Benefits of ACDR (Air Cavity Drag Reduction) for Vessels

Equations and Definitions:

(Ref: *"A Generalized Engineering Design Procedure"* by Thomas G. Lang, Ph.D.)

W = Wo + Ws + Wp + Wf = Vessel Displacement

Wo = payload and outfitting; Ws = structure and ship systems; Wp = propulsion system; Wf = fuel+ system

Ws = Ws'*W where Ws'= Structural weight ratio

Wp = K1*D*V (K1 = Propulsion system weight constant; D = Drag; V = Vessel speed)

Wf = K2*D*R (K2 = Fuel and fuel system weight constant; D = Drag; R = Range)

DRF = (D/W)/(D1/W1) = Drag reduction factor that provides the calculated results. Model tests are needed to determine actual DRF values.

Assumptions:

Payload, speed, and range are constant for each type of vessel.

Vessel cost ~ Ws + 3Wp; Fuel cost ~ Fuel used; Maintenance cost ~ Vessel cost

Results:

1. ACDR is of greatest benefit for very high speed, high speed vessels, and long range vessels.
2. Cargo vessels benefit most by fuel and propulsion system savings.
3. Limited private model tests indicate that DRF values of around 2.0 are achievable; values up to 3.0 are possible.