

# Maryland State Pilots



# Why are there Pilots?

- Pilots represent the citizens of the State by protecting our precious natural resources while safely and efficiently moving the maritime commerce that fuels Maryland's major economic engine
- Pilots provide special skills that ships need to successfully transit the narrow, restricted waterways of the Chesapeake Bay.



# Service to Ships

- Pilots provide two specialized skills that deep sea ship officers lack: SHIPHANDLING and LOCAL EXPERTISE
- Expert local knowledge is mandatory when there is no time to refer to charts or reference books
- Only local professionals know individual tugboat idiosyncrasies and hidden dangers around the berths
- Ship's maneuvering characteristics are **very** different in narrow, confined waters as compared to the open ocean

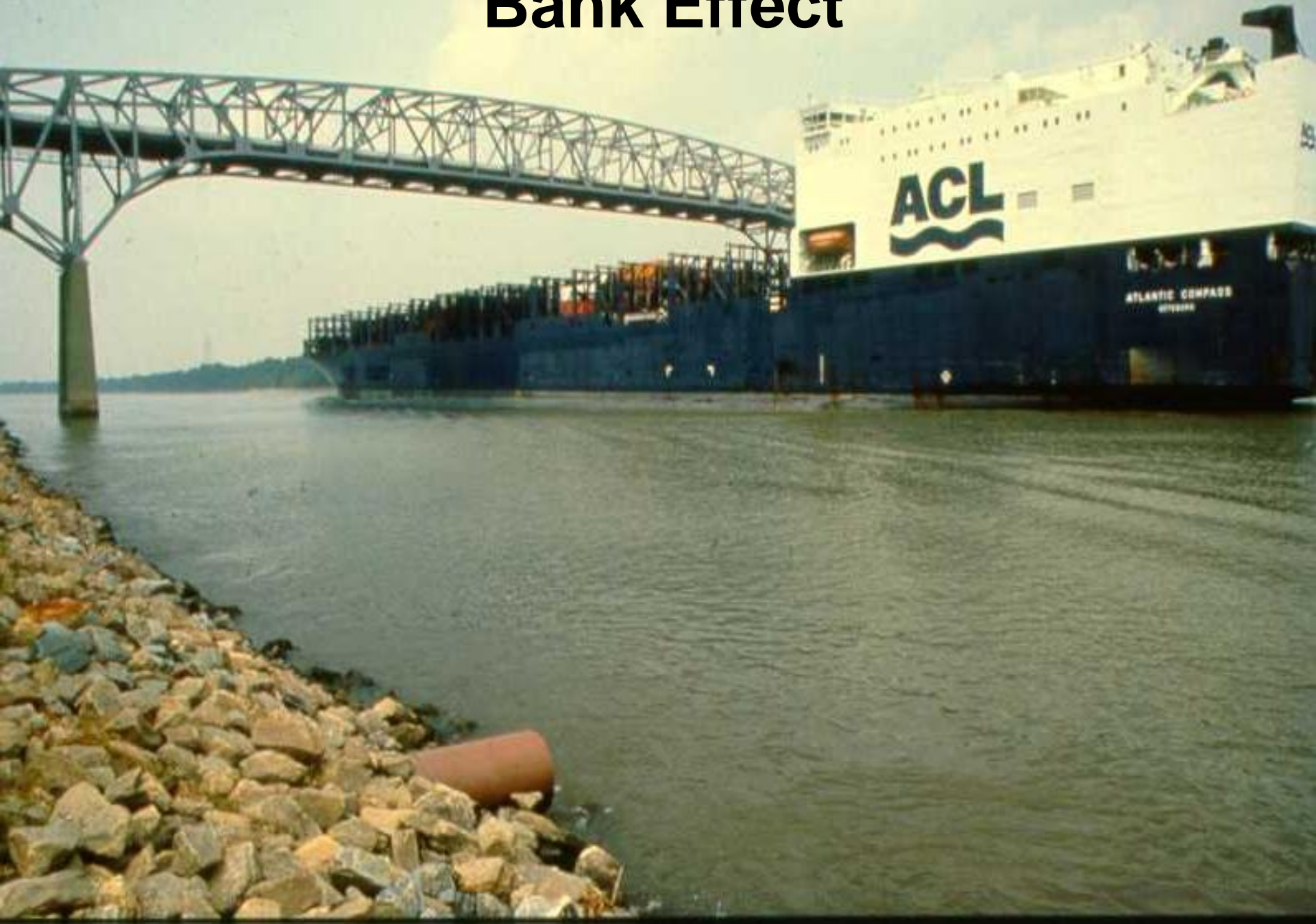
# Environmental Impacts on Ship Maneuvering

- Wind and Current (above the water surface)
  - Forces ships to “crab” in order to stay in a confined channel
  - Results in ships sweeping a much larger path than their actual width
- Hydrodynamic Interaction (under the water surface)

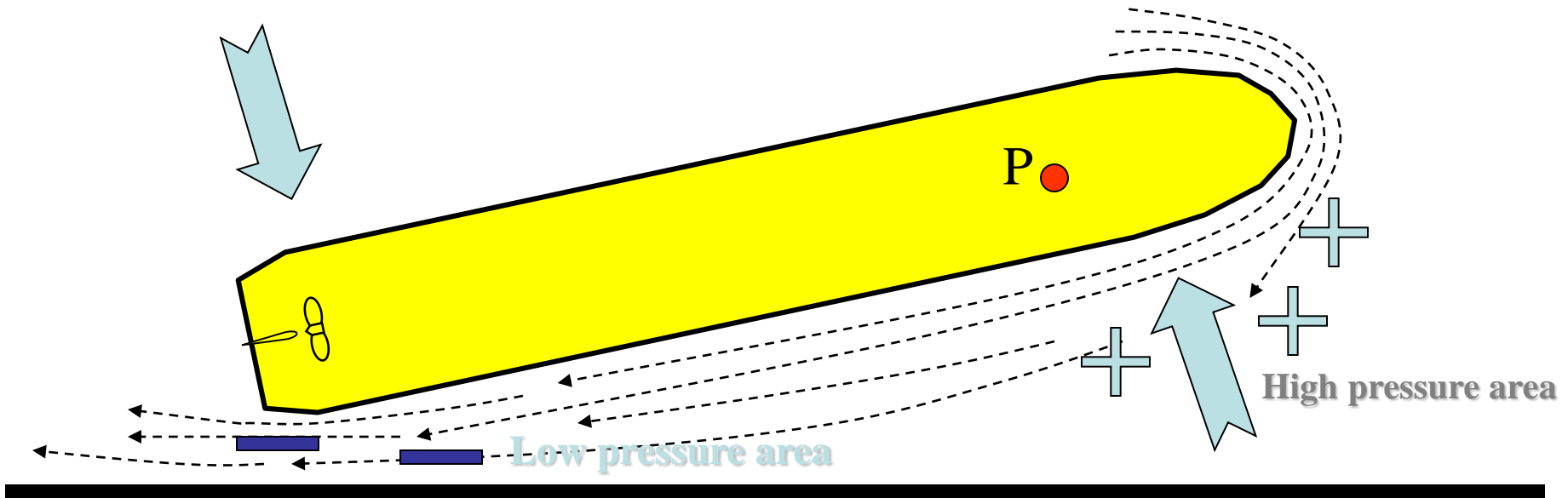
# **HYDRODYNAMIC INTERACTION**

Courtesy of the Maritime Institute  
of Training and Graduate Studies

# Bank Effect

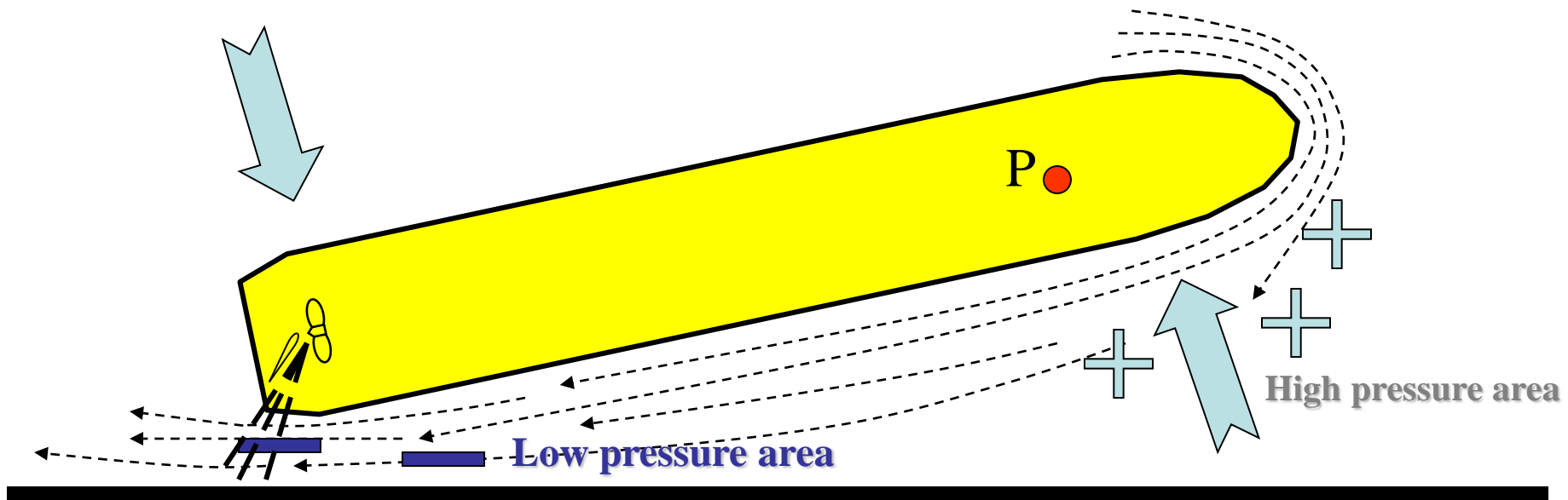


# Bank Effect





# Compensating for Bank Effect

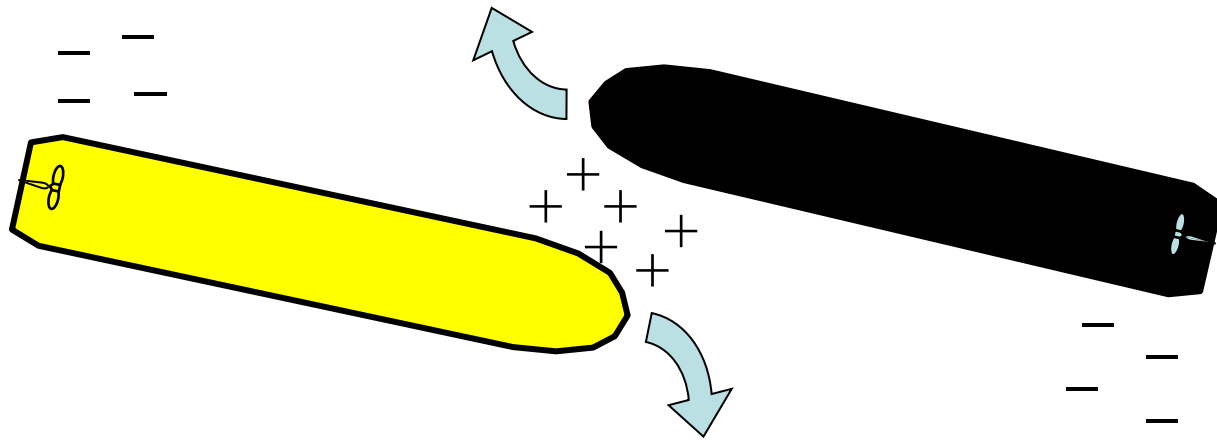


# Ship to Ship Interaction



# Ship to Ship Interaction

## *Meeting "Bow to Bow"*



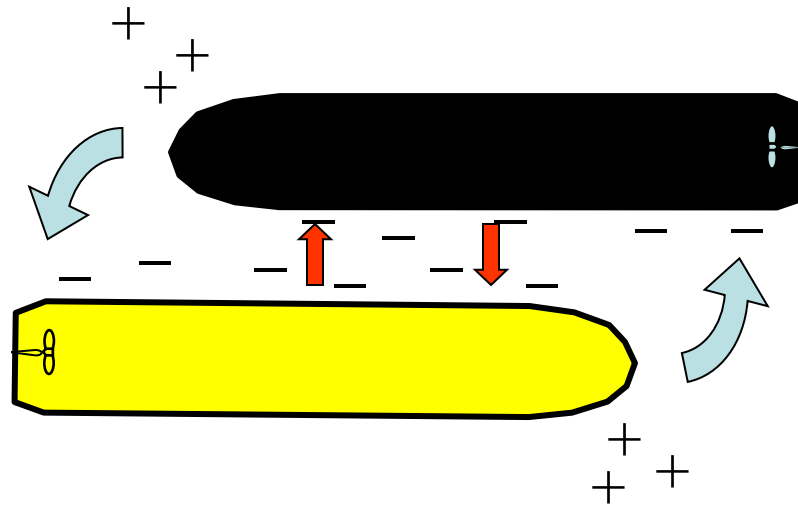
**Bows pushed apart**

# Ship to Ship Interaction

## *Meeting "Side by Side"*

Bow and stern attract

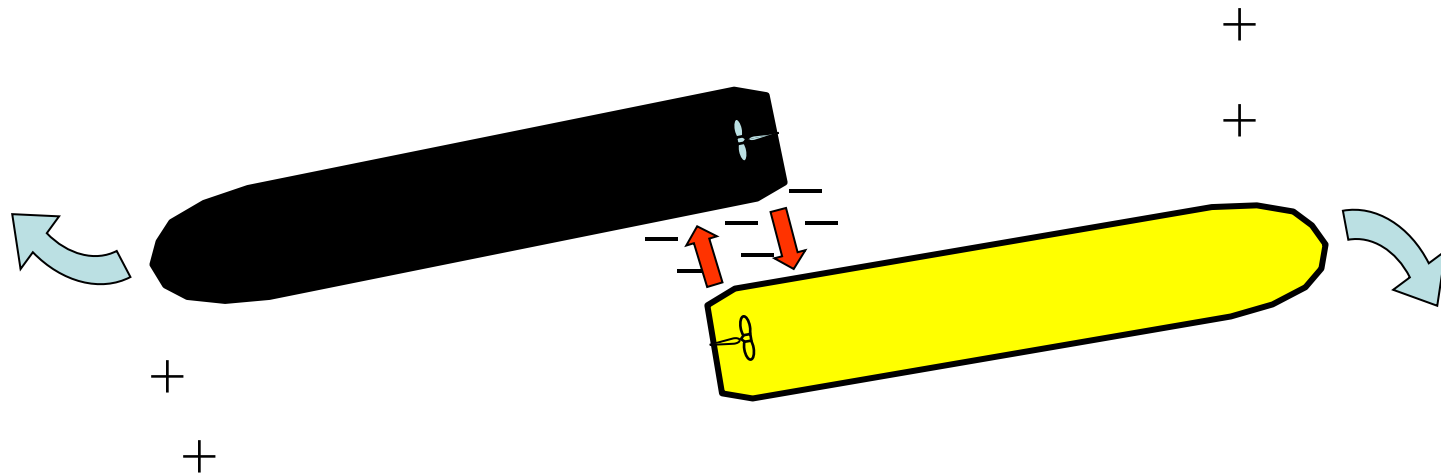
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**Bodily attraction**

# Ship to Ship Interaction

## *Meeting “Stern to Stern”*

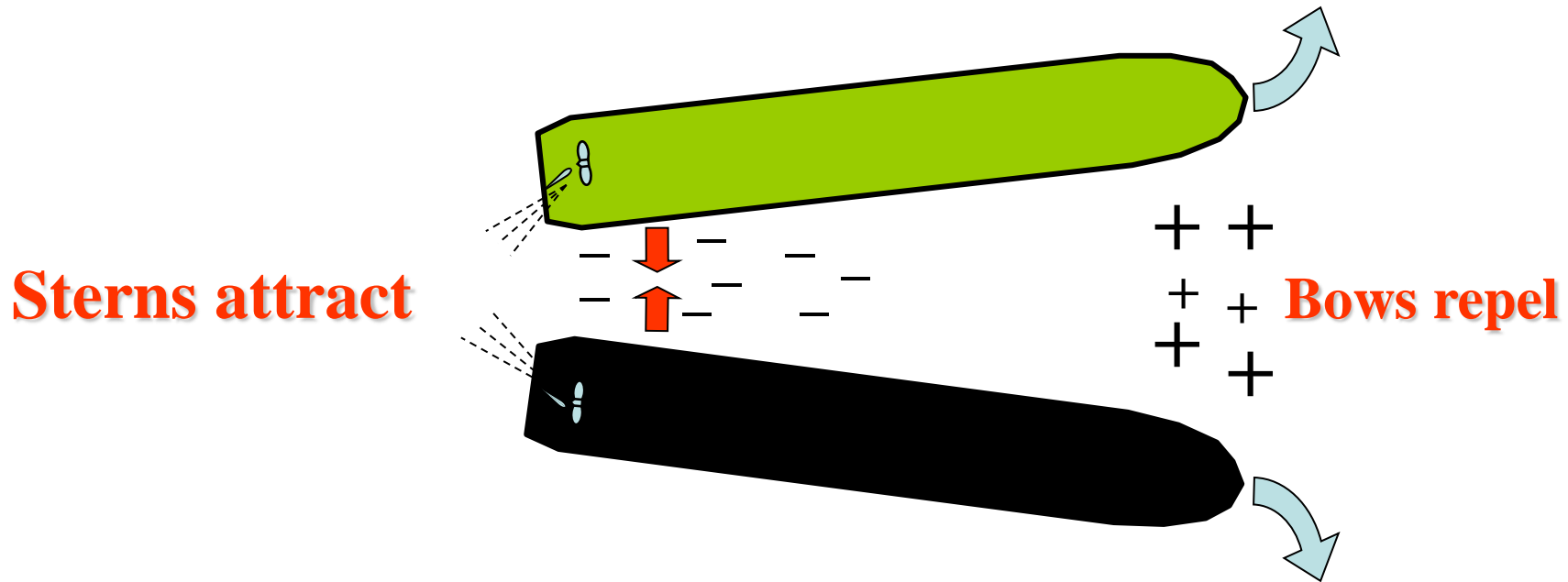


**Sterns attract**



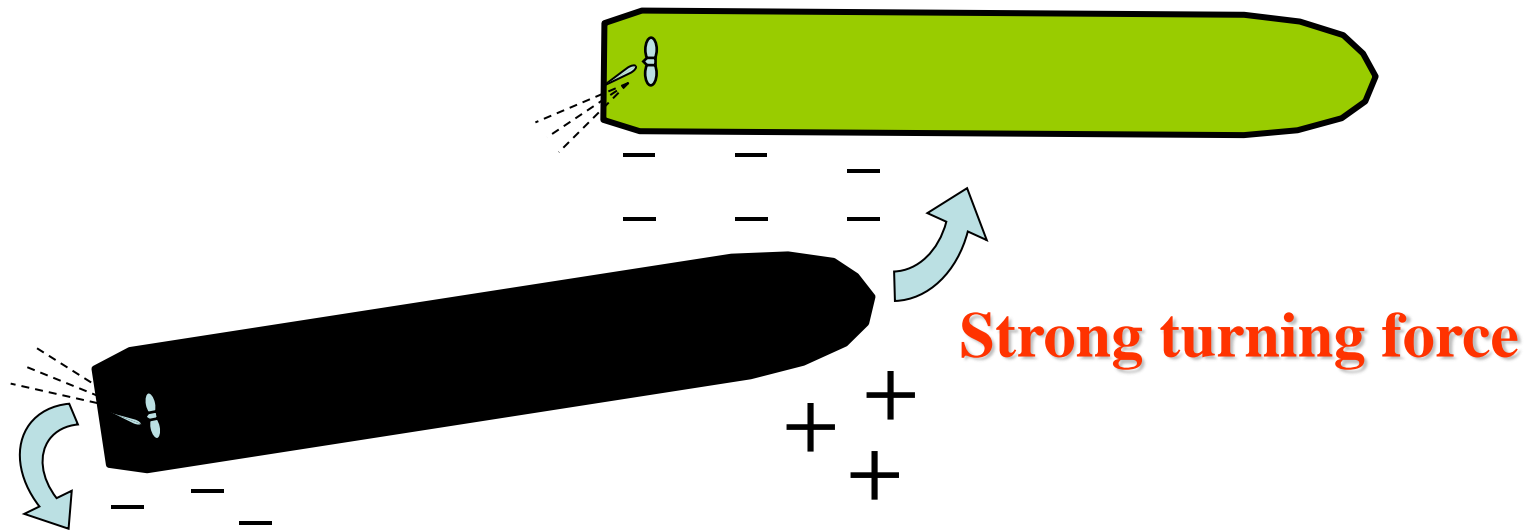
# Ship to Ship Interaction

## *Overtaking "Side by Side"*



# Ship to Ship Interaction

## *Overtaking "Stern to Bow"*

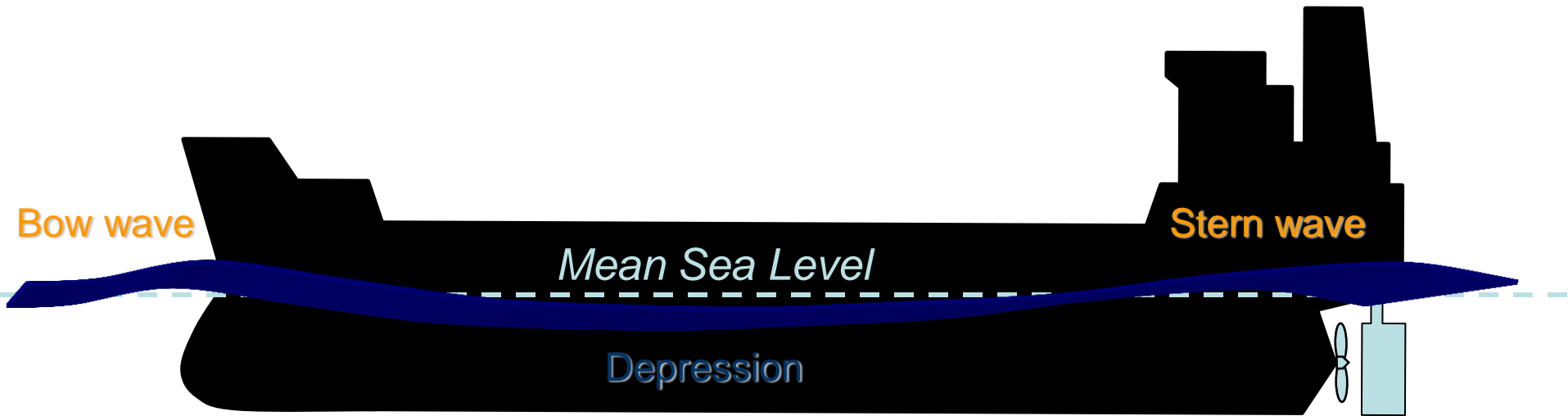




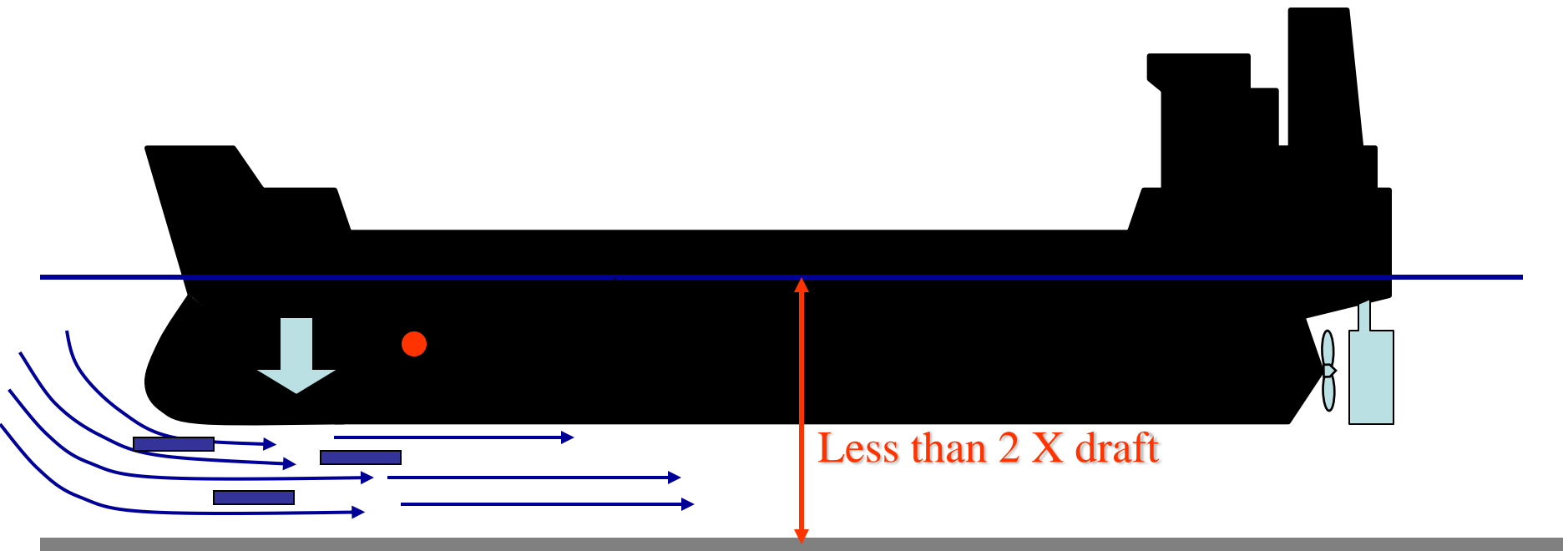
# Shallow Water Effects



# Squat in Deep Water

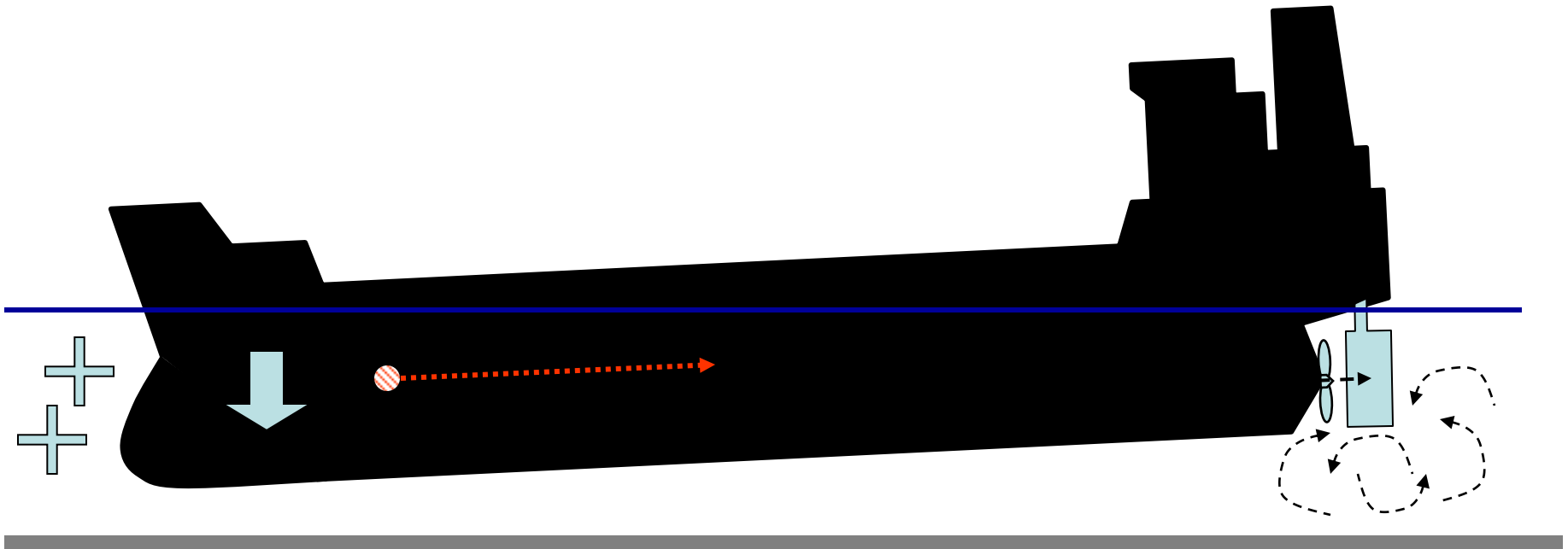


# Squat in Shallow Water



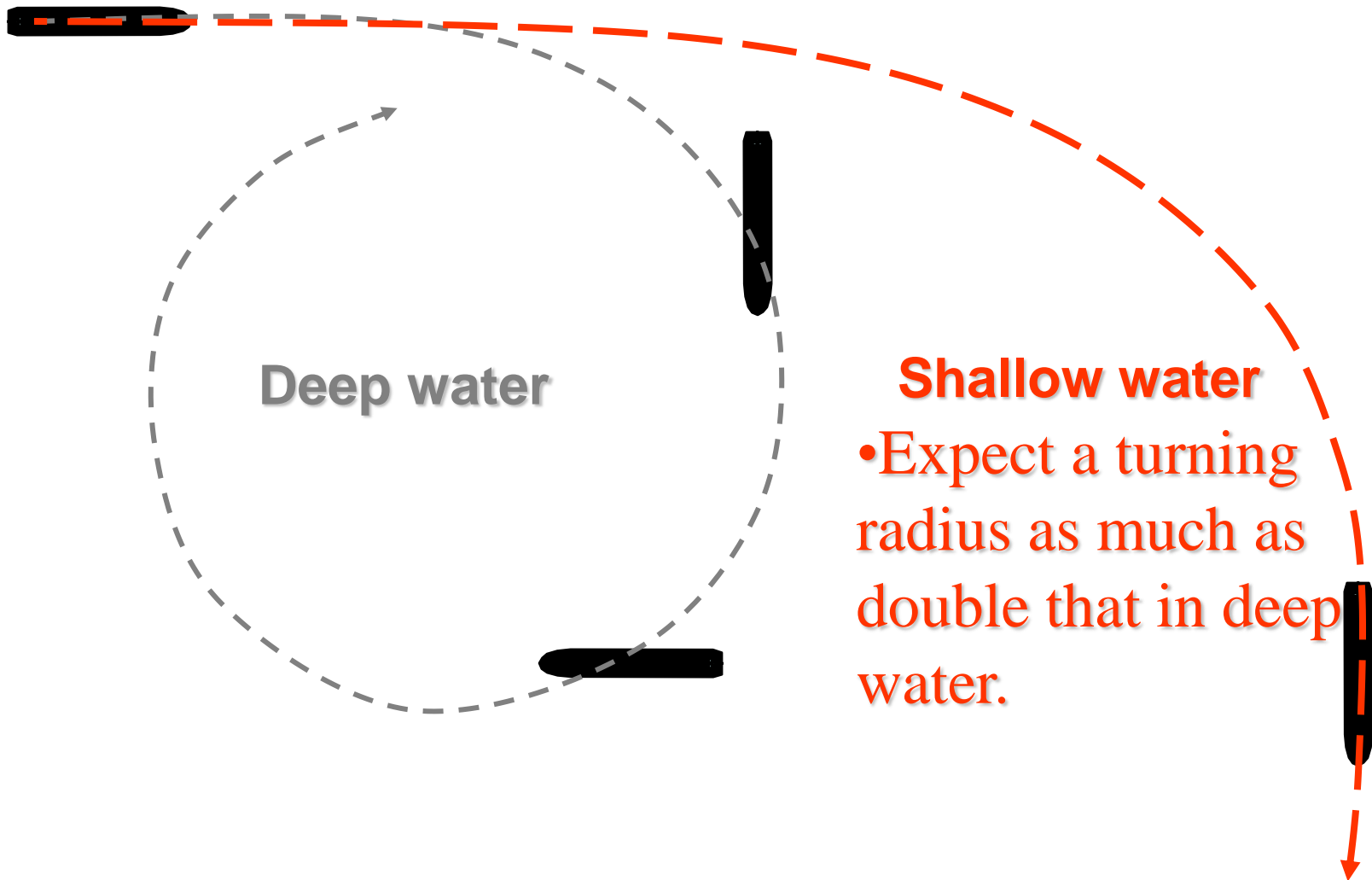
Accelerated flow = low pressure

# Bow Squat

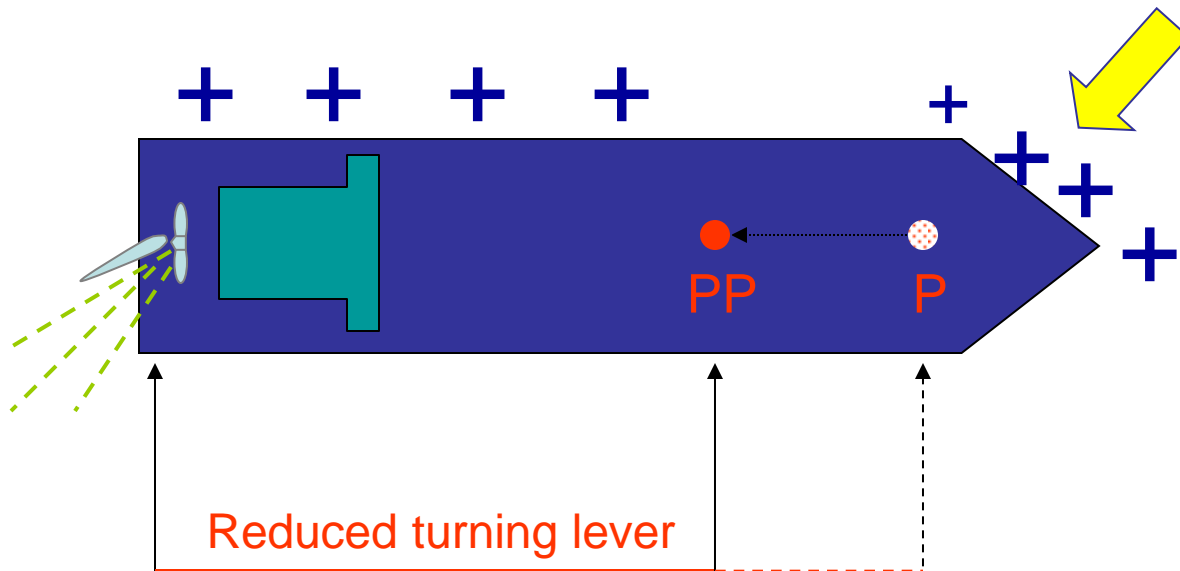


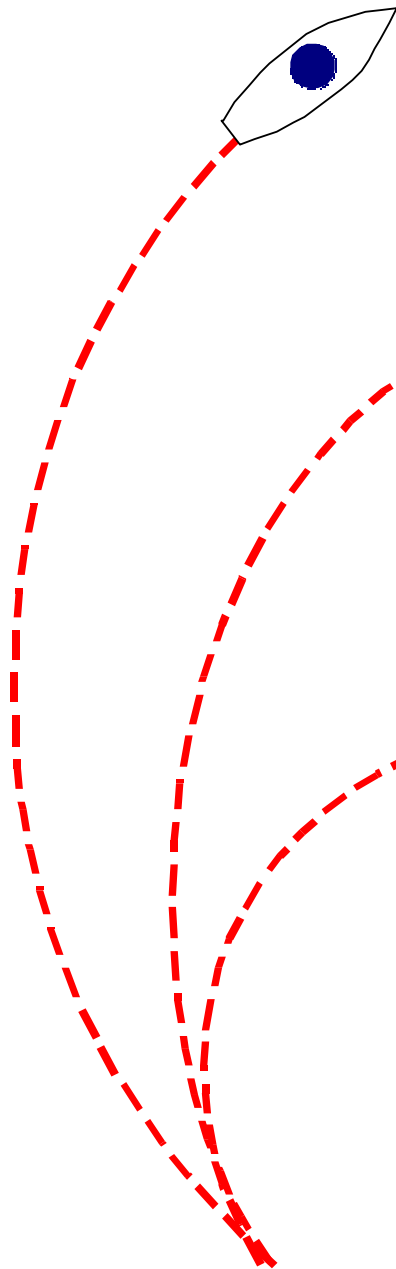
**Poor response to helm**

# Turning in Shallow Water



# Bow Pressure





**Water Depth =  $\pm 1.2$  times Vessel's draft...**  
**Virtually No Drift Angle...**  
**Very Large Turn Circle from Turn...**  
**Same R.O.T...      No Speed Loss**

**Water Depth =  $\pm 1.5$  times the Vessels draft...**  
**Smaller Drift Angle...      Small Loss of Speed...**  
**Larger Turn Radius      Nearly Same R.O.T.**

**Deep Water...**  
**Large Drift Angle...**  
**Large Loss of Speed...**

# **Comparison**

## **RADIUS OF TURN**

# Effect of Shallow Water on Stopping

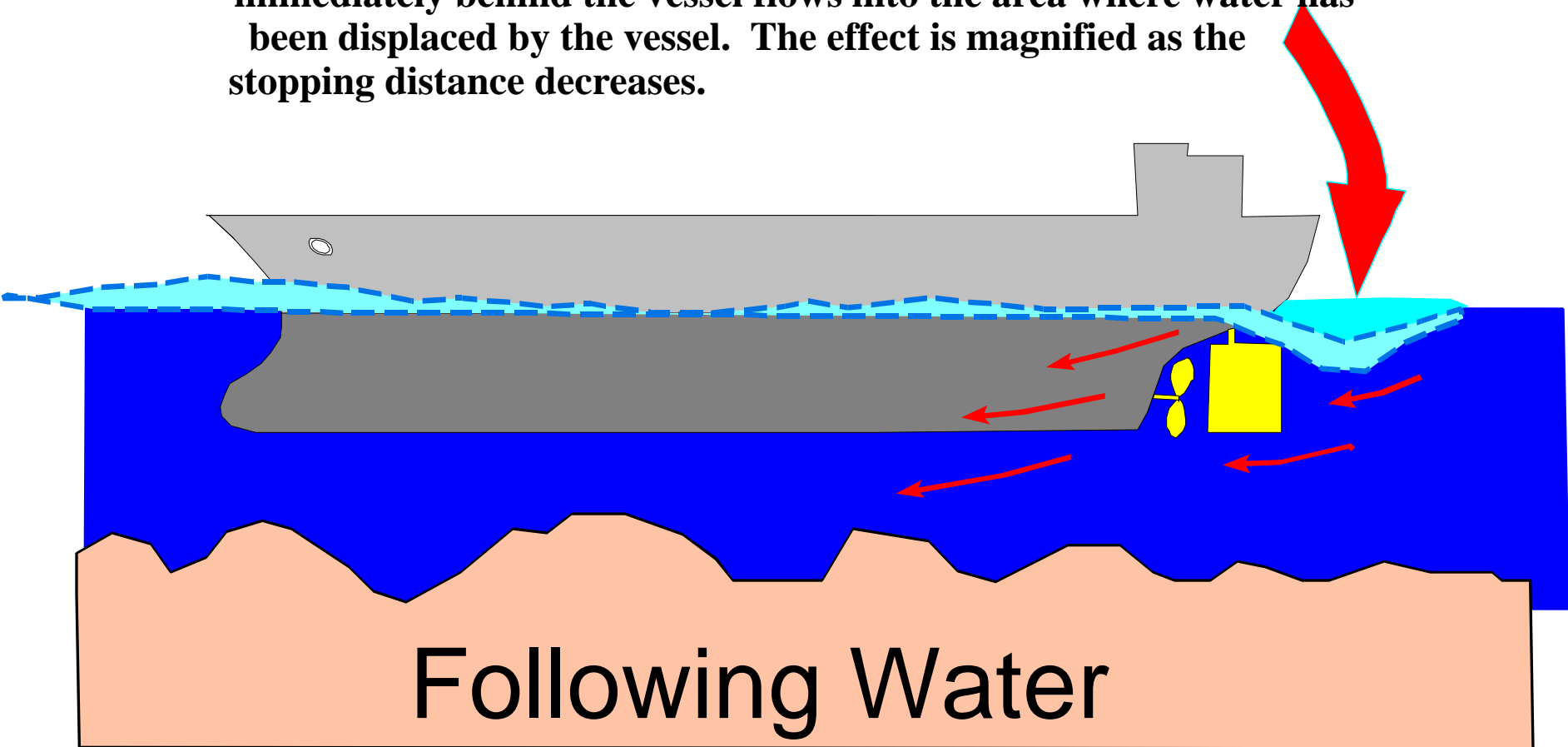




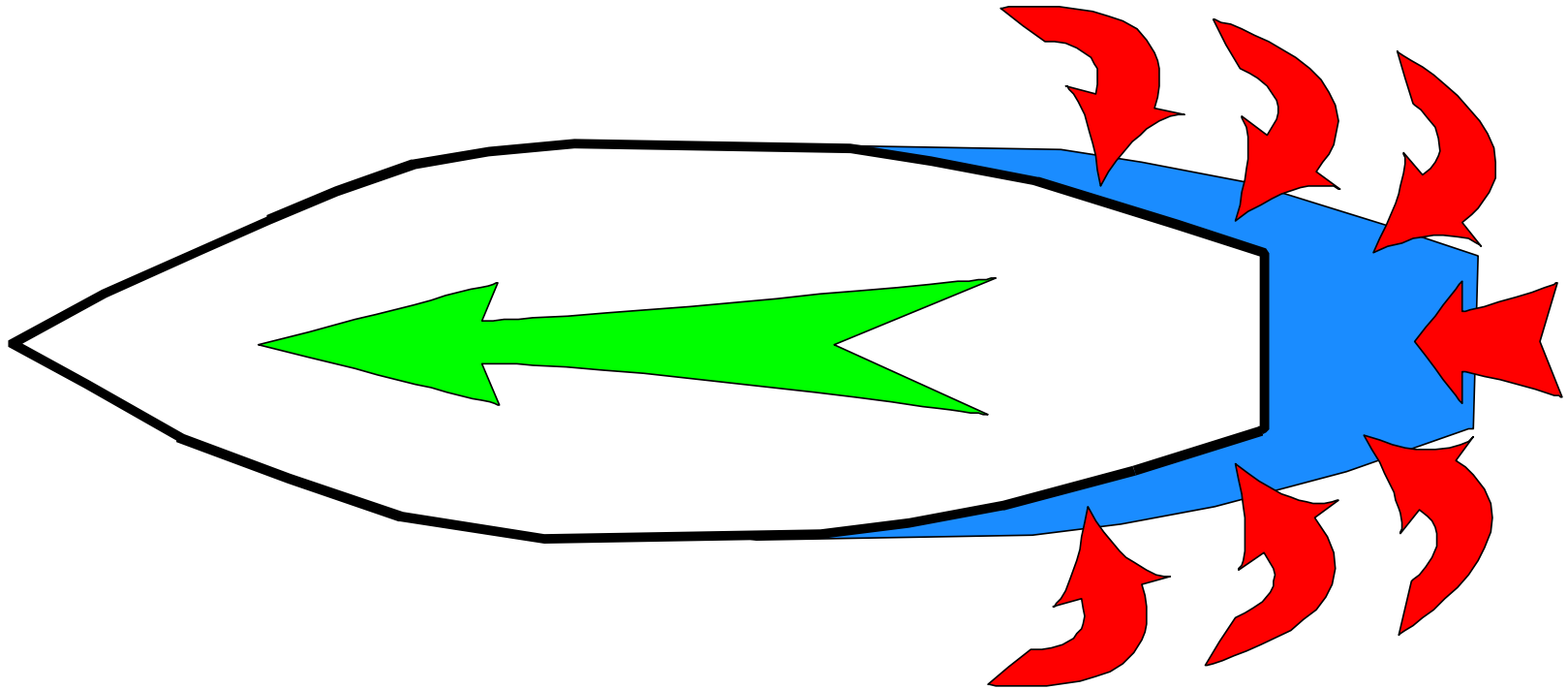
# Effect of Shallow Water on Stopping

## Shallow Water :

Most prevalent at minimum speed is the cavitation which occurs during stopping. This makes it difficult to bring the vessel to a complete stop in shallow water because the higher water level immediately behind the vessel flows into the area where water has been displaced by the vessel. The effect is magnified as the stopping distance decreases.



**If Vessel is moving ahead . . .  
then the "hole" is always behind the ship.**



**As Vessel forges ahead water cascades into depression, thus increasing the effort required to stop the vessel.**

# Conclusions

- Impact of *above water forces* are increased at lower ship speeds
- Impact of *under water forces* are increased at higher ship speeds
- Pilots must *balance* these forces
- Properly designed and maintained channels help makes this possible

