



## Orca3D Training Syllabus

### Introduction

Orca3D is a completely new program designed and developed by a group of naval architects. Orca3D provides powerful naval architectural design and analysis capabilities that are easy to learn and run in a power 3D CAD environment: Rhinoceros. Orca3D provides all the ship design tools necessary in a single environment preventing the need to transfer your model from one program to the next.

Orca3D is available in 2 versions: Level 1 and Level 2.

#### Level 1

- Hull Design & Fairing
- Hydrostatics & Stability

#### Level 2

- Hull Design & Fairing
- Hydrostatics & Stability
- Weight & Cost Tracking
- Speed/Power Analysis

### Installation and Licensing

Orca3D runs on Windows XP, Windows Vista, and Windows 7. It is compatible with Rhinoceros 4.0 SR 6 or higher and Rhinoceros 5.0 (32-bit). Orca3D is provided as a self-extracting zip file containing all the necessary components for installation. Orca3D will first check that the following components are installed:

- Microsoft Report View Redistributable 2.0
- Microsoft .Net Framework 2.0

If these files are not already installed, Orca3D will automatically install these components. Once Orca3D is installed, it can be launched by opening Rhinoceros. (Note: when running Windows Vista or Windows 7, right-click on Rhinoceros and select "Run as Admin" the first time after installation. This will assure that the licensing service is started correctly).

Orca3D only currently supports single-user licenses, however the software-based tool used to manage the license is flexible and easily allows the user to activate and de-activate the license code to move between computers. Network licensing is currently under development and should be available with the next Orca3D release.

The Orca3D License Manager can be accessed from the Start Menu (All Programs > Orca3D > Orca3D License Manager) or from the Orca3D menu inside of Rhinoceros. The License Manager allows the user to:



- Check the status of a license
- Activate the license via the Internet
- Recover the installation ID for a permanent unlocking code or evaluation extension
- De-activate and Re-activate a license moving between computers
- Manually move a license code
- Permanent remove a license code and receive a code to prove it

The preferred method of activating a license code is using the Internet Activation tab. When using a proxy server, these settings can be entered after choosing Help > Advanced from the license manager menu. If no Internet connection is available, or a firewall or other security prevents access, a permanent unlocking code can be obtained by emailing [support@orca3d.com](mailto:support@orca3d.com) and providing the license level and installation ID. The permanent unlocking code cannot be moved between computers and thus requires a new permanent unlocking code anytime the license is moved.

### Orca3D User Interface

- Orca3D automatically loads when Rhino starts
- A new menu “Orca3D” is available in Rhino
- Orca3D toolbars can be shown with or without command text
- Orca3D commands are available, all begin with “Orca”
- Almost all functionality available through commands, toolbars and menu
- Orca3D has its own viewports to re-orient the model in plan, profile and body views
- Default right-hand coordinate system: -x fwd, +z up; orientation can be changed in Orca Properties

The following is included in Orca3D Levels 1 and 2:

### Orca3D Properties

- Project and company info and logo file to be used in reports
- Orca3D unit preferences; includes custom unit systems; Rhino length unit is independent
- Model orientation can be changed
- View options can be customized
- Equilibrium limits set for free float condition
- Meshing parameters set: Default, Basic and Advanced

### Hull Assistants

- 3 Default designs available: planning hull, sailboat hull, ship hull
- Hull shapes are customizable and can be saved
- Hull shape can be previewed and updated in real-time
- Preview design waterline and 21 stations
- Preview hydrostatics



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- Deck and Transom included for roll-over hydrostatic calculations
- Ability to import/export hull libraries
- Demo ship hull assistant and shape parameters

### Orca3D Sections

- Orca Sections are associated with the hull surface and automatically update with surface
- Section curves are Rhino curves
- Sections can be entered by location, number and spacing using hull extents
- Preview section planes at selected locations
- Sections tree allows sections to be turned on/off, removed and assigned unique color
- Sections can be placed on same or separate layers with default or custom name
- Sections can be exported to external program
- Sections can be edited, deleted, etc. by returning to sections dialog

### Surface Editing

- Edit Orca Control Points; these allow sections to update automatically
- Orca Edit Plane allows user to move points in one direction only
- Insert chine command inserts discontinuity directly into surface allowing single surface to model chine
- Create Plate creates surface with user-defined dimensions and number of rows and columns
- Foil assistant for foil-shaped surfaces such as keels and rudders; import custom offsets
- Orca Move
  - o Ability to move one or more Orca Control Points
  - o Absolute: points moved relative to world origin
  - o Relative: move a point relative to its current location
  - o Local Origin: move point relative to another point
  - o Polar: specify a specific angle, e.g. deadrise angle

### Lines Drawing

- Creates a new 2-D page view including a profile, body, and plan view
- Can include all or selected curves, title block, section labels, design hydrostatics, coordinate axes
- Page size, scale, page orientation, margin options
- Customizable title block

### Offset Table

- Creates a table of offsets in Excel including buttock heights, waterline half-breadths, and 3D curve intersections
- Can select all curves, Orca3D curves only, or selected curves only
- At least one buttock, waterline and station must be defined and included



### Points of Interest

- Track points as the model heels, trims and sinks during hydrostatics and stability calculations
- Reports height above waterline
- User-defined name
- Points can be turned on/off
- Location can be entered (X, Y, Z) or graphically selected in model

### Hydrostatics and Stability

- Fixed weight or fixed flotation plane; half or full model
- Model requirements:
  - o May be composed of surfaces, poly surfaces, meshes or any combination of these
  - o Model does not need to be completely sealed, however any gaps will decrease accuracy
  - o No naked edges should become submerged; e.g. a model without a deck will not run for conditions in which the deck edge is submerged
  - o The normal direction for ALL surfaces and meshes must point into the water
  - o The surfaces and meshes being analyzed should only represent the outside shell of the vessel
  - o Note any interior surfaces (e.g. cockpit) that are intersected by the waterplane and form a well will be treated as if the well is filled with water. (i.e. all selected geometry that is completely or partially below the waterplane will be treated as if that portion of the geometry below the waterplane is wet)
- Plane can be added representing water surface
- Model can be transformed to resultant condition
- Heel: the heel angle of the vessel, in degrees, about the world longitudinal axis
- Trim: the trim angle of the vessel, in degrees, about the world transverse axis (note if there is heel, this is not the trim in the boat's axis)
- Sinkage: the depth of the world origin below the resultant flotation plane, perpendicular to the resultant flotation plane. Positive sinkage is defined as the origin being below the flotation plane.
- Vessel is first heeled, then trimmed and last sunk when defining a fixed flotation plane
- Analyses can be performed with any of the following flotation conditions:
  - o Weight, LCG, TCG
  - o Weight, LCG, Heel
  - o Weight, Trim, TCG
  - o Weight, Trim, Heel
  - o Model Sinkage, Trim, Heel
- Weight calculator can be used to compute the overall weight and CG of several items
- Custom conditions:
  - o Instead of listing values, flotation conditions are separated into individual lines
  - o Conditions can be turned on/off
  - o Conditions given unique names
- Objects can be added to the previously selected objects



### Design Hydrostatics

- Ability to define one “design” condition that can be computed with a single button click during the hull fairing process
- Fixed weight or fixed flotation plane
- Real-time hydrostatics shows and updates up to 4 non-section based hydrostatic calculations while the model is updated in real-time

The following is only included in Orca3D Level 2:

### Weight & Cost Tracking

- Maintain a library of material mass and cost(labor and material) properties for points, curves, surfaces and volumes
- Material library can be imported and exported
- Materials and properties saved with model
- Assign objects name and weight/cost properties; object CG or user defined, new or existing material
- Add new weight/cost point
- Weight and Cost Manager
  - o Edit objects
  - o Sum of weights, CGs, and cost
  - o Clear object’s properties
- Editing material property will update all objects associated with property
- Weight and Cost Report
  - o Choose objects to include
  - o Summary of weight and CG totals
  - o Summary of costs
  - o Summary of materials used
- Use weight and CG data for hydrostatics calculations
- Ability to select only objects with Weight/Cost properties

### Speed/Power Analysis

- Two analyses available: Holtrop (displacement hull) and Savitsky (planing hull)
- Model Requirements:
  - o Must represent only have of the hull
  - o Must have a transverse coordinate of 0 on the centerline
  - o Must have surface normal pointing outward into the water
  - o Must only represent the hull surface up to the chine (Savitsky only)
  - o Must only select external surfaces that are “wet” at the static waterline (Holtrop only)
  - o Integrated skegs may be included as part of the hull (Holtrop only)
- Calculates bare hull resistance



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- Enter margins to calculate required power
- Parameter checks to ensure accurate results
- Sensitivity analysis to reduce drag
- Drag prediction libraries provided by HydroComp
- Export data to SwiftCraft or NavCad

### **Additional Resources**

- Help file
- Forum
- Website
- Videos
- Blog
- Support Email
- Local reseller support