



Design

Theory of “ARG” operation

ARG uses basic gyro physics to assist in eliminating boat roll.

The gyro has three axis.

Spin axis ó the axis in which the flywheel is spinning, in this case the vertical axis.

Input axis ó the axis in which input forces (boat roll) are applied, in this case the longitudinal (fore and aft) axis.

Output axis ó the axis about which the gyro rotates in reaction to an input force, in this case the athwartship axis

When the spinning flywheel is rotated around the input axis (caused by the boat rolling), the gyro generates a force to rotate (precess) the gyro around its output axis. This is the fundamental gyro principle.

In the top diagram - Angular Momentum \mathbf{H} (the product of the ARG’s flywheel weight distribution and rpm) and roll angular velocity ϕ (the rate of boat roll, or input) produce gyro torque \mathbf{T}_g .

$$\mathbf{T}_g = \mathbf{H} \times \phi$$

Damper \mathbf{C} is used to control the rate at which the gyro rotates (precesses) around the output axis, this is Angular velocity θ (the rate of gimbal roll).

In the lower diagram \mathbf{H} and θ produce a torque \mathbf{T}_s .

$$\mathbf{T}_s = \mathbf{H} \times \theta$$

\mathbf{T}_s acts as suppression torque proportional to the boat rolling angular velocity ϕ .

