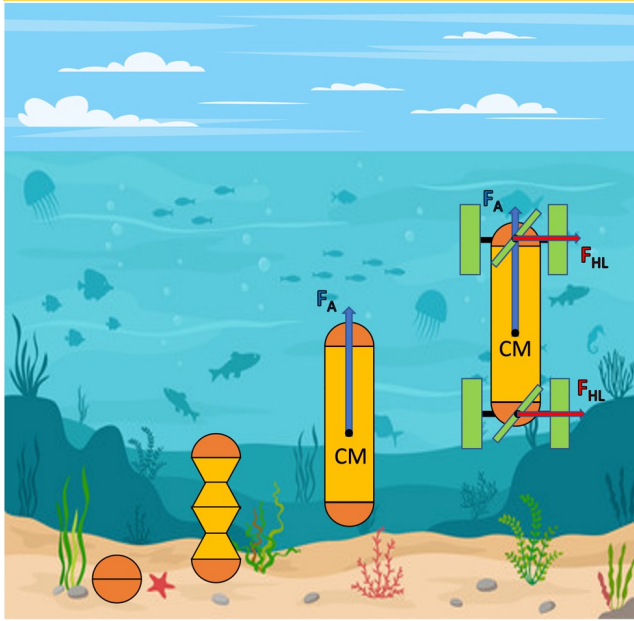


# Mechanical Design and COMSOL Analysis of Archimedes-Force Quiescent UUVs for Large-Scale Distributed Offensive Mine Operations



We propose a new mine weapon that is deployed in a compact collapsed stealthy state. When activated, it expands, gains buoyancy, and uses Archimedes force to surface and engage the enemy. Plane steering allows translation in the horizontal plane.

## Problem Statement

- What are you trying to do? We propose to develop a new ultra-low-cost, highly reliable, stealthy, soft UUV mine drone. When activated, it expands and is propelled by Archimedes force at high velocity, to surface and engage enemy ships. Such a weapon would be employed *en masse* in clusters for battlespace control and areal denial.
- What is your approach? COMSOL physics simulations sweeping for shape, cross-section, volume, and steering configuration, to determine and optimize terminal velocity, horizontal translation rate, and horizontal and vertical range.

## Impact

- What contribution does this work make to your field? The success of the project will provide accurate estimates of critical operational parameters of this new mine weapon, such as terminal velocity, translation rate, and horizontal and vertical effective range. This info will establish technical feasibility and utility to the Navy.
- What is the warfighting impact? The Navy will get a new means for inexpensive areal control to offset the numerical advantage of peer adversaries.
- How will you measure success? Successful complete study that establishes military feasibility for this new weapon.

## Transition

- Who cares? Any Navy stakeholder with interest in offensive and defensive mine warfare. Any stakeholder interested in controlling battlespace. Any stakeholder interested in defending Taiwan from invasion.
- What are specific sources of continued support and collaboration? We should be successful in receiving direct support from ONR Section 32, which is responsible for mine warfare. In addition, we will pursue any sponsor identified by RADM Rick Williams, who is our on-campus expert on mine warfare.

