



Bluewater Sailing

Est. 1978,
A Division of Compass Rose, Inc.
SAFETY! FUN!! LEARN!!!™

Sailing, Power & Navigation Instruction
Yacht Management and Delivery
Boat Rentals & Yacht Charters
Group / Private Lessons

Our Professional Instructors Average More than 20 Years Experience On The Water

FIVE BOAT FORCES AND LARGE VESSEL MANEUVERING

Table Assumes 'Right - Handed' Propeller
Right Handed Propeller Turns as Follows (Viewed from Stern): Ahead: Clockwise Astern: Counterclockwise

Five Forces Acting To Turn/Rotate Vessel: 1) **Rudder**, 2) **Wind**, 3) **Current**, 4) **Prop Wash**, 5) **Propeller Torque**/'Walk'

Notes: 1) Managing these forces, especially at slow boat speed, is the FOUNDATION of all inboard engine power handling which allows safe boat operation for docking, undocking, anchoring or mooring. { Forces listed below
2) ALL of these forces are acting on vessel to pivot or turn vessel ALL OF THE TIME. { are shown as if they
3) Forces INTERACT with one another to reinforce or cancel each other out. { acted independently.
4) Strength of each force VARIES quickly with time. Each force may be controlling at different points of time.

· **RUDDER FORCE** PRIMARY CONTROL OF VESSEL AT MODERATE TO HIGH SPEED

Effect of boat moving through water, causing water flow on rudder

Primarily Works: Only when boat is moving through water with sufficient Headway or Sternway

HEADWAY (vessel moving forward through water)

- Left Rudder
- Right Rudder

STERN WAY (vessel moving backward through water)

- Left Rudder
- Right Rudder

BOW

Port
Starboard

Rapidly Starboard
Slightly Port

STERN

Starboard
Port

Rapidly Port
Slightly Starboard

OUTSIDE FORCES PRIMARY CONTROL OF VESSEL AT LOW SPEED

Effect of natural forces causing boat to rotate and move through water

Primarily Works: Whenever these forces are present but are more noticeable at low boat speed.

- **WIND** - Sets Boat in Direction of Wind
- Greater Effect on Bow Which Is Set to Leeward

- **CURRENT** - Sets Boat in Direction of Flow
- Greater Effect on Stern Due to Deeper Draft

PROPELLER FORCES

- **PROP WASH** or Significant effect, works on rudder even if boat has zero speed and rudder is otherwise useless.
Propeller Discharge Current Only Seen: whenever engine is briefly placed in Forward Gear. Does not work in Reverse.

ENGINE BRIEFLY IN FORWARD (operates at zero boat speed, no headway or stern way required)

- Left Rudder
- Right Rudder

BOW
Port
Starboard

STERN
Starboard
Port

PROPELLER FORCES (prop. discharge does not affect rudder when engine is in reverse)

- **PROP TORQUE** or Effect of side forces on propeller. Affects boat at any speed, but is more noticeable at slow/reverse.
Prop "Walk" Primarily Seen: whenever engine is placed in Reverse. Not a major effect in Forward.

ENGINE IN REVERSE (rudder position does not affect prop torque, occurs at near zero speed)

BOW
Starboard

STERN
Port

BACK & FILL: Vessel under 40' and Moderate Wind => Can often leave wheel hard starboard, only shift wheel to port if boat begins to move backwards while in reverse

- 1) Rudder Hard Right
- 2) Engine (briefly) in Forward Gear
- 3) Short Burst of Throttle / RPM
- 4) Throttle to Idle / Neutral
- 5) Brief Hesitation in Neutral
- 6) Engine (briefly) in Reverse
- 7) Short Burst of Throttle
- 8) Throttle to Idle / Neutral
- 9) Hesitate in Neutral
- 10) Repeat (ALWAYS SHIFT GEARS IN NEUTRAL AT SLOWEST SPEED)

