

27 An aeroplane makes a complete quarter circle of 40m radius towards left while flying at 175 km/hr. The mass of rotary engine and propeller is 400 kg with $k = 300 \text{ mm}$, its speed of rotation is 2500 rpm clockwise when viewed from the rear.

Find the gyroscopic couple on the aircraft. What will be the effect by the aeroplane turn towards right instead of left.

⇒ ~~Soln~~ $r = 40 \text{ m}$
 $V = 175 \text{ km/hr}$
 $= 175 \times \frac{5}{18} = 48.61 \text{ m/s}$

$m = 400 \text{ kg}$

$k = 0.3 \text{ m}$

$N = 2500 \text{ rpm}$

$\omega = \frac{2\pi N}{60} = 261.79 \text{ rad/s}$

Then: Gyroscopic couple $G_1(t) = I \omega \omega_p$
 $= (mk^2) \times (261.79) \times \left(\frac{V}{R}\right)$

$$= (400 \times 0.32) \times (261.79) \times \left(\frac{48.67}{40}\right)$$

$$= 11471.89 \text{ N.m} \underline{\text{Ans}}$$

When viewed from rear & clockwise

As Nose down, tail up

For right turn $\frac{N \downarrow}{T \uparrow} \underline{\text{Ans}}$