetal acceleration, v is velocity in meters per second, and r is the radius of the circle in meters.

Thus,

$$g_p = \frac{10.8^2}{120} = 0.972\text{ m/s}^2$$

Answer: $g_p = 0.972\text{ m/s}^2$.