

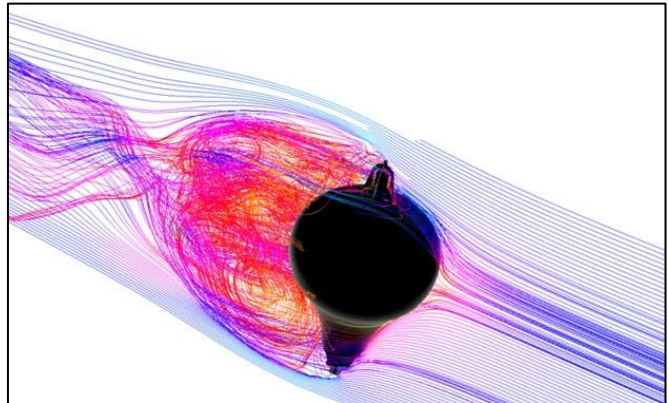
## Sonar Float Oceanic Flow Calculation

Our clients are world leaders in subsea navigation, positioning and communications. They are developing a new design of communications float to minimise drag and oscillation noise. The float is used for acoustic navigation and positioning, and can be used to identify submerged equipment. DC White Consulting Engineers were asked to investigate the drag characteristics of the new design over a range of uniform flows.

### Our approach

We took the design as supplied by our clients, and de-featured it to remove all appurtenances with minimal drag impact. The domain size was calculated to minimise artificial flow constriction, and confirmed with various sensitivity studies.

The system was then meshed using an unstructured meshing routine with six levels of refinement and a detailed inflation layer at the float surface. The flow solution was reached using a transient incompressible isothermal solver which captures wake oscillation. The solver used a k-omega SST RANS formulation for the more turbulent end of the Reynolds number range.



### Verification

CFD results should always be treated with appropriate caution, and we took the utmost care to construct strong verification cases. Getting an appropriate resolution of the boundary layer and separation points are essential for accurately computing the skin friction and form drag components respectively.

This must usually be grounded in some form of empiricism. By inspection, most of the float's surface can be characterised as somewhat in between a sphere and a cylinder. For every Reynolds number result for the float, we also performed and provided back-to-back verification solutions for a cylinder and sphere using exactly the same domain, diameter, mesh parameters and solution inputs. All these benchmark results were within about 1% of the established empirical results, lending strong credence to the input parameters and mesh design.

### Results

The float drag coefficients fell somewhat in between those of a cylinder and sphere, as expected. We went further and also demonstrated the presence and extent of flow instability, the deflected cable and float inclinations, and the potential effect of surface roughness. These can thus be known and accounted for in the design and in the eventual navigation calculations.

### Get In Touch

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