



A Plug-in for
Rhino[®]



Orca3D

Hydrostatics and Intact Stability

The process of hull design is more than simply aesthetics; the hull must meet various other requirements, including overall dimensions, displacement, center of buoyancy, and stability. Therefore, the process of hull design and the analysis of hydrostatics and stability must be closely linked. In Orca3D, the model for these tasks is one and the same; the hull is designed using one or more NURBS surfaces, and these same surfaces are used in the calculation of the hydrostatics and stability properties. In fact, they are so closely linked, that the hydrostatics can be updated in real time, as the hull surface is modified.

What calculations are included?

Orca3D computes intact hydrostatics at one or more waterlines, or multiple displacement/center of gravity combinations. In addition, at each of these conditions, the righting arm curve may be computed. Computed values include:

- Overall and waterplane dimensions
- Integrated values: volume, displacement, center of buoyancy, wetted surface
- Waterplane properties: waterplane area, center of flotation
- Maximum sectional area data
- Hull form coefficients: block, prismatic, vertical prismatic, max section, waterplane, wetted surface
- Stability parameters: transverse and longitudinal inertias and metacentric heights
- Righting Arm Curve: righting arm and trim angle versus heel, height of any points of interest above the flotation plane

What kinds of vessels can be analyzed?

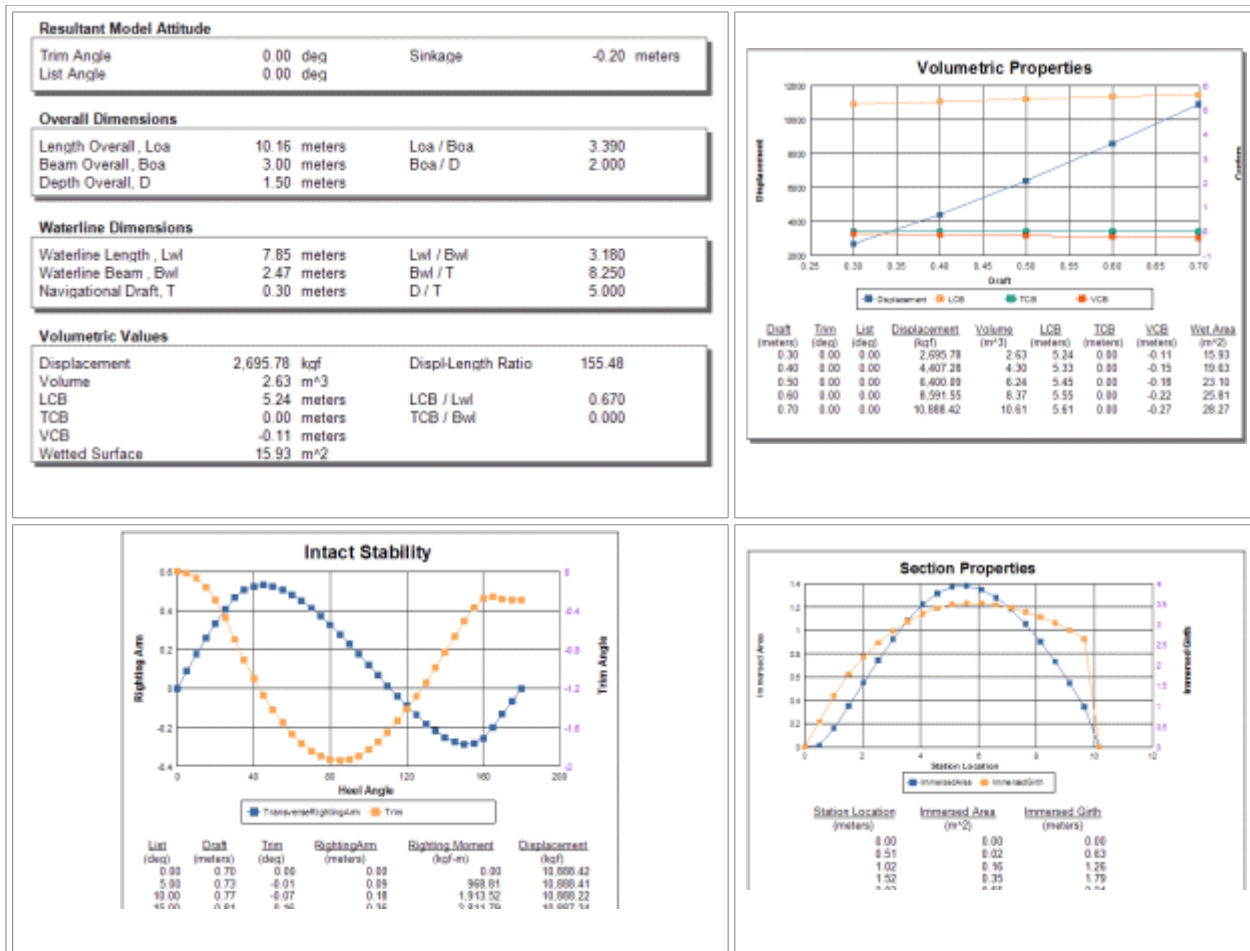
Because Orca3D computes the hydrostatic properties based on the surface model, using first principles, there is really no limit to the type of vessel or object that it can analyze. Monohulls, multihulls, vessels with propeller or bow thruster tunnels...basically, anything that floats, or even sinks, can be analyzed with Orca3D.

What output is available?

Graphical output consists of a planar surface inserted at the equilibrium flotation plane, with the LCB and LCF annotated.

Orca3D produces a report that includes tabular data at each flotation condition, as well as plots of appropriate parameters. The report is created and displayed using Microsoft Report Generator; the file

may then be printed, or saved in Adobe Acrobat (pdf) or Microsoft Excel format. Examples of portions of the output are shown below.



What are the model requirements?

Since Orca3D uses the surface model to compute the hydrostatics and stability, it is very forgiving with regard to the model. The requirements are as follows:

- The model must consist of one or more surfaces.
- The surfaces need not join perfectly.
- As long as a region will not become submerged, it need not be sealed. For example, a deck is not required, as long as the deck edge will not become submerged during the analysis.
- The transom is not required, if the assumption of a flat transom, perpendicular to centerplane is adequate.
- The surface normal direction for all surfaces must be pointing into the water (otherwise, their volumes will be negative).
- Stations are only required to compute the prismatic coefficient, sectional area curve, and max section coefficient.
- The model may be a half or whole model.