

Orca3D 3 Release Notes

Orca3D is a plug-in for designing and analyzing marine structures in Rhino. These release notes describe the status and updates included in the current release of Orca3D.

Orca3D 3.0 Requirements

- Rhino™ (by McNeel) Installation:
 - Rhino Version 7 or Version 8 (latest Service Release)
 - Orca3D V3.0 will not run with Rhino version prior to 7
- Hardware:
 - See Rhino hardware requirements at http://www.rhino3d.com/system_requirements/
- Operating Systems tested: Windows 10/11
 - All other Windows operating systems **have not** been tested but may work
 - Mac: The Intel Mac with Boot Camp **has not** been tested but may work
- Operating System Pre-Requisites: (Note - The Orca3D installation will attempt to install any not already on your computer)
 - Microsoft .NET Framework 4.5.2
 - Microsoft Visual C++ 2014 Runtime Libraries
- The Offset Table, Tank Capacities Table, the CFD Report functions require Microsoft Excel
- Valid license key (without this, Orca3D will operate as a 15-day fully functional evaluation copy)

Release 3.1.1 (March 20, 2024)

Enhanced Features

- Modified Load Case form to improve usability. This includes allowing the user to perform bulk editing operations for the fluid loads. The user can now perform multi-selection of the rows in the fluid loads grid and right-click the mouse to perform bulk editing of the selected compartments. In addition, a toolbar was added to the fixed loads grid to support add/delete/copy functions similar to the context menu for the grid.
- Added a new Fluid Load Summary table to the hydrostatics report. This summary table groups tank loads by fluid and shows the weight, CG, and free surface moment by fluid in the report. It can be optionally enabled/disabled through the stability reporting options.
- Updated stability report to include a Compartment Status summary in the load condition details.
- Added a new column to the Orca3D Weight and Cost Items form to show the currently assigned stock material (or "None" if no material is assigned) to each item.
- Added plotting of GMT to the righting arm curve report output of a stability analysis as a straight line representing the slope of the curve at equilibrium.
- Added hydrostatics error messages related to failure to mesh selected Rhino geometry to the Orca3D log so that the user can see which geometry failed as well as copy the object ID to search for it in the Rhino document.
- Made a change to serialization logic to remove the use of a .NET Framework class that will become unsupported in a future version of .NET.

Bug Fixes

- Implemented several fixes for Orca3D Marine CFD including (a) addressing issues in performing a simulation using the "Submerged Body" hull type, (b) fixing issues creating a wake survey simulation, (c) fixed an issue where Orca3D could incorrectly warn the user of missing "deck" faces.
- Fixed an issue in the Load Case form where changing the fluid of a tank did not immediately force an update to the computed fluid weight (although the weight was properly updated when the form was closed). This behavior also existed when resetting a tank fluid or permeability back to the compartment default value.
- Fixed an issue in hydrostatics calculations using virtual free surface correction together with a fixed flotation plane, where the virtual CG shift was not computed correctly.

- Modified the behavior of the tank capacities report so that for a specified tank level (sounding or ullage) where the level is below the bottom of a tank, the reported tank CG is the lowest point of the tank instead of 0,0,0.
- Fixed an issue in which merging another file into an Orca3D Library (e.g., stability criteria library) could cause Orca to incorrectly save the library.
- Fixed an issue in stability criteria evaluation in which a stability limit that uses an angle keyword (e.g., GZmax) in the requirement on the right-hand-side of the inequality could have the requirement interpreted as the righting arm at that angle instead of the angle itself.
- Handle meshing errors that occur during a hydrostatics calculation.
- Modified Orca3D Ship Hull Assistant to avoid certain kinds of surface singularities when creating the deck surface.
- Fixed an issue in the scriptable version of the command, OrcaCompartmentProperties, when trying to set an unrecognized fluid on a compartment (i.e., the fluid is not in library).
- Fixed an issue in the scriptable version of the command, OrcaManageLoadCases, when trying to set a fluid or a fluid quantity on a non-tank compartment.
- Added a version check when reading Orca3D libraries (fluid, material, criteria) to ensure we don't try to read libraries with newer versions than the current version.
- Added a check to make sure that all fluid load cases have all of the required fluid loads (even for empty tanks) when created from the scriptable version of the command for creating load cases.
- Fixed a globalization issue that affected the stability criteria evaluation on systems with keyboard settings using “,” as the decimal separator.

Release 3.1.0 (February 29, 2024)

Enhanced Features

- Added logic to issue a warning to the user if the program detects a weight/cost item with negative weight when (a) creating a weight/cost report, (b) clicking the Close button on the weight/cost manager; the check only applies to enabled items and items that are being reported on.

Bug Fixes

- Fixed a bug in which Orca load cases could inadvertently report a center of mass that includes the virtual CG shift associated with tank free surface.
- Fixed an issue in which using Orca3D Marine CFD to create a self-propelled simulation with a propeller actuator disk with constant

thrust/torque failed to generate the simulation files.

WIP Release 3.0.16 (February 22, 2024)

New Features

- A new feature, Design Variables, has been added to the Orca3D Stability Criteria. Design Variables are user-defined variables that can be referenced within a stability criteria limit, e.g., NumberOfPassengers. Design Variables can be integer or floating point values and can also be dimensional. If a stability criteria evaluation uses a limit containing a Design Variable, that variable's value must be defined in the Orca3D Design that is being analyzed. See the Orca3D Help file for more information.
- Orca3D Marine CFD has added two new features. The first is the ability to add user-defined body forces to a simulation. The second is the ability to perform a (towed) resistance simulation with propulsors. To accommodate this new functionality, the OrcaSimericsAnalysis command and user interface have been modified as described in the Help file.
- A new automated Orca3D Product Model validation/repair process has been added. This process is automatically performed when a Rhino model containing Orca3D data is opened. The process checks for errors and potential conflicts in the Orca3D model data and allows the user to choose how to address these issues. See the Orca3D Help file for more information.

Enhanced Features

- The Orca3D Stability Criteria manager has been extended to allow a hierarchical organization of the criteria within user-defined criteria folders. This should allow the user to view, find, and apply criteria more easily.
- The Orca3D syntax for specifying drafts as input to a hydrostatics analysis as well as for defining draft as output from a hydrostatics analysis has been modified. The prior syntax using Tfp and Tap for specifying draft at the forward and aft perpendiculars, respectively, was deemed somewhat ambiguous in terms of how the draft was measured. Orca3D now uses Twp@FP and Twp@AP for specifying draft at the forward and aft perpendiculars measured normal to the resultant waterplane (i.e., as a distance of the FP/AP points at baseline below the waterplane). Correspondingly, the distance of the FP/AP points at baseline to the waterplane measured in the centerplane of the vessel are now specified as Tcp@FP and Tcp@AP. As vessel trim and heel increase relative to the initial position of the vessel in the Rhino model, the deviation between Twp and Tcp increases as well.

- When the user chooses to add a waterplane computed from a hydrostatics analysis to the Rhino model, Orca3D now includes the draft measurements as dimensions in the Orca float plane including Sinkage, Twp@FP, Twp@AP, Tcp@FP, Tcp@AP (the latter four only if the model FP/AP have been defined).
- Made several changes to Orca3D reports including, (a) updated the hydrostatics report notes to indicate whether the analysis uses virtual or actual CG shift, (b) extended the loading condition report details to include free surface type in the table, (c) extended the Orca3D report header to include the Orca3D Design name (or No Orca3D Design for free form analyses, (d) modified the planing, displacement, and van Oortmerssen analyses output to ensure that the output table headers for long tables are repeated at the top of each page, (e) added "constant lines" to the righting arm chart to help distinguish zero values for trim and righting arm, (f) updated reports to use current culture when generating numerical values in code (to match automatically generated values that match the current culture).
- Modified the Orca3D Load Case form so that the fluid loads grid is automatically sized to column contents.
- Modified the Orca3D panel to open docked within the main Rhino panel dockbar.
- Modified the user interface for defining/modifying refinement zones in Orca3D Marine CFD to be more flexible by allowing the user to not only recreate the box from scratch but also translate and resize the box.
- Made several changes to the Orca3D planing analysis command including, (a) modified the command prompt to indicate selected planing surfaces should be on the port or starboard side but not both, (b) added a check and user warning if planing geometry spanning both sides is detected, (c) added model tolerance information to the error message issued when a non-planar set of curves is detected in a station.
- Modified the Orca3D command for cross curves of stability analysis, OrcaCrossCurves, to work with the Advanced Stability module (in addition to Design module as was previously implemented).
- Added a warning for users when they using Orca3D Design geometry for basic stability analyses that do not account for free surface effects of fluids in tanks including Basic Hydrostatics analysis, Cross Curves analysis, and Stability Criteria evaluation with a fixed load case. Also added a user warning when replacing Orca3D Design component geometry to inform them that things like curves of interest, points of interest, fixed loads, fixed load groups, etc may need to be updated manually.

Bugs

- Fixed a bug in the hydrostatics equilibrium computation for a fluid load case when specifying a fixed flotation plane together with fluid loads that use a virtual CG shift.
- Fixed an issue where some ship hull assistant parameters were not being properly de-serialized.
- Fixed an issue where using any of the hull/foil assistants caused the Rhino thread utilization to go to 100%.
- Fixed an issue in which the waterplane area/inertia for Orca3D design components did not include permeability in the displacer calculation (for damaged compartments).
- Modified the calculation of free surface correction (both transverse and longitudinal) to use the free surface type of the load case (virtual or actual) instead of always using a virtual correction.
- Fixed an issue when a load case automatically updates its fluid loads (based say on a model topology change or a compartment change to/from a tank) so that when it creates a new fluid load it sets the free surface type to match the rest of the load case.
- Fixed an issue in the Sections form where the user could not remove all objects for a section collection. Also fixed a Sections issue that could cause some models to perform very slowly when selecting Orca3D design components with sections.
- Fixed an issue which prevented Orca3D properties (e.g., Orca units and model orientation) from being read from a Rhino .3dm file that was being used as a Rhino template for new models.
- Modified the calculation of fluid load properties so that an empty fluid load returns the lowest point in the owning tank as the fluid volume centroid (and hence CG) instead of the geometric centroid of the tank. This change affects tank tables and load cases.
- Fixed a bug in Orca3D solid and point stock materials where extrusions were not being handled properly.
- Fixed a bug in the OrcaReportAreaVolume command where the default filename used for CSV output was inadvertently set to the XML filename.
- Fixed an issue where the initial mouse right-click to open the context menu in the stability results form was ignored.
- Fixed several issues in the Orca3D Marine CFD Wake Survey report including, (a) loosening the tolerance for checking the radius of wake survey points, (b) properly finding/applying model Forward/Up directions, and (c) turned off model gridlines in the graphic image.
- Added logic to automatically save the Orca3D libraries (fluid, stock material, stability criteria) when Rhino closes in case any unsaved changes were made.
- Modified the Orca3D offset table command to use the Rhino document tolerance for curve/curve intersections. Also corrected the reporting of

the tolerance used in the computation.

WIP Release 3.0.15 (February 1, 2024)

This is an internal release of the Orca3D 3.0 WIP.

WIP Release 3.0.14 (January 15, 2024)

This is an internal release of the Orca3D 3.0 WIP.

WIP Release 3.0.13 (January 5, 2024)

Enhanced Features

- Modified the Load Case form behavior so that if the user changes a tank load to 0 or 100% for a tank that has a custom free surface moment, the custom FS moment changes to 0 immediately and becomes a read-only cell that cannot be changed (unless/until the tank load is changed).
- Increased the size of the float plane that gets inserted into the model when requested by the user to improve visibility.

Bugs

- Updated Orca3D V3 installation to work when only Rhino 7 or Rhino 8 is installed as well as when both Rhino 7 and 8 are installed.
- Fixed a bug in the Holtrop resistance analysis where one of the coefficients was not properly computed for certain speeds and displacement-length ratios.
- Fixed a bug in the Orca3D subdividing logic where inheritance of compartment properties did not always work for certain compartment geometry (e.g., L-shaped compartments).
- Fixed a bug in which hydrostatics and stability calculations, using a load case with fluid loads using a virtual free surface moment, reported the "corrected" GM inaccurately (the GM correction was effectively doubled).
- Fixed a bug in the Orca3D Marine CFD rendering command, OrcaCreateCfdRender, in which it was requiring that the free surface be imported whenever importing streamlines. Now those two import options are independent.
- Fixed a bug in Orca3D Marine CFD reporting where the report results were not being correctly sorted on ascending speed.
- Changed the behavior of the Orca3D CFD Report input form so that the list of simulation files is not refreshed when clicking other form controls. In the past this would cause the user to have to reset the states of the checkboxes in the list.

- Fixed an issue in the Load Case form where an erroneous entry in the fixed load input grid could cause the program to stop responding. Also addressed an issue in the same form in which user changes to the value of a custom free surface moment were not being persisted.
- Fixed an issue in the Compartment Properties form in which text in the Permeability dropdown could become selected when the dropdown control does not have the form focus.
- Fixed a bug in deserializing saved CFD meshing parameters.
- Fixed a bug in deserializing saved Ship Hull Assistants.

WIP Release 3.0.12 (December 6, 2023)

Enhanced Features

- Improved error reporting in the Load Case form by popping up an error message to make the issue more apparent to the user.

Bugs

- Fixed two issues in the Orca3D Marine CFD Wake Survey report. The first addresses the case where the number of timesteps in the integrals file is less than the number of steps set by the user to sample for the report. This can occur when doing a continuation run with only a few timesteps. In this case just use the available number of timesteps for data averaging. The second was related to the option to insert the wake geometry into the model. When length units other than meters was selected, the wake geometry was not correctly positioned in the model.
- Fixed a bug where equilibrium hydrostatics calculations were neglecting to include the free surface effect of tanks. Righting arm curve calculations were unaffected.
- Fixed a display issue where the basic Hydrostatics form could have part of the bottom cut off when something greater than 100% font scaling is used.
- Fixed an issue where opening a model with a saved Orca3D hydrostatics report that references a load case that no longer exists (having been deleted) could be problematic.

WIP Release 3.0.11 (November 28, 2023)

Enhanced Features

- Modified the heeling arm definitions for beam winds with rolling (and by extension beam winds with rolling and ice) to include a wind area margin factor. This factor, which defaults to 0, allows the user to account for lateral projected area of items that are not included in the model as a simple multiplier on the input/calculated projected area.

This new capability is included in both the interactive and scriptable command versions and is also displayed in the report output.

- Updated the Floodable Length analysis functionality to include a user-specified Factor of Subdivision, which defaults to 1, which is multiplied by the computed floodable lengths to obtain permissible lengths. Added the analysis check to see if input transverse bulkhead locations and specified number of flooded compartments pass/fail the computed permissible lengths. Include this analysis check in the report (and XML) output. Implemented the scriptable version of floodable length analysis.
- Added two new application-level settings for Orca3D (i.e., they are stored for the Rhino app, not within the Rhino 3DM). The first is the hydrostatics solution tolerance, which defaults to 1e-4, and controls when the free-float hydrostatics condition is considered converged (the default corresponds to 0.1 mm of sinkage and 0.006 deg of heel/trim). The second is the maximum number of iterations for finding the hydrostatics solution, which defaults to 100. Extended the scriptable version of the command, OrcaProperties, to include these.

Bug Fixes

- Fixed a units issue in the righting arm energy report output.
- Fixed a bug in which hiding and then showing an Orca3D Design would cause the underlying Rhino objects associated with design components to lose their names.
- Fixed a frame system display bug in which changing the frame system origin graphically could cause the frame "points" to be displayed in incorrect locations.
- Modified the Orca3D report header to fix an issue where opening a saved report showed the current date/time in the report header as opposed to the date/time the report was originally created. This fix will not correct reports created prior to this release.
- Fixed a units issue in the Floodable Length analysis along with a tolerance issue where if one of the "cutter" planes was within the tolerance of the end of the vessel, the trimming operation could fail.
- Handle zero inputs when computing the form factor for the Van Oortmerssen resistance analysis by returning $k = 0$.
- Fixed several issues related to sections-based hydrostatics calculations including, (a) when there are multiple section lists defined, for sections at the same location the area was being summed which is incorrect. This occurred for both solid and fluid hydrostatics. Now duplicate sections are ignored, (b) for fluid hydrostatics using an Orca3D Design with multiple components, the section areas were summed for as many components as there are, which again was incorrect. This has been fixed so the number of components does not affect the section-

based calculation, (c) there was an issue in the calculation of the station locations so that with certain model orientations, xAx could have an incorrect sign, which has now been addressed

- Fixed a bug in computing GZmax (and RA@GZmax) in which a value near, but not at, the actual max was being reported
- Fixed a bug in creating/editing ship load cases in which the check to ensure all fluid loads are using actual CG shift or virtual CG shift could incorrectly fail due to a "non-tank" compartment load (e.g., for a damaged compartment)
- Modified the Load Case form to leave percentage, ullage, sounding, and volume fields blank for non-tank fluid loads.

WIP Release 3.0.10 (November 2, 2023)

New Features

- Added a preliminary implementation of a new stability analysis capability, Floodable Length Analysis, to Orca3D. This new analysis type works with both Orca3D Designs (and fluid load cases) and Rhino geometry that is not part of an Orca3D Design (and fixed load cases). In addition to geometry, other input consists of the calculation locations, permeabilities, and optionally proposed bulkhead locations and number of compartments to flood. Output is currently limited to formatted reports with both graphical and tabular results from the analysis. This new capability is still under development and testing.

Enhanced Features

- Added the ability to use a non-integral exponent when defining Orca3D Heeling Arm/Moment cosine distribution with heel angle.
- Extended the scriptable version of the command for creating/editing Orca3D sections, OrcaSections, to include the ability to specify the "usage" (e.g., hydrostatics, hull fairing, etc.) of section lists.
- Modified the command for creating Orca3D designs, OrcaCreateDesign, and for adding a new Orca3D design component, OrcaCreateComponent, to change the default value of the argument "DeleteInput" to No so that users must consciously choose to delete the input geometry if desired.
- Modified the command for generating area/volume reports, OrcaReportAreaVolume, so that when creating CSV output the names of compartments, bulkheads, and decks are interpreted as literal strings when opened in Excel.
- Modified the Compartment Properties form dropdown list of fluids to be sorted in alphabetical order including user-defined fluid names.
- Modified hydrostatics and stability output reports so that the tables for sectional area curve, righting arm curve, loading details, and points of

interest repeat the table header row on every page since these tables often span multiple pages. Also avoid "orphaned" table headers at the bottom of a page for these tables.

- Modified the behavior of the Log control on the Orca3D Panel so that new error/warning messages do not automatically cause the Log tab to become the active tab if the option to show error/warning messages is not checked. If the option to show error/warning messages is checked, then the log is still automatically shown as new messages occur.

Bug Fixes

- Fixed an issue in the scriptable version of the OrcaSections command when setting the current section list and the section list name has spaces in it.
- Fixed an issue with real-time hydrostatics and sectional area curve in which clicking the Mirror About Centerplane checkbox did not cause the hydrostatics to update immediately.
- Fixed an issue in real-time sectional area curve calculation where if multiple section lists are defined, the sectional area curve values were not sorted properly.
- Fixed an issue in which editing a SubD object that has Orca3D sections by editing a sub-object (e.g., SubD edge) in the SubD caused sections to be lost.
- Fixed a bug in computing the peak of the righting arm curve (GZmax) where a failure could occur under specific conditions.
- Fixed a bug when exporting subdivision history for an Orca3D Design component, where the subdivision operations for deleting or moving faces did not include the world coordinates specifier for the PointInside locations of compartments.
- Fixed a bug that could cause the calculation of a closed silhouette for heeling moment calculations to fail under specific conditions.
- Modified the logic for assigning face attribution when using the Orca3D Marine CFD command, OrcaSimericsAnalysis, so that if the user chooses to delete a CFD face type from the model, any model faces still using that face type are flagged as unrecognized when trying to create the simulation.
- Fixed a bug that occurred when reading in Orca3D V1/V2 data from a legacy Rhino model in which propeller definitions used by Orca3D Marine CFD were not being updated to compute J/Kt/Kq values resulting in empty (and hence invalid) kt/kq.txt files.
- Implemented a change to the internal Orca3D subdivision logic to address an issue creating Orca3D Designs for certain specific cases.
- Fixed an issue in the Orca3D resistance analysis command, OrcaPlaningAnalysis, that could cause the analysis to fail for specific geometries.

WIP Release 3.0.9 (October 1, 2023)

Bug Fixes

- Fixed a bug where the form for creating/editing Orca3D Load Cases did not dynamically update fluid load weight/CG values when an input quantity changed.
- Fixed a bug when the position of the Orca3D Load Case form was saved on a screen other than the main PC screen and then later could not be opened when the "other" screen was not present.
- Added output of the SimericsMP "integrals" filename to the CFD Powering Report, like what is done for the Resistance Report.
- Fixed a bug in the Orca3D Fixed Load Case panel (along with other parts of the UI that use the same control) where the user defined Orca3D coordinate system was not being properly accounted for.
- Fixed a bug in the Orca3D Fixed Load Case panel where the load case names did not update after editing a fixed load case.
- Fixed a bug where deleting a Component from an Orca3D Design could pop up a (usually benign) warning.
- Fixed the error message text in the Load Case form when the user enters a sounding/ullage value that is greater than the length of the sounding tube.

WIP Release 3.0.8 (September 2023)

New Features

- Implemented the ability for compartments in Orca3D Designs to optionally have separate default permeabilities for "intact" and "damaged" states. When this option is selected, the appropriate permeability value will be automatically used in a fluid stability analysis depending on whether the compartment mode for the load case being analyzed is damaged or intact. If a user directly sets the compartment permeability in a load case, that value is used regardless of tank status.

Enhanced Features

- Added the ability to reset tank permeability and contained fluid to the tank default values in the Load Case editor by right-clicking in the selected field and selecting the option to Reset to Default Value.
- Added ability to copy heeling arms/moments both in Orca3D product model tree for Orca3D Designs as well as in Manage Heeling Arms form for the Free Form Design
- Modified the VCG input field in the Fixed Load Case definition control so that it remains enabled even when the user is specifying a fixed

float plane as input so that the condition can still be used for righting arm calculations (where VCG is required).

- Extended the Basic Hydrostatics control for defining custom conditions to include cut and paste functionality along with other functional improvements.

Bug Fixes

- Fixed a bug in the scriptable version of the Orca Hydrostatics command where when choosing the option to write output to a CSV file, the user could not change the output CSV filename/path from the default.
- Fixed a bug in the form for attributing face types as part of the Orca3D Marine CFD interface, where a user could create a new face type name containing spaces. Since this would result in an invalid face type name, the user is warned that internal whitespace is not allowed in face type names.
- Fixed issues related to Curves of Interest (e.g., deck edge, margin line) when using non-default model orientation.

WIP Release 3.0.7 (August 25, 2023)

New Features

- Added the ability to perform Stability Criteria Evaluation on the "Free Form" Orca3D Design (i.e., general Rhino surface/mesh geometry) excluding subdivision and free surface effects.

Enhanced Features

- Made enhancement to Orca3D report output:
 - Updated the Analysis description in the stability reports to indicate whether the analysis is for "Fixed" load analysis without free surface or "Fluid" load analysis with free surface.
 - Changed the Stability Criteria report in the heeling arm output to report "Upright Heeling Arm" along with "Upright Heeling Moment" for all heeling arm types.
- Made several enhancements to the Orca3D user interface:
 - Added menu items to the context menu for the Fixed Load Case control to include options to run stability analysis and stability criteria evaluation.
 - Modified load case related context menus to show "Fixed" or "Fluid" load case.
 - Automatically select load case(s) and automatically set mirror option (based on checkbox control) when running fixed hydrostatics from the Fixed Load Case tab of the Orca panel.
 - Added display of the library path for the Orca3D Fluid Library

- and Stability Criteria Library to their respective forms.
- Made changes to the Holtrop analysis form to make behavior of the Ca (correlation allowance) control similar to that on the Van Oortmerssen form (and fix some issues related to the Ca control populating list multiple times);
- Modified Stability Criteria tree in the form for running criteria analyses to "grey out" stability criteria that have no matching heeling arm for the current model to make it clearer to the user which criteria can be selected.
- Modified the Manage Sections form to be resizable.
- Added a new Boolean member, `IsOrcaAutomated`, to the list of Orca3D script-accessible properties that script writers can use to tell Orca that it is to be treated as if it is running in a script (to bypass any UI pop-ups that might require user interaction).

Bug Fixes

- Fixed a bug in which certain "hollow" compartment geometries failed to find a point inside of the geometry to use to locate the compartment.
- Fixed a bug in the Load Case form where after trying to change fluid loads to use one of the virtual free surface options the user would get an error when trying to click OK.
- Updated the label on Compartment Properties form to say "Watertight (i.e., Buoyant)" to clarify the meaning.
- Modified formatting for Points of Interest in the Orca3D tree view to exclude location information since it was always in SI units, and values can be seen in Properties grid.
- Fixed a units bug in the Stability Criteria Evaluation report for the Minimum Downflooding Height.
- Fixed an issue reading legacy Orca3D V1/V2 "Custom Cosine" heeling arms/moments which caused the deserialization to fail. Also fixed an issue in reading Orca V2 files with Orca sections into Orca V3 related to orientation.
- Fixed an issue in Orca3D Marine CFD in which if a CFD simulation has been set up and saved with Orca3D, and then at some later time the model is opened without loading Orca3D (or opened by another user that does not have Orca3D installed) and the model geometry is transformed in some way (e.g., scale the geometry), when that transformed model is opened later with Orca3D the transformed geometry is not recognized by OMCFD. This fix will only work for Rhino 7 SR 20 and later.
- Fixed an issue in Orca3D curve export where station curves that were linear (such as stations through a flat deck) were not being exported.

WIP Release 3.0.6 (August 8, 2023)

Enhanced Features

- Enhanced the dynamic display of Hull Assistant geometry to include drawing of the reference coordinate system (aft, starboard, and up) including any user-defined origin shift used to compute the hull geometry and perform hydrostatics calculation.
- Extended the command, OrcaManageLoadCases, to work with Orca3D Designs other than the "Current" Design. As a result, this command can be used to create "Fixed" load cases that are used (a) to perform basic hydrostatics analyses (b) to compute hydrostatic inputs to parametric resistance methods like Savitsky, Holtrop, and van Oortmerssen, and (c) to compute mass properties for Orca3D Marine CFD analyses. This enhancement also provides a scriptable mechanism to define fixed load cases. The Orca3D V3 menu was modified to include a new menu item to Manage Fixed Load Cases as part of the Basic Hydrostatics & Stability analyses.
- Modified the user interface in areas related to Heeling Arms/Moments to include more descriptive titles for the Heeling Moment "type" (e.g., "Personnel Crowding/Offset Load"), hopefully clarifying the intended uses of these Heeling Moment types.

Bug Fixes

- Fixed several issues relating to the definition/computation of Orca sections including (a) fixed an issue in computing Orca section properties (area and centroid) on some sections that did not meet the default planarity requirement, (b) fixed a bug when adding closely spaced sections to the model where the tolerance used for seeing if a section already exists at the same location was not being converted to internal units, (c) added a fix to ensure that sections saved with an Orca Design are still there when re-opening the rhino model containing that design, (d) changed the Sections form label from "Select Objects..." to "Add/Remove Objects" and also change the prompt for selecting to indicate <CTRL> key can be used to deselect objects.
- Fixed several issues in the scriptable version of the OrcaExportCurves command.
- Added logic to the van Oortmerssen resistance analysis to ensure that the Ax value is properly computed.
- Modified the scriptable version of the command, OrcaHoltropAnalysis, to behave like OrcaVanOortAnalysis, allowing the user to select objects and specify a Fixed Load case to use to populate the input parameters. Also fixed a bug that had prevented the scriptable version of the Holtrop scriptable analysis from working, even with direct input of values.

- Disabled the UI controls on the "View" tab of the Orca3D panel to be disabled if the current license does not include Advance Stability functionality.

WIP Release 3.0.5 (August 2, 2023)

New Features

- A new speed/power command, OrcaVanOortAnalysis, has been added to allow the user to predict the calm water resistance and hull/propeller interaction coefficients of small ships such as trawlers and tugs using the empirical prediction method developed by G. van Oortmerssen (see "A Power Prediction Method and its Application to Small Ships," by G. van Oortmerssen, International Shipbuilding Progress, vol. 18, no. 207, pp. 397-415, 1971 and "Update on van Oortmerssen's Resistance Prediction," by P. Helmore, University of New South Wales, Australia). The command can be run interactively for via a command macro and allows both formatted report output as well as CSV file output.

Enhanced Features

- Modified formatted reports from the Orca3D empirical speed/power reports to apply visual highlight to warnings that indicate some aspect of the analysis (generally related to input values) needs to be reviewed.
- Added an initial implementation of a scriptable version of the OrcaSections command. This implementation assumes for now that the user intends to modify the "Default" section list only and that the sections "Usage" flag is not to be modified from its current state.
- Modified functionality associated with Orca libraries (e.g., the Stability Criteria Library) so that immutable library objects can be updated when merging in another library and a duplicate is found. This was done to allow us to send out updates to things like modified stability criteria, while still maintaining any customizations the user may have made in a library.

Bug Fixes

- Fixed a bug in Orca sections that could potentially leave orphaned Rhino curve object in the model. Also removed the option to delete empty section layers as this is now obsolete.
- Fixed an issue in the Orca Stability Criteria Limits form where the units field for the limit "requirement" sometimes only contained units that were part of the current Orca unit system instead of all units for that unit type
- Fixed an issue in the scriptable version of the OrcaProperties command

where the displacer fluid option was sometimes not available due to the appearance of invalid characters in one or more fluid names.

WIP Release 3.0.4 (July 19, 2023)

Bug Fixes

- Added a check to see whether Rhino is being run in an automated mode (such as from Excel or another program) in the decision as to whether to display the Orca3D units-changing notification form. If running automated the form is not displayed.
- Fixed a bug in the Orca3D Hull Assistant geometry creation in which using a non-default model orientation and choosing the create port side model geometry (including the option to create a full model) caused the port side geometry to be incorrectly oriented.
- Fixed a bug in the Orca3D Hull Assistant form in which enabling real-time hydrostatics and then performing an operation that causes the form to be hidden (such as shifting the origin location) causes the real-time hydrostatics controls to be incorrectly placed when the form is re-displayed.
- Fixed a bug the Orca3D Hull Assistant real-time hydrostatics computation if the user shifts the origin location from the default Rhino world origin.

WIP Release 3.0.3 (July 17, 2023)

Enhanced Features

- Added default libraries for Orca fluids, stock materials, and stability criteria.

Bug Fixes

- Fixed an issue in the OrcaCreateCfdRender command in which the required material file was being searched for in the wrong location.

WIP Release 3.0.2 (July 10, 2023)

Enhanced Features

- Modified the report output from stability analysis with righting arm (both basic and advanced) to tabulate righting arm and righting moment using P/S (port/starboard) notation vs +/- in order to be consistent with graphical chart output and be clearer on whether ia moment is restoring vs upsetting.
- Modified righting energy calculation (i.e., area under the righting arm curve) to start from equilibrium heel angle and work "outwards" in both directions.

- Modified basic hydrostatics analysis at multiple conditions so that each condition has a unique name.

Bug Fixes

- Modified the CFD reporting command to fix a localization issue when using a non-zero roughness allowance with non-US regional settings on the computer.
- Fixed an issue in sectional area curve calculation where in certain specific cases the logic could incorrectly compute a deducting area as an additive area.

WIP Release 3.0.1 (June 28, 2023)

New Features

- Several additions were made to the Orca3D Stability Criteria definition to provide greater flexibility including, (a) a new stability limit angle, ResGZ0, representing the angle where the residual GZ0 between righting and heeling arms goes to zero was added to avoid ambiguity in using GZ0 in a limit when a heeling arm is required, (b) similarly a new stability limit requirement value, RA@ResGZ0, was added representing the righting arm at the angle where the residual GZ0 becomes zero, (c) added check when reading prior stability criteria libraries so that if a criterion is found that requires a heeling arm and has GZ0 in a limit, the user is informed that the limit should be reviewed to determine if it should be changed to ResGZ0, (d) added a user warning if the user tries to modify an "immutable" criterion through the user interface (rather than just ignoring the modification as done previously), (e) extended the expression evaluation capability for stability limits to use "built-in" python functions like min, max (for example an angle can now be specified as `'min(GZ0, Flood, 40)'`) and math functions like sin, cos, tan (for example `'math.tan(14*math.pi/180)'`), (f) improved the clarity of the angle modifier portion of the stability limit so that instead of using "From" and "Between" Orca3D now uses "Anywhere From" and "Everywhere From" as appropriate.
- Added the ability for the user to specify a "usage" for Orca3D sections. This is especially important now that Orca3D allows multiple section collections to be defined. Instead of all sections being used in all analyses, the user can now specify the usage for each section collection including "Hull Design and Fairing", "Lines Drawing and Offsets", "Hydrostatics", or any combination of the above.

Enhanced Features

- Added scriptable access to Orca3D hydrostatics results from the most

recent stability calculation. As described in the Orca3D Help File topic, "Scripting Hydrostatics," these values are available via the plug-in methods "MostRecentStabilityResults" and "MostRecentHydrostatics."

- Completed implementation of the area/volume reporting command, OrcaReportAreaVolume, to include all area volume information for Orca3D Designs containing subdivision models. Output to both XML and CSV is now supported.
- Added logic to pop-up an informational message about purchased time-limited Orca3D licenses (similar to the message for evaluation licenses informing the user how much time is left on the license) when loading Orca3D. The user is given the option not to show this message in future sessions.
- Made several enhancements to the OrcaSections command to improve usability including, (a) implemented the ability to Preview section plane locations in the Sections form, (b) modified Sections form button text to be clearer as to their functions, (c) modified the behavior regarding the selection of Rhino objects to section to allow pre-selection of geometry whenever none is currently defined in the default section collection, (d) implemented the ability to create Orca sections on individual layers for each section as well as layers grouped per section type (with user-defined layer naming in both cases).
- When creating a "Custom" heeling arm, allow the user to specify whether the values should be treated as heeling arm values or heeling moment values. In the latter case, the heeling arm values will vary depending on the displacement associated with the load case being analyzed.
- Updated Orca3D V3 toolbars to improve organization and to include V2 toolbars.
- Extended stability report for righting arm analysis to include righting energy (area under curve) for both basic and advanced hydrostatics calculations. This includes both CSV output and formatted report output.

Bug Fixes

- Modified Orca3D sections to be aware of changes to model units and orientation and automatically update the sections as needed.
- Modified the behavior when creating a CFD powering report, so that if there are multiple propellers in the simulation(s), ask the user to confirm that the propellers have the same rpm, kt, and kq characteristics instead of just failing to create the report.
- Addressed several issues related to heeling arms/moments including (a) fixed an orientation issue in creating heeling moments for lifting and personnel crowding from the Heeling Moment form, (b) fixed an internal issue in the definition of positive and negative heeling

moments based on the location of the load creating the moment, (c) fixed a "units" issues in computing the towline pull heeling moment from inputs, (d) modified all heeling moments so that they cannot return a negative value (which would be a righting moment) except for the Custom Heeling Moment with user-input point values, (e) modified Custom Heeling Moment behavior so that if the calculated heel angle is outside range of input values, zero heeling moment is assumed.

- Fixed a reporting issue where a stability criteria evaluation report could sometimes include information such as, "50=50.000 deg" in the output.
- Fixed a bug in the frame system drawing logic so that longitudinal frames are drawn below the frame system longitudinal axis.
- Fixed a bug in which the user could not delete a section collection (the Default collection still cannot be deleted).
- Fixed an issue in computing residual area where the signs of the righting and heeling area could be incorrect.
- Addressed an issue where a new Rhino service release could cause Orca3D to lose saved application settings like the locations of the fluid library or other user settings.
- Fixed an issue where Orca3D "reference" objects were sometimes not properly deleted.
- Fixed an issue in which reading in a model with Orca3D report data saved from a prior stability criteria evaluation might fail.
- Improved internal logic for loading Orca3D libraries (fluid, material, stability criteria).
- Modified stability analyses for Orca3D Designs so that stability analyses include Orca sections with the "Hydrostatics" usage.

WIP Release 3.0.0 (June 7, 2023)

Enhanced Features

- Added logic to attempt to maintain existing compartment properties where possible when subdividing the model. For example, if an existing tank is subdivided, the resulting compartments should also be tanks with the same default fluid and permeability as the original tank.
- Extended the command for creating weight/cost reports to allow grouping by Orca3D stock material as an additional option.
- Added logic to remember the size, state, and location of the Orca3D Load Case form when closed, and to reuse that information when re-opened.
- Extended the scriptable version of the OrcaManageHeelingArms command to allow using Rhino model geometry and specifying a wind gradient when creating a wind heeling moment.

- Changed how Orca3D handles non-watertight compartments in stability calculations so that the non-permeable portion of these compartments are included in the buoyancy calculations. As a result of this change Orca3D now allows the user to set the default permeability for all compartments including non-watertight compartments as well as to override the default permeability of non-watertight compartments in the Load Case form.
- Extended the functionality of the Load Case control used for creating "solid" load cases to allow copying an existing load case via the toolbar or the context menu.
- Modified the report for Stability Criteria Analysis to (a) include Downflooding "Points of Interest" heights above waterline if selected in the reporting options, (b) display the GZ0 point including the heeling arm in righting arm curve as "ResidualGZ0" (c) include the height of the lowest Downflooding point (along with its name) in the main Righting Arm table.
- Modified the OrcaCreateCfdRender command, adding logic to handle importing of streamlines, handling cases the tow point is changed from the default CG location, and making the ability to filter free surface mesh vertices below a certain height a user-controlled option.
- Added notes to the Hydrostatics Analysis report describing how center of mass of fluid loads was treated in the analysis (virtual vs. actual CG shift).

Bug Fixes

- Fixed a reporting bug in the stability Cross Curves report when only one displacement or sinkage is specified as input.
- Fixed a bug related to user units and model orientation in computing wind heeling arm from design geometry.
- Added a check to make sure Orca3D is not running from within a Rhino script or RhinoInside before popping up a units-changing notification form.
- Fixed an issue in the Savitsky and Holtrop analysis forms where a user could potentially change the checked load case before a prior calculation update was finished, resulting in an exception. Now when the mass properties are being updated the form is disabled so that no other selections can occur.
- Fixed a bug in the Orca3D Hull Assistant, related to the functionality for shifting the origin of the assistant geometry, where the user could click Cancel and be left with "ghosted" display images.
- Fixed several issues in the Orca3D Marine CFD interface including (a) fixed a bug in the analysis Options form in which the CFD Grid Size dropdown was accumulating mesh size options from past opening of the form, (b) modified the CFD Face Type Attribution form so that the

Classification column allows the user to select from Hull, Deck, Appendage, (c) updated the CFD Python run script to use the latest version.

- Fixed an issue in the Load Case form behavior so that when editing a load case any changes are not fully committed until the user clicks OK allowing the user to cancel out of an edit if desired.
- Fixed a bug in which changing the Orca3D model orientation the updates to the internal Orca3D model were not properly saved to the 3dm file.
- Fixed an issue in which compartments composed of multiple spaces (via the OrcaJoinCompartments command) did not properly compute the default "implicit" sounding tube.
- Fixed an issue in which an error could occur when computing hydrostatics for certain models with internal seams.
- Modified the calculation logic for analyzing tank fluid loads that are set to use a virtual free surface moment to handle CG shift. Now tanks set to use a virtual FS moment use their initial upright CG in computing the equilibrium condition but when performing a righting arm calculation, the virtual rise of CG due to tank FS is included.

WIP Release 2.5.16 (May 4, 2023)

New Features

- Extended the wind heeling moment functionality to allow (a) use of Rhino model geometry to determine the lateral projected area and centroids of the above water and below water geometry, (b) apply a user-specified vertical wind gradient, (c) apply a user-specified drag coefficient. In addition to the previous wind heeling moment where the user directly input the wind area and lever arm, the user now has several additional geometry-based mechanisms for defining these quantities. First, the user can select one or more closed planar curves that will be used for the calculation of wind area and centroid and for underwater center of lateral resistance. Second, the user can select surface and mesh geometry from which the lateral projected outline is computed. Third, the user can specify use of the Orca3D Design geometry in which case the design components are automatically used to compute the lateral projected outline. For subdivided design geometry, the calculation of lateral projected area can sometimes take significant time, so the user is given the option to ESC from the computation if desired. The user is given the option to include a vertical wind gradient in the computation defined by a reference height, a vertical power (exponent), and a vertical integration interval. This gradient can be applied not only to the wind speed but also to the wind pressure if the pressure input option is chosen. If the gradient

option is not selected, the vertical distribution of wind speed or pressure is assumed to be constant. If the wind speed input option is chosen, the user can now specify the lateral drag coefficient for the calculation instead of using a fixed internally defined value. This new functionality is also available for wind with icing heeling moments.

Enhanced Features

- Added output of heeling moment information in the Stability Criteria Evaluation report. For wind heeling moments this includes the wind heeling arm curve geometry if used.
- Modified the Planing Hull assistant so that it creates the transom surface with an improved topology to avoid potential issues with downstream analyses (e.g., Savitsky).
- Removed extraneous values from the Excel CFD report that could potentially cause confusion including "Samples" on the SimData worksheet as well as all references to "Ca", "Ra", and "ScaleRatio."
- Added the automated Pre-float Check form and associated logic in the Basic Hydrostatics analysis.
- Added logic to address changes to the Simerics ".spro" native file data which no longer includes information about the model up and forward directions. The new logic adds expressions when the file is created from Orca and the reporting logic checks for this new information and issues a warning if it cannot be found. Also added a new check with the user in the OrcaCreateCFDReport command to make sure the user has the appropriate model loaded before creating the report so that the desired units (and potentially model orientation) is used.
- Modified the compartment selection behavior for commands like OrcaCompartmentProperties so that the compartments can be selected from the Orca3D product model tree.

Bug Fixes

- Fixed a bug where importing/merging a file into an Orca library (e.g., stability criteria library or stock materials library) caused the library path to change to the location of the imported file.
- Fixed an issue in how virtual CG shifts are computed for tank loads to avoid a singularity at 90 deg.
- Fixed a bug related to model orientation when writing the loads information to the hydrostatics CSV file.
- Fixed a bug in which changing Rhino units and choosing the option to scale the model did not clear the cached data for compartments which could cause subsequent compartment calculations to fail.
- Fixed a units-related bug in the wind heeling moment calculation in which the moment was off by gravitational acceleration.
- Fixed a bug in the Load Case form where user could click on a read-

only field that can sometimes contain non-numerical values (e.g., "Solve") and could get stuck in an error handler that would not let the user do anything else.

- Modified the stability reporting logic to ensure that if the user chooses to show fixed loads in the graphical output, views of the model include those fixed loads that might lie outside of the bounding box of the model geometry.
- Modified the stability analysis righting arm calculation to address several issues including: (a) ensure that the 180 deg angle is properly computed and handled regardless of direction of heel, (b) improve handling of GZ0 calculation when the model is stable up through 180 degrees, (c) ensure that 0 deg heel is included in the analysis, (d) improve logic to determine ranges of heel angle needed to satisfy stability limit evaluation.
- Fixed an issue in stability criteria evaluation report in which the Heeling Arm column was left in the report table even when there was no heeling arm for the starboard heeling arm output.
- Fixed an issue where selection of a compartment (say as input to a subdivision operation) could incorrectly select a neighboring compartment.
- Implemented logic to disallow performing subdivision operations and stability analyses on Orca3D Designs that are not currently visible, because this could cause an error. A design must be visible in order to operate on or analyze it.
- Modified the Load Group form to (a) fix an error when deleting a fixed load from a group and (b) to auto select full row when right clicking so the Add/Copy/Delete context menu has something to act on.
- Fixed an issue that could occur when subdividing certain models.
- Addressed an issue in the Stability Results form where choosing "Update View" (from the context menu or form button) on an individual simulation result did not update certain things like the damaged compartment view.
- Fixed a bug in which a design component containing a single compartment that is not watertight could result in incorrect stability results due to improper data caching.
- Fixed a bug where running a stability analysis on the current design could fail ("Specified key already exists") if there are multiple Orca3D designs in the model and 1 or more of them are turned off/disabled.
- Fixed an issue in Stability Criteria Evaluation report in which when performing more than one analysis (e.g., 2 or more criteria) an error could occur if some evaluations used a heeling arm while others did not.

WIP Release 2.5.15 (April 3, 2023)

Enhanced Features

- Modified the Fluid Load Case form to (a) allow the user to insert a flotation plane into the model representing a solved hydrostatics condition, (b) create a hydrostatics report for a solved hydrostatics condition, (c) add a new fixed load item representing the current residual weight and CG to the load case, (d) separate load total weight/CG from overall total weight/CG, (e) improve validation of user input so that it does not allow a negative value for tank load percentage, sounding, ullage, volume, permeability, or custom FSM. Also do not allow a load fraction or permeability > 1 , a sounding or ullage longer than the sounding tube, or a volume greater than the tank volume, (e) notify the user if solving for equilibrium fails, (f) changed the display of fixed load groups in the fixed load grid view to use a color with more contrast, (g) modified the context menu for the fixed load grid view to not allow delete or copy operations if the selection includes a fixed load group
- Modified the behavior when the user changes Rhino model units to ask whether you want these changes to affect the Orca3D model data. This includes things like the frame system, component geometry defined in Orca designs as well as load cases and fixed load groups.
- Modified the Tank Capacities report to output weight instead of mass for each tank.
- Made several modifications to the Wake Survey CFD report including: (a) added output of the Reference Velocity along with a check for 0 velocity, (b) improved sizing of the wake survey images, (c) allow wake survey reporting with different propulsors and allow self-propelled simulations to be used (with a warning added for the latter case since this is atypical), (d) added a warning if the number of wake survey points in the results does not match the expected value, (e) accommodate default SimericsMP values for the number of radial and circumferential point counts, (f) use the wake radius as a guess for the propeller radius if the propeller radius cannot be determined, (g) added logic to handle wake surveys on centerline for a symmetrical simulation, (h) modified contour plot labels to show V_a/V_0 rather than $1-V_a/V_0$.

Bug Fixes

- Fixed a bug in which changing Rhino units with model scaling did not clear the cached data for compartments which could cause subsequent compartment calculations to fail.
- Fixed an issue in which the hydrostatics report could sometimes list an incorrect fluid name (although the reported fluid density was correct).
- Fixed several issues in the Orca3D RIB hull assistant related to (a)

proper surface normal direction, (b) correct logic to address various model orientations and (c) removal of an extra transom surface.

- Fixed an issue in the hydrostatics report output for stability analyses of load cases with fluid loads in which the report showed the CG of the fluid load for the vessel in its initial condition rather than the modified equilibrium condition (with shifted tank fluids). Also modified the report logic to exclude display of fixed loads that are disabled in the load case, and modified the CSV output from fluid load hydrostatics to include the names of fixed loads rather than just writing "Fixed Load" to the CSV file.
- Fixed several issues related to using Orca model orientations other than the default orientation including: (a) fixed an issue in adding Rhino geometry to an Orca component with the mirror option set to true, (b) fixed an issue in the OrcaSubdivide command, where using the option to subdivide by box did not properly account for model orientation if one or more box side input options was set to "Fit" to the component, (c) fixed issues in changing model orientation in relation to the Load Case form, including behavior of fixed loads (and fixed load groups), running hydrostatics via solve, and converting residuals to fixed loads, (d) fixed issue in hydrostatics report in listing input CG values for non-default orientation, (e) fixed an issue related to incorrect surface normals that affected all hull assistants when creating just the hull surface, (f) fixed issue in wake survey report related to properly transforming data to the correct orientation.
- Fixed a unit conversion issue in the Load Case form when choosing the options to Specify a Float Plane and override the VCG.
- Modified logic for CFD Powering Report to accommodate a propeller ID other than 1 as the first propeller.
- Addressed several issues in the Orca3D stability criteria analysis related to computing righting arm curve maxima and intersections in specific cases.
- Fixed an issue in which changing the Orca3D mesh parameter settings did not update the underlying meshes used for stability analyses with Orca design load cases.
- Modified the Stability Criteria Evaluation report to remove heeling arms from chart and righting arm table if no heeling arm was used for the analysis.
- Modified CFD Powering report so that propulsion sources that are wake surveys do not trigger the warning about multiple propulsors.
- Addressed issues in the Holtrop resistance analysis including accommodating various model orientations and correcting the stern coefficient calculation to consider mixed area/length units systems.
- Fixed several issues in the Tank Capacities analysis including (a) modified CSV output where an extraneous multiplication by "g" was

included, (b) added the component name to tank capacity table output for tanks and included the component name for tanks and non-tank compartments in CSV export, (c) removed extraneous spaces in CSV export of tank capacities and hydrostatics, (d) modified Tank Capacities command and form to set upper/lower limits on input quantities as needed, (e) make the compartments selected for analysis clear through use of radio buttons for All Tanks, All Compartments, or Selected Compartments, (f) disable CSV file controls if output checkbox is not checked.

- Fixed a bug in which the report option to show POI (points of interest) was not being set properly in the Report Options form.
- Fixed an issue in which running hydrostatics analysis with multiple fixed float planes (e.g., curves of form) could result in a "key already used" error, causing the calculation to fail.
- Fixed issues in Planing and Holtrop analysis forms in which editing the associated load case in the form did not automatically update the parameters used for the analysis.
- Fixed an issue in which deleting a fixed load by right-clicking on a checkbox cell (the column used to enable/disable fixed loads) caused an internal exception in the grid control.

WIP Release 2.5.14 (February 28, 2023)

New Features

- Implemented new equilibrium solver functionality in the Fluid Load Case form. As part of this implementation, the form was modified to (a) replace the three-state checkbox previously used to both specify a fixed float plane sinkage and an initial float plane height for free float load cases with separate checkbox and textbox controls, (b) removed the fix trim and fix heel checkboxes in favor of a Fix Float Plane checkbox control, (c) show float plane (sinkage, trim, and heel) values together with weight/CG values and provide "Solve" buttons to allow the equilibrium condition to be computed and displayed, (d) include residual weight and CG fields to display the difference between sum of fixed and fluid load and specified or solved weight/CG (with negative residual weights now allowed), (e) display GMt corrected when the equilibrium solution is calculated, (f) allow sinkage and trim fields to be input/computed based on any combination of sinkage at the origin, draft at FP/AP/midships, and trim angle.

Enhanced Features

- Extended the resistance reports for planing analysis (Savitsky) and displacement analysis (Holtrop) to optionally include "Check" notation labels in the graphical plots for any speeds in which a prediction check

note occurred. The user can choose whether to include this report output through a reporting option available in the forms for these commands as well as in the Reports tab of the Orca Properties form. Also for planing analysis specifically output of LCG and VCG in Rhino coordinates relative to the origin (vs transom/baseline) was added.

- Extended functionality related to the Orca3D "Active Load Case" to include (a) allowing the user to set the active load case from the Orca3D Product Model tree context menu when right clicking on a Fluid Load Case, (b) adding a visual notation of the active load case in the tree view via highlighting, (c) adding a dropdown control in the View tab of the Orca3D panel where you can both see what the active load case is and directly set it. The active load case is that load case for which the viewing options to display tank contents and tank status apply. In addition, the OrcaSetActiveLoadCase command was modified to allow "None" as input to unset the active load case.
- Added the ability to edit a Fixed Load Case via the context menu that opens when you right-click on a Fixed Load Case or via a new tool strip button (part of a new tool strip was added to the Fixed Load Case tab to allow adding, deleting, and modifying load cases). Related to this addition, the Fixed Load Case naming behavior was modified so that the load case details (weight/CG or sinkage, trim, heel) are only added to the load case name if the user doesn't specify any name. Otherwise, the load case details are appended to the load case name in the Fixed Load Case tab of the Orca3D panel for display purposes only.
- Extended the Fixed Load hydrostatics analysis to include display of the "mirrored" model geometry in the Orca3D Hydrostatics & Stability form that displays the progress of the computation as well as in the hydrostatics report when the user has chosen to mirror geometry. The former also includes a statement in the graphical viewport as to whether the model has been mirrored (the report output had already included the status of the Mirror flag). This new functionality allows the user to visually ensure they have selected the correct mirror option during the analysis.
- Extended Report tab in Orca3D panel so that double-clicking on a report automatically opens it.
- Implemented improvements to the display of geometry associated with error/warning messages in the Orca3D log.
- Extended compartment status display mode to show frozen compartments as yellow (damaged compartments remain red and intact remain green).
- Implemented the hydrostatics "Pre-float" functionality for basic hydrostatics calculations from version 2.0.
- Extended the command OrcaAssignWeightCost and associated form to allow the user to specify the name of the Rhino object (which is also

- used for the weight/cost component name).
- Modified the behavior of the commands, OrcaCreateDesign and OrcaCreateComponent, so that the initial component geometry can be a non-manifold solid. Previously it had been required that the initial geometry was manifold solid, but now the component can be created with multiple internal regions that will be recognized as spaces/compartments.
 - Modified the command, OrcaExtractComponentGeometry, to add a new option "InitialGeometry" which when set to true extracts the initial component geometry. If the initial component geometry was a manifold solid then this option behaves the same as the ExternalGeometry option; otherwise the ExternalGeometry will retrieve the manifold solid geometry (i.e., gets the infinite region of the initial component geometry).

Bug Fixes

- Removed any leftover dependencies on Microsoft ReportViewer now that a newer reporting platform is being used.
- Modified the Orca3D product model tree to exclude the "Stability Analyses" tree node since it is not currently relevant for Orca Designs.
- Made some adjustments to the dynamic layout of the clipping box controls to try to improve display with scaling set to something other than 100%.
- Made numerous modifications to the Real-Time Hydrostatics and Real-Time Section Area Curve controls and behavior. This included (a) re-initializing real-time hydrostatic parameter values when any stability input is changed (e.g., selected geometry, selected load case, mirror flag), (b) improving logic to dynamically arrange real-time hydrostatic dock bar controls, (c) improving general error handling and robustness, (d) proper scaling of real-time SAC as stability input or units are changed, (e) fixed a calculation issue related to the use of an incorrect coordinate system, (f) fixed section area calculation issue when the mirror flag is set
- Fixed an issue that prevented Fixed Load Case Hydrostatics analysis with Rhino Mesh objects from working.
- Addressed several issues related to Rhino automatically splitting geometry along creases including, (a) modified the Planing Hull assistant to create the hull geometry as a brep (vs surface) so that it can be added to the model without automatically splitting along creases, (b) created customized logic for splitting surfaces along creases to address issues with the Rhino version of the logic that could result in "bad" geometry in specific cases, (c) modified the OrcaExtractComponentGeometry command so that the resultant brep does not automatically split along creases, (d) modified the logic that

adds component geometry for Orca Designs to add without automatically splitting along creases.

- Addressed several issues in the Savitsky planing analysis including, (a) added a necessary tolerance argument to the area mass properties calculation for sections, (b) modified the logic to work correctly with Orca Design components by extracting external geometry from the component, (c) modified the logic to work with trimmed surfaces (faces), (d) clear any cached data between invocations of the planing analysis command, (e) fixed an orientation issue in closing section curves for planing analysis, (f) fixed unit labels in planing analysis form, (g) modified the planing analysis command so highlighting of the selected planing surfaces works properly for Orca Design components, (h) fixed an issue in the Planing Analysis form where the read-only status if the VCG field was not being set correctly.
- Addressed several issues in the Holtrop displacement analysis including, (a) modified the calculation to continue if a section curve calculation returns a curve with zero points (presumably because it is a small amount off of the end of the model due to trim/heel), (b) fixed a units issue where unit conversions were being double-counted, (c) fixed an orientation issue when section properties are being computed.
- Modified the stability analysis reports to attempt to determine if a heel angle of 180 deg should be treated as port or starboard heel based on reviewing other "nearby" heel angles.
- Made several changes to Fixed Load hydrostatics analysis including, (a) remove unneeded surface edges before computing hydrostatics to avoid duplicate counting of waterplane edges when they are coincident with an internal edge, (b) fixed a model orientation issue in hydrostatics calculations, (c) fixed bug in the Hydrostatics input form in which specifying a float plane as a Sinkage in combination with one of the "DraftAt..." options caused the calculation to fail, (d) modified the calculation logic to remove any internal longitudinal/transverse shift of the model when computing the equilibrium transformation.
- Made a change to the OrcaRemoveWeightCostComponents command to address a bug in which clicking on the "Clear Weight/Cost Properties" button in the Weight/Cost Manager form fails to properly remove the weight/cost item.
- Addressed several issues in the Orca3D Units Manager including, (a) the list of units for acceleration did not include ft/s^2 , (b) the currency dimension had an inconsistent symbol (\$ vs USD) and (c) a legacy model with custom units did not properly convert speed units when opened in the new version of Orca3D.
- Fixed a bug in which changing the mesh used for hydrostatics calculations in Orca Properties was not applied to ensuing calculations.
- Fixed an issue in selecting component geometry for Orca Designs in

which the user was allowed to select mesh geometry when they should not have been.

- Modified parametric resistance calculations to use linear interpolation to evaluate drag forces.
- Added a check on Load Case names to make sure they don't include invalid characters.
- Fixed a display color issue in drawing preview geometry like that for the hull assistants.
- Fixed orientation issues in tank capacity table calculation and output related to the sign of heel and trim angles specified as input. Also fixed an orientation issue in tank capacity centroid location for CSV output.
- Fixed a bug in which certain operations, like importing a Rhino model into the current model or copying/pasting geometry from another model, could trigger the Orca units change logic. This could result in an incorrect change to Orca load case and other information without the user's knowledge.

WIP Release 2.5.13 (January 13, 2023)

New Features

- Implemented Savitsky empirical method for predicting resistance of planing hulls via the command OrcaPlaningAnalysis. In this new implementation the user can select the planing surface without having to split the hull surface at the chine.
- Added the ability to define new (non-fluid) load cases by right-clicking on the load case control and choosing "New Load Case" from the context menu. This opens a new form where the user can enter one or more combinations of sinkage/weight, trim/lcg, heel/tcg, and vcg to define the new load cases. This behavior is available anywhere the Orca3D load case control is used including the Load Case tab of the Orca3D panel, the displacement and planing analysis commands, the CFD analysis command, the lines drawing command, etc.
- Implemented ability to export Orca3D curves to various file formats via the new OrcaExportCurves command. Supported formats include IDF (IMSA Definition File), ORC (Offshore Racing Council offset file), Pias, and Precal.

Enhanced Features

- Improved CFD reporting command for wake survey analyses to include harmonic analysis of circumferential variation of the wake field as well as to optionally allow/exclude the free stream velocity from the radial and tangential flow analysis. Also improved report formatting to include user control of colormap display range, scaling of flow direction arrows, and a listing of parameter definitions in the report. Finally,

also added output of computed 1-w to the report.

Bug Fixes

- Fixed several issues in the OrcaHoltropAnalysis command.
- Addressed several issues in the OrcaCreateLinesDrawing command including (a) stations and waterlines not being drawn on proper side of bodyplan/plan views for port side model geometry, (b) addressed an issue where leaders were not being computed correctly in all cases, (c) fixed a bug in creating Orca sections for lines drawing from Rhino curves in which the Orca model orientation was not being accounted for, (d) fixed an issue where the logic to compute the section curve plane needed a tolerance added
- Fixed a bug that caused compartment properties (e.g. name, fluid) to be lost when modifying the model topology (like inserting subdivision or moving faces).
- Fixed an issue where the Orca control polygon could become transparent and therefore not show up in the display.
- Modified Orca reports (e.g., hydrostatics, resistance, etc.) to allow other user interface elements like message boxes and other forms to be visible if they are brought to the top of the view.

WIP Release 2.5.12 (December 21, 2022)

Bug Fixes

- Fixed a bug in computing compartment size which could cause tank load calculations to fail.

WIP Release 2.5.11 (December 20, 2022)

New Features

- Implemented the command, OrcaCreateLinesDrawing, to create a Rhino page view containing a traditional lines drawing.

Enhanced Features

- Extended the Orca Foil Assistant to (a) implement place and rotate functionality on the Placement tab, (b) implement mass properties functionality on Analysis tab based on solid material selection, (c) make the assistant work with different Orca orientations.
- Implemented the ability for Orca Marine CFD to utilize saved solid load cases as input to the mass properties calculation via the "Design Condition" button.
- Implemented the ability to enter a "target" sectional area curve to use with real-time SAC.
- Updated the hydrostatics report to highlight heel/trim values that are

above the heel/trim threshold settings in Orca Properties.

- Modified the hydrostatics CSV output to move the Load Condition details out of the main hydrostatics table for easier parsing/post-processing.

Bug Fixes

- Fixed a bug where changing the hydrostatics fluid density was not having any effect on hydrostatics calculations.
- Fixed bug in which solid hydrostatics could not be applied to Rhino extrusion objects.
- Fixed a bug in the Load Case form where the dropdown combobox containing the fluids did not include fluids that were in the load case but not part of the Orca3D Fluid Library. In this case selecting the dropdown for a fluid that is not in the fluid library could cause the fluid to change for that compartment.
- Fixed a bug in calculating the bounding box for compartments where the model origin (0,0,0) was always assumed to be included in the bounds.
- Fixed a bug in computing tank levels for specified load fraction related to non-SI units.
- Fixed a bug in logic to select compartments and components where inserted text dots could be hidden if the layer they were placed on was hidden.
- Modified the lofted dev hull assistant to correctly set the surface normal directions on the underlying surface geometry.
- Modified Orca control points to draw the control polygon using the currently defined colors in the Orca document settings, and fixed a bug in drawing u-direct chine curves.
- Fixed a bug where default tank sounding tubes were no longer being computed/displayed as a result of a recent optimization.

WIP Release 2.5.10 (December 1, 2022)

New Features

- Made several changes to Orca3D Marine CFD implementation to (a) bring it up-to-date to the implementation in Orca3D v2.0 and (b) implement the ability to create Wake Survey simulations from Orca3D including specifying number of radial and circumferential point counts, as well as a wake disk scale factor so the disk can be larger in diameter than the propeller, and (c) added a new CFD reporting option for wake survey simulations that generates a Wake Survey report including tabular and graphical representations of the flow velocities.
- Added the ability to create a weight/cost report in CSV format. In addition to all the weight/cost information, the CSV export will include

user-defined object metadata defined as user text.

- Implemented the OrcaHoltropAnalysis command to perform parametric resistance predictions for displacement hull forms using the Holtrop/Mennen method.
- Implemented the “real-time sectional area curve” functionality for control point editing. This is enabled by activating the desired solid load case (by clicking the radio button) and then selecting the Real-time Sectional Area Curve checkbox in the Solid Load Cases tab. The geometry to be included in the real-time calculations must be selected by clicking the “Select Real-Time Geometry” button. If the geometry needs to be mirrored click the “Mirror About Centerplane” button. The real-time sectional area curve will be updated when editing Orca3D control points (the “Points On” button can be used to enable Orca control points).

Enhanced Features

- Made improvements to the Orca3D hull assistants; (a) Implemented the ability to compute and display real-time hydrostatics in the Orca3D hull assistants; (b) Implemented ability to control what geometry is created by hull assistants, hull only or hull deck and transom and port side, starboard side, or both sides.
- Automatically make the Orca3D message log tab visible in the Orc3D panel when any warnings and error messages are added
- Extended reporting of weight/cost item information to include Rhino block instances. Include a report section for Block Item Details at the end of the report.
- Extended weight/cost report to implement grouping by layer and grouping by Rhino group.
- Implemented the ability to transform the model in solid hydrostatics. This new capability enhances the legacy model transform functionality by making a copy of the input hydrostatics model instead of transforming the original and by inserting multiple transformed models as child layers when a rollover analysis is performed.
- Implemented the ability to populate weight/CG input values from the current Orca3D weight/cost items in the model as well as via the Weight Calculator in the solid hydrostatics form.
- Modified the Stability Simulation form so the view is only fit once at the start of the simulation, allowing the user to resize the view during the computation.
- Made several performance improvements that speed up performance for very detailed/complex Rhino models.

Bug Fixes

- Fixed a bug in which the mass density units label for curve materials

- had length instead of mass in the numerator
- Fixed the computation of CG for Orca weight/cost items associated with curve materials
- Fixed a bug in reading legacy weight/cost item information from V2.0 and earlier files
- Fixed a bug in the foil assistant.
- Fixed an issue in OrcaViewports command implementation
- Improved error handling for stability analyses so that the analysis fails if an error occurs to avoid reporting results with possible erroneous data
- Improved transom topology for Hull Assistant geometry to avoid surface degeneracies.
- Improved robustness of tank volume calculation during stability analyses
- Fixed bugs in surface materials and solid materials in which the unit basis (area and volume) were not using the correct units conversion
- Fixed bug in weight/cost items where disabled items were being included in the component retrieval and totals calculation even when the user selected Enabled Items only.
- Fixed a bug in the center of mass computation for weight/cost items
- Fixed a bug in managing Fixed Load Groups where deleting a group that was added in the Fixed Load Group form without first closing the form failed
- Fixed a bug in real-time hydrostatics calculations in which the mirror flag was not being set properly
- Addressed reading of Orca3D Marine CFD information from legacy version 2.0 files.
- Modified the time of creation of the Orca3D reference layer to avoid potential conflicts with other plug-ins such as ExpressMarine

WIP Release 2.5.9 (Internal Release Only)

WIP Release 2.5.8 (October 13, 2022)

New Features

- Orca3D load cases can now be organized in a hierarchy consisting of "load case" nodes and "load case folder" nodes that contain load cases or other load case folders. The command, OrcaCreateLoadCase, was modified to take a new first argument which is the parent load case folder within which the new load case should be placed. The default is to place the new load case within the root "Load Cases" folder. The context menu for the Orca3D Product Model tree was modified to (a) add the ability to create a new load case folder, (b) add the ability to create a new load case within a specific load case folder, (c) select a

load case folder in the tree in response to a command request. Replaced the prior "Manage Load Cases" form with a new form containing a tree control that allows manipulation of the load case hierarchy including drag and drop, creating/modifying/deleting via context menus, etc.

- Given the new load case hierarchy functionality, right-clicking a load case folder node in the Orca3D Product Model tree and choosing a stability analysis to run automatically selects all descendant load cases of the selected node to analyze.
- Added a new command, OrcaReportWeightCost, for reporting weight/cost information. Note that the current implementation is still not complete in that it does not implement the legacy report grouping options (group by Rhino layer or by Rhino group), nor does it handle Rhino block instances. These are left for future development.

Enhanced Features

- Added a plot and data table to the output for a Cross Curves stability report.
- Changed the default moment unit for the "Imperial-LT" unit system to ltf-ft instead of lbf-ft.
- Made several enhancements to the user interface including:
 - Modified the behavior of the Orca3D Solid Load Case tab in the Orca3D Panel so that the context menu allows the user to open the Hydrostatics form with the weight/cg/sinkage/trim/heel values pre-populated.
 - Modified the behavior of the Orca3D Reports tab in the Orca3D Panel so that if you right-click on a report type, you have the option to delete all reports of that type from the Rhino model
 - Added a message when creating Solid Load Cases from the Hydrostatics form to let user know how many load conditions were saved and how many if any failed to be saved
 - Grayed out fixed loads in Load Case form and Fixed Load Group form if the load is disabled.
- Modified the internal brep meshing logic to be faster for certain complex models when meshing for hydrostatics analysis.

Bug Fixes

- Fixed a bug in reading Fixed Load Groups from models created with WIP Version 2.5.6 and earlier in which the names of the fixed loads in the load group were not being preserved. This fix also would have affected the quantity and unit weight of the fixed loads if the quantity was other than 1.
- Updated Orca3D hull assistant input parameter names to match those used in v2.0 for consistency and so as not to invalidate previously

created scripts and macros.

- Made several fixes in the user interface including:
 - Modified the Fixed Load Group form and the Load Case form so that the grid controls automatically resize rows for all cells so that the checkbox controls to enable/disable a fixed load or group are visible with different display settings
 - Removed image from clipping box control to address display issues on certain systems
 - Modified Orca3D Product Model tree view to update tree node names when name changes are made outside of the tree.
 - Made minor changes to the Orca3D report header format
 - Modified the node names for Points Of Interest within a design to show the units and orientation assumed for that point.
 - Fixed a bug in the real-time hydrostatics control that sometimes caused red "X"s to appear in place of the meter control that shows the change in hydrostatics values graphically
 - Made change to the Orca3D Fluid Library Manager form to properly resize columns
- Fix a bug in the logic for computing tank fluid properties from a fluid level to address an issue in the calculation of free surface area and moment properties for certain tank geometries.
- Fixed a bug in the evaluation of stability limits that refer to "GM" to include the virtual effect of free surface corrections (i.e., GMcorr).
- Fixed several bugs related Orca3D weight/cost items including:
 - Fixed a units issue for weight/cost item center of mass
 - Fixed issues related to updating weight/cost item properties via direct editing of values in the grid control of the Manage Weight/Cost Items form (specifically the "enabled/disabled" property and the item "name" property)
 - Fixed a bug in reading legacy weight/cost items created in Orca v2.0 or earlier where the material ID for a "local" material (one that is not in the material library) was not being preserved
- Fixed an issue where Orca Designs, Load Cases, and Fixed Load Groups did not update properly when the user changes the Orca3D Model Orientation. As part of this fix, the requirement that LBP must be positive as computed from input FP and AP values was reinstated. This will hopefully help to catch potential cases where the user has an incorrect model orientation.
- It should be noted that this fix is intended to capture the scenario where the current model orientation does not match the current model and is changed to make them agree. This does not handle the case where the orientation matches the model but the user wants to change the orientation to something else. That scenario will be addressed in a future release.

- Fixed a bug in Loading Details section of the Hydrostatics report where the total LCG, TCG, and VCG of all fixed loads were not being output

WIP Release 2.5.7 (August 24, 2022)

Enhanced Features

- Added sectional area curve output to the Orca3D Stability Report. There is a new sectional area curve reporting option, which is set to "Enabled" by default.
- Modified the behavior of Load Cases and Fixed Load Groups so that the user can enable/disable individual loads via a checkbox in the associated forms. Fixed loads in a Load Case or Fixed Load Group are enabled by default, and disabled loads remain in the Load Case/Fixed Load Group but are not included in stability analyses. Furthermore, all currently defined Fixed Load Groups are automatically shown in each Load Case, and the user can choose to include/exclude the load groups via a checkbox (Fixed Load Groups are excluded by default).
- Removed the "Automatic" checkbox and associated behavior for Fixed Load Groups. Instead, new toolbar buttons were added to the Manage Fixed Load Groups form to enable/disable selected load groups in all currently defined load cases.
- Modified the list of Load Cases in the Stability Analysis form to remove checkboxes and instead use selection as the mechanism to identify the Load Cases to include in the analysis. The list control supports extended multi-selection behavior.
- Added the ability to handle changes to Rhino units in the Orca3D model. This includes both the case where the user chooses "Yes" to scale model geometry (indicating the model "physical" size is correct but they just want to model in different units), as well as the case where the user chooses "No" (indicating the "physical" size was defined incorrectly and was meant for a different unit system). Necessary changes are made to Orca3D Design component geometry as well as to the Orca3D frame system, points/curves of interest, and center of mass locations for fixed loads in Load Cases.
- Added ability to double click (or right click) on Fixed Load Groups in the Orca3D tree view to edit the selected group. Also added a check for name uniqueness when changing a Fixed Load Group name. Also implemented the ability to edit heeling arms via a context menu in the Orca3D tree view.
- Modified the Orca3D clipping box control slider bars to have finer increments (1000 over the length of the model). Depending on your screen resolution and scaling/font size, the control may not size properly. Remember that the Orca3D panel can be undocked and resized (and even moved to a second screen). The slider bars can also

be controlled by the mouse wheel or the arrow keys; click on the slider you want to change, and the left/right or up/down arrow keys will move it, as will the mouse wheel. Page Up/Page Down will move it ten times faster than the arrow keys.

Bug Fixes

- Fixed an issue in copying an Orca3D Load Case where the loads in the new copy were "linked" to those in the original.
- Modified the Stability Report output for analyses that use a heeling arm that changes the mass of the load case (e.g., icing and lifting) to show the modified mass properties in the output.
- Fixed a bug where the Orca3D clipping box bounds were not being reset when an Orca3D Design was deleted (and it was the "Current" design).
- Fixed an issue in the OrcaProperties interactive command related to setting/persisting the Heel/Trim Angle Thresholds, Sectional Area Curve scale factor and color, and Require Prefloat setting.
- Fixed an issue in the sectional area calculation of Orca3d stability analyses that could cause sectional areas not to be computed when there was any trim in the float plane or when model units and orientation were anything but the defaults.
- Fixed an issue in computing sections for non-manifold cellular topology where we were including internal portions of the sections.
- Fixed an issue in evaluation of stability criteria limits in which an evaluation error that might occur for one condition was carried over to a following condition by resetting the error condition each time the criterion is evaluated.
- Fixed a bug where when selecting an Orca3D component by its corresponding text dot, the selection failed.
- Fixed an issue in the Orca3D Fixed Load Group form where the total mass and CG were not automatically updated as changes were made to its constituent loads.
- Fixed a bug in which the user could specify an invalid input value for the Major Divisions value in the Frame System form. Major Divisions should be ≥ 1 .
- Fixed an issue when joining multiple Orca3D compartments into a single compartment so that currently defined Load Cases are automatically updated to reflect the topological change.
- Improved error messages in Load Case and Fixed Load Group forms for invalid input in the data grid view controls.
- Set the grid controls in the Load Case and Fixed Load Group forms to use period as the decimal separator to be consistent with other decimal input.

WIP Release 2.5.6 (July 27, 2022)

New Features

- Added a new command, OrcaEditComponent, to allow the user to edit the name of a design component (and potentially other component properties in the future). This command can be executed from the command line or from the context menu in the Orca3D tree view.
- Added the ability to save loading conditions for "Solid" hydrostatics analyses (Solid Hydrostatics is the current name given to those hydrostatics analyses that are based only on the external shape of the model and treat all internals as solid). In the Orca3D panel there is a Load Case tab which lists these new saved loading conditions. To save these conditions, you can click the "Save Conditions" button on the Hydrostatics dialog, or you can right-click on a load case in an Orca Design and choose "Save as Solid Load Case." The saved load case(s) are shown in the "Solid Load Cases" tab of the Orca3D panel.
- Implemented "real-time hydrostatics" calculations for control point editing. This is enabled by activating the desired solid load case (by clicking the radio button) and then selecting the Real-time Hydrostatics checkbox in the Solid Load Cases tab. The geometry to be included in the real-time calculations must be selected by clicking the "Select Real-Time Geometry" button. If the geometry needs to be mirrored click the "Mirror About Centerplane" button. Real-time hydrostatics will be updated when editing Orca3D control points (the "Points On" button can be used to enable Orca control points. The real-time hydrostatics dockbar allows the user to choose the parameters to display.
- Implemented tank free surface load fraction limits so that tanks that are less full (or equal to) than the minimum limit or fuller (or equal to) the maximum limit are assumed to have 0 free surface moment. These limits only apply to tanks whose free surface type is set to either "VirtualVcgShiftTrue" or "VirtualVcgShiftMax". The other free surface types retain their moment until the tank is full or empty. The values of the limits default to 0.001 and 0.98 for the min and max values, respectively. They can be set in the Hydrostatics tab of the OrcaProperties command form and are saved with the Rhino document.

Enhanced Features

- Several enhancements were made to Orca stability reporting.
 - The stability report now includes more hydrostatic details in the "detailed" report and is similar to the detailed hydrostatics report in Orca 2.0. In addition, the stability report options allow the

user to choose which categories of detailed hydrostatics to include in the report. The detailed report also now includes the sources for the mass properties (specified, computed from loads, or derived from condition).

- The stability report now optionally includes a “summary” report with selected hydrostatic parameters and grouped for multiple load cases. The summary report looks similar to the Orca 2.0 hydrostatics summary report.
- In the loading details a new table of initial fluid load quantities and permeabilities are included, and the load case label is included at the top of every page for clarity. Also for fixed loads the quantity and unit weight are shown.
- Added the ability to optionally show tank labels in the stability report tank views.
- Modified the report so that the plots of hydrostatics properties for hydrostatics analyses should never show up for single condition analysis and should only show up in multi-condition analyses when the user chooses the Curves of Form report option.
- Added the ability to include “non-tank” compartments in the tank capacity table output via a new option on the Tank Capacities input form.

Bug Fixes

- Fixed a bug in Load Case form in which changing permeability on a tank did not automatically update the quantity fields.
- Fixed a bug in creating and persisting fixed loads with a quantity other than 1 in which the quantity and unit weight were not being saved.
- Fixed a bug in computing the lowest point of a tank, which is used to create the default tank sounding tube.
- Modified the Stability Analysis form to allow the list of load cases to analyze to automatically scroll horizontally if the load case names are wider than the control.
- Fixed a bug in the stability report header in which the model filename was printed twice.
- Fixed a bug in which Fixed Load Group names were not being displayed in the Load Case form or the stability report after they were added to the load case.
- Addressed some stability reporting issues in which the CG and GM were not being reported in certain cases.
- Fixed a bug in the UI in which changing the report option for output of Righting Arm table and plot was not properly retained.
- Fixed a bug in which deleting the “current” Orca design could cause the Orca product model tree view to stop working properly.

- Fixed a bug where it was possible to modify a compartment name to be the same as another compartment in the same component. We now check for uniqueness of compartment name when a new compartment is added or an existing compartment is modified via the OrcaCompartmentProperties command. It is still possible to change a compartment name through the Property grid control on the Orca panel, but this will be fixed in a future release.
- Fixed a bug where for certain model tolerances the clipping box control could cause the wrong clipping plane to move.
- Made changes to the Orca clipping box control to try to improve layout with a wider variety of display settings.
- Modified the OrcaCreateCfdRender command to apply dynamic trim to the model about the tow point (defaults to the CG if no tow point is specified). Also make sure to remove white space from the beginning/end of the SimericsMP output file name in case the user inadvertently added one or more. Also modified the command to work with the latest SimericsMP .spro file format.

WIP Release 2.5.5 (June 17, 2022)

New Features

- Added a new command, OrcaSelWeightCost, to allow the user to select items in the Rhino model that have/do not have weight/cost information. As in Orca3D v2.0, this command also allows selection filtering by material type or material name.
- Added the functionality to save Orca3D reports in the Rhino 3dm file. This includes both reports created by analysis of the FreeForm concept as well as those created from Orca Designs. For the former, the Orca3D tabbed Panel now contains a tab showing these reports, grouped by type. For Orca Designs, reports are listed as a child node of the design in the Orca product model tree view. Right-clicking on a specific report allows you to open or delete an existing report, and saving the model persists all reports for future Rhino/Orca sessions. In recognition of this new behavior, Orca stability analyses are no longer added to the StabilityAnalyses root node in the product model tree view.
- Orca compartments which do not have a sounding tube explicitly defined by the user now have an implicit sounding tube extending from the lowest point on the compartment vertically to the maximum compartment height. In the case where the lowest point is not unique, the aftmost point closest to the vessel centerline is used. Note that the upper point may not be physically in/on the compartment. Orca3D displays implicit sounding tubes for tanks when there is no explicit tube. Explicit sounding tubes are dashed blue lines and implicit tubes

are dashed orange lines.

Enhanced Features

- Extended the list of available expressions for defining the requirement of a stability limit to include "RA@GZmax" and "RA@GZ0" since there are some requirements where GZmax and GZ0 refer to the angle and some where they refer to the righting arm. **This change requires that any existing stability criteria definitions that use GZmax or GZ0 in a requirement where the intention is RA@GZ will need to be updated!**
- Modified the behavior for defining sounding tube to (a) allow selection of an existing polyline curve in the Rhino model for its definition, (b) to draw compartment ghosted so you can see through the compartment and (c) to use the tank fluid color for ghosted compartment shading. Also modified drawing of sounding tubes to used dashed polylines with symbols at start and end.
- Implemented a scriptable version of the OrcaHydrostatics command so that the command can be automated from a command macro or Rhino script.
- Improved stability report behavior (a) to use the Analysis Description entered by the user in the report header for rigid hydrostatics or an enhanced description of the analysis type for free surface hydrostatics, and (b) by eliminating implicitly added blank report content that sometimes caused the report to include an unnecessary blank page
- Implemented a new property on Orca compartments defining whether they are to be considered as watertight. Compartments that are set as non-watertight do not contribute to the buoyancy of the owning component. Compartments are set to be watertight by default on creation. Tank compartments (compartments which have a default fluid) are always watertight, so you cannot set the watertight property to false on a tank. Tanks can be damaged in a specific load case, however. This feature allows things like non-watertight superstructure and other spaces to be excluded from the displacement calculation. The OrcaCompartmentProperties command and associated form have been modified to allow setting and display of this property. Non-watertight compartments are automatically removed from the list of compartments in a load case since they cannot be loaded.
- Added a 'ForceUpdate' option to the OrcaCheckModel command so that even if no issues were explicitly found with the model, the user can force a topology update to fix certain issues that are not easily detectable.
- Enhanced the Orca3D message log behavior by allowing the user to display the geometry related to a message (if any exists) when the message is opened.

- Modified OrcaDeleteDesign command to include wording describing the potential for loss of geometry in the confirmation message that opens.

Bug Fixes

- Fixed several issues related to compartments composed of multiple spaces (a) correctly and consistently compute the lowest point in the compartment, which is necessary for the implicit sounding tube used in computing tank levels, (b) fixed errant compartment volume and level properties calculation by avoiding trying to merge spaces and instead computing properties of spaces as separate volumes.
- Fixed a bug in parsing integer values in stability limits that could cause an expression to be evaluated incorrectly or fail to be evaluated at all.
- Fixed an issue in the Orca3D hydrostatics form in which the heel and trim input fields had the values reversed when they were obtained by selecting a flotation plane.
- Fixed a bug in the Orca3D Units Manager where if a length dimension was input for a stability requirement, it was using an internal length unit instead of using the Rhino length units.
- Fixed an issue when importing Rhino models with legacy Orca3D document data (v1 or v2.0) related to weight/cost components.

WIP Release 2.5.4 (May 19, 2022)

Enhanced Features

- Extended behavior of the Stability Results form so that double clicking on a stability simulation or individual hydrostatics result updates the view (in the same way right clicking and choosing Update View from the context menu does).
- Made several improvements in stability reports including (a) using suffix "P/S" for heel and "BU_p/BD_n" for trim consistently throughout report output rather than signs, (b) making sure that righting/heeling arm curves are plotted with principal direction going from left to right when doing a both positive and negative heeling direction, (c) adding a Status column for fluid loads to show the tank mode.
- Added Report Options item to the context menu in the Stability Results form so the user can change report options directly from the form.
- Made several improvements in the Orca3D product model tree view behavior including (a) ensuring compartments and spaces remain sorted alphanumerically by name if either of their names are changed by the user, (b) fixed behavior where changing name in the Orca3D PropertyGrid caused the tree view to reset to its original unexpanded state.
- Implemented appropriate default units for tank-specific unit dimensions (TankSounding and TankVolume) for the various Orca unit

systems

- Modified the wording used in the Orca Frame System form to be clearer as to the frame orientation.
- Added a check to the OrcaJoinCompartments command so that if the compartments could not be joined because they are in different components, the user is informed of the issue.
- Modified Compartment Properties form to display and allow input of compartment permeability as a decimal fraction rather than a percentage to remain consistent with other parts of the UI.
- Prepend compartment name with component name in Load Case form so you can distinguish between components of the same name.
- Modified behavior of fluid loads in Load Cases so that all tanks must have a load assigned which defaults to 0% full. Modified logic to improve tracking of fluid loads in Load Cases as compartment properties are changed (e.g., changing from a tank to non-tank compartment and vice-versa).
- Added a check in the calculation of compartment meshes that the mesh is manifold and try to fix if it is not.

Bug Fixes

- Improved performance for calculating tank free surface moment using VirtualVcgShiftMax by caching maximum free surface moment.
- Fixed a bug in trying to define sounding tube from the Compartment Properties form in which the UI would freeze up.
- Fixed a bug in which creating a weight/cost point component that did not have an associated material (i.e., the weight is directly set by the user) did not have its mass properly set.
- Fixed a units bug in stability report for Points of Interest (e.g., downflooding points). Also added unit labels to the Points of Interest form.
- Fixed bug in which Fixed Load Groups were displayed in stability report as "Fixed Load"; now we use the load group name.
- Fixed a bug in editing a compartment by double clicking on the compartment name from the tree view in which the compartment name could not be edited if multiple compartments with the same name existed in different components.
- Fixed a bug when using Custom Orca units where when creating a stability limit based on righting arm area, no units were available in the units combobox. This was fixed by exposing RightingEnergy as a dimension of interest for Orca3D units.
- Fixed a bug in evaluating stability limits in which GZMax should be interpreted as the angle at which GZMax occurs for a righting arm area stability limit rather than the maximum righting arm value.
- Fixed a bug in which multiple components in a single Orca Design

- could have the same name; this should not be permitted.
- Fixed a bug in computing shift of tank CG when using a virtual FS moment (True, Max, or Custom).
 - Fixed a bug in a mesh conversion utility method that had the effect of causing some compartments that are 100% full to have an incorrect CG computed.

WIP Release 2.5.3 (May 3, 2022)

Enhanced Features

- Added the ability to set the tank free surface behavior to 'VirtualVcgShiftMax' or 'VirtualVcgShiftCustom'. This can be done in the Load Case form. When 'Max' is selected the maximum tank free surface (using the current Rhino model orientation) is computed and shown in the FS Moment column. When 'Custom' is selected, the user can enter the desired free surface moment value for a tank by editing the FS Moment column. In both cases subsequent stability analyses using that load case will use the specified free surface moment.
- Modified the commands, OrcaCreateNewDesign and OrcaCreateComponent, to provide the option of not deleting the input Rhino geometry when creating the new components. The default behavior is for the input geometry to be deleted from the model.
- Made several modifications to the Orca3D Load Case form. (a) Right-clicking in the Fixed Loads control in the form now selects the row so that the context menu allows copying/deleting the row, (b) added display of free surface moment to the right of the tank free surface type column, (c) when new load cases are being created tanks are set to be empty by explicitly setting their load to 0%, (d) cells in the Free Surface Type and FS Moment columns of the fluid loads grid control have tooltips so that by hovering over the cell you can see a brief note about the contained information.
- Extended the behavior of the tree view in the Orca3D panel so that double-clicking items in the tree can have a default action. Double-clicking compartments opens the Compartment Properties form. Double-clicking a specific load case opens the Load Case form. Also added some new context menu items like managing load cases by right clicking on the Load Cases item.

Bug Fixes

- Implemented legacy command, OrcaHelp, to provide access to the Orca help file as well as technical support solutions.
- Implemented legacy command, OrcaLicense, to allow user to review and update the license settings.
- Modified tank properties calculation so empty or full tanks have zero

free surface.

- Addressed a sign issue in reporting trim values for righting arm curve where trim direction is specifically reported as BDn/BU_p.
- Fixed a bug in computing tank properties where the volume that was used as input to compute other derived quantities like waterplane properties (inertia, etc.) did not include permeability correctly
- Modified logic that retrieves values from the grid controls in the Load Case form to use parse values correctly for systems not using the US regional settings.
- Fixed a bug in which when opening Rhino models containing legacy Orca3D data by double-clicking them in File Explorer, an error could sometimes occur.
- Fixed an issue in the Stability Results form where the view of the model being analyzed was sometimes not updated.
- Removed the checkbox control for inserting a float plane from the Stability Analysis form as this is now obsolete since you can add a float plane by right-clicking on a particular calculation in the tree control.

WIP Release 2.5.2 (April 22, 2022)

Enhanced Features

- Modified the behavior of deleting or copying fixed loads in the Load Case form so that when right-clicking on the fixed load grid control, Copy and Delete options are only shown in the context menu if one or more entire rows is selected in the grid.

Bug Fixes

- Fixed a hydrostatics bug in which certain model geometries failed to reach a converged hydrostatics equilibrium.
- Fixed a bug in the stability reports in which hydrostatics analysis with multiple load cases showed the same resultant condition image for all of the load cases.
- Fixed an issue parsing stability limit text.
- Addressed a rare issue where a Load Case could not be edited because one or more of its fixed load definitions became corrupted in the Rhino file. Now these "corrupted" loads are removed from the load case automatically with notification to the user via the Orca3D log window.
- Made minor GUI UI change regarding the Stability Limits form.

WIP Release 2.5.1 (April 18, 2022)

Enhanced Features

- Made minor changes to stability reporting to improve visibility of fluid loads.

Bug Fixes

- Fixed an issue when reading heeling arm data created with Orca3D v1 and v2.0.
- Addressed localization issues throughout the code.

WIP Release (April 4, 2022)

Enhanced Features

- Extended the options on the Stability Simulation window shown when performing stability analyses to improve visualization. This includes the ability to show internal tank loads and tank labels, the ability to draw in wireframe as well as shaded mode, and the ability to set visibility of resultant waterplane.
- Made several enhancements to stability report output. Added new graphics to the stability report to show damage status of tanks, whose output is controlled by user-defined report options. Added labeling of forward, starboard, and up directions to the report gnomon. Added optional labeling of fixed loads in the report.
- Modified the behavior of Orca3D load cases when a tank load is specified by a sounding or ullage. The new behavior treats that load as being associated with the Rhino model in it's initial Rhino orientation as opposed to its computed static equilibrium condition in order to avoid potential confusion caused by the tank load mass potentially changing from the displayed value in the load case definition (which is associated with its initial orientation).

Bug Fixes

- Fixed bug in which text dots were inadvertently being drawn in the stability report.
- Fixed bug in stability report in which bow was sometimes being drawn pointing to the left.

WIP Release (March 23, 2022)

Enhanced Features

- Added new graphics to the stability report to show tank loads that are included in the analysis, if any.
- Moved user interface for setting global FP/AP/BL from Orca Properties form to Orca Frame System form.

Bug Fixes

- Fixed bug which occurred when clicking on the Rhino Units button in Orca Properties form when opened from Orca Design form.

WIP Release (March 18, 2022)

New Features

- Added a new command, OrcaManageLoadGroups. This command allows the user to manage Fixed Load Groups, which are named groups of fixed loads (each having a mass and center of mass) that are saved with the Rhino model and can be added to individual load cases. An example would be a Fixed Load Group containing a single load called "LightShip" defining the lightship weight and center for a design. Fixed Load Groups can be marked as "Automatic" so that when new load cases are defined, any Fixed Load Groups that are marked with the Automatic flag are automatically added to the load case. Since the load groups are included by reference, any changes to the fixed load groups are automatically realized by the load cases containing them. Fixed Load Groups can also be added to load cases manually through the context menu in the fixed load grid control.
- Added functionality when loading a Rhino model containing Orca3D document data so that if an error is encountered while reading the Orca3D data, the user is given the option to save the data to an external file for examination and possible correction. A new command, OrcaImportProductModel, was developed to provide a mechanism for users to read in Orca3D document data that has been modified/corrected.

Enhanced Features:

- Enhanced Orca3D capabilities related to display and interaction with model FP, AP, and Baseline locations. The FP/AP/BL are now defined globally for the model (instead of per Design) and are set in the OrcaProperties command and user interface. The user can display the current FP, AP, and midship locations by toggling the Frame System display option to on. The FP, AP, and midship locations can be referenced interactively through standard Rhino point snapping, and the Rigid Body hydrostatics analysis and Load Case definitions allow the user to enter sinkage (and trim for rigid body hydrostatics) values by specifying draft at AP, FP, and/or midship locations. Draft at the midship location has been added to the stability reports.
- Added charts to the stability reports displaying traditional curves of form when multiple load conditions are analyzed. Note that these can be disabled via the report options if desired.
- Extended the equilibrium hydrostatics calculations to compute and report free surface correction and corrected GM for the equilibrium condition based on the tank loading condition associated with the load case.

Bug Fixes

- Fixed a bug in several of the Orca3D hull assistants related to matching the user-specified model orientation (Forward and Up directions).
- Fixed a bug in saved stability analysis results for stability criteria evaluations.

WIP Release (February 28, 2022)

Enhanced Features:

- Extended the stability reporting output to use a modified format that (a) is more concise, (b) will better support end-user customization, (c) includes previously missing information such as Points of Interest location and height above waterline, and (d) includes drafts at FP and AP.
- Implemented the ability to read Orca3D version 1.0/2.0 document data from Rhino files including section definitions, heeling arm data, points of interest locations, and most CFD analysis information.
- Updated Orca3D Help File to include documentation for creating and analyzing a subdivision model.

Bug Fixes

- Fixed several bugs in the Point of Interest form when launched by the Orca3D product model tree view context menu. Also implemented Points of Interest button from the rigid Body Hydrostatics form.
- Fixed a bug in the command to delete an Orca3D Design when launched by the product model tree view context menu.

WIP Release (January 31, 2022)

Enhanced Features:

- Extended the scriptable version of OrcaSubdivide command so that subdivision locations can be specified by frame names.
- Added "Heeling Moments" and "Curves of Interest" to the Orca3D product model tree view along with context menus to create/modify/delete these. Also made these new additions as well as compartments and spaces lists sorted alphanumerically which can be especially helpful when the model has many compartments.
- Modified Orca commands which require selection of the design to use so that the design can be selected by clicking on the geometry of a component in the design or on the design in the product model tree view.
- Extended Orca3D stability calculation to improve robustness for certain

- “extreme” cases.
- Changed all Orca3D stability reports to use the new reporting tool.

Bug Fixes

- Fixed a bug in the reporting of righting arm/moment which did not properly include the effects of tank fluid CG shift.
- Fixed a bug in which Orca3D downflooding points of interest were included in the calculation even if they were disabled via the UI.
- Fixed a couple of orientation issues in the scriptable version of the Orca CFD command.

WIP Release (January 12, 2022)

Enhanced Features:

- Modified Orca hydrostatics report details to include the resultant weight/CG in addition to attitude (sinkage, trim, and heel) which was already included. When a sinkage, trim, and/or heel constraint is applied in the load case, the user can now see the implied CG location.
- Added display of Orca3D curves of interest in the product model tree view.
- Modified the reporting behavior for stability criteria analysis to show port and starboard heeling directions as separate righting arm curves and data tables depending on the user's choice for heeling direction. Also added “P/S” and “Bup/Bdn” heel and trim labels to be more clear than positive/negative signs.

Bug Fixes

- Fixed a bug in the LoadCase command in which overriding the total CG was not properly transformed into internal orientation.
- Fixed a bug in the stability criteria limit definitions when a required value has no units since it is dimensionless.
- Fixed a bug in computing downflooding heights, margin line heights, and freeboard heights when performing heel in the starboard direction.

WIP Release (January 4, 2022)

Enhanced Features:

- Additional development of the scriptable version of the OrcaSimericsAnalysis command to allow self-propelled simulations to be created.
- Modified the stability reports to include reporting of transverse free surface moment for fluid loads in the load case information.

Bug Fixes

- Fixed a bug in the reporting of center of mass of compartment fluid loads.

WIP Release (December 31, 2021)

Enhanced Features:

- Added a scriptable version of the OrcaSimericsAnalysis command to create CFD simulation files.
- Added the ability for the user to control whether to heel to port, starboard, or both during stability criteria analyses.
- Added the ability for general Rhino operations to snap to the Orca Frame System by adding point objects at frame locations.
- Extended scriptable version of OrcaManageHeelingArms command to allow definition of custom heeling arms.
- Added the ability to select multiple load cases in the scriptable version of the OrcaRunStabilitySimulations command.

Bug Fixes

- Fixed a bug in the reporting of GM for load cases with fixed trim and/or heel.

WIP Release (December 16, 2021)

New Features:

- Added two new unit dimensions for Tank Soundings and Tank Volumes. This was done because it was often desired to use a different length and volume unit when dealing with tanks than when considering the entire ship for hydrostatics. These are available in the Orca Properties form and can be set directly through custom unit settings.

Enhanced Features:

- Made the grid controls for fixed and fluid loads in the Load Case definition form sortable by clicking on a column header
- Added a new button to the Create/Edit Orca Design form that allows the user to directly access the Orca Properties to form in order to set model orientation
- Implemented some efficiency improvements in the meshing logic for Orca stability calculations to make righting arm calculations (especially cases with damaged tank volumes) faster.
- Added ability to define tank sounding tubes from the Orca Compartment Properties command (the standalone OrcaDefineSoundingTube command remains)
- Modified display of Orca Frame System so that it is not clipped by the Orca clipping planes.

- Extended the Check Model command to find and repair any spaces in the compartment model that are not associated with a compartment.
- Extended the Orca Frame System functionality so that "intermediate frames," which are those frames which should not be included in the ordinal numbering of frames, can optionally be displayed with a label. Previously the tick mark would display, and they could be snapped to but no frame label was displayed. In addition, the Frame System context menu has been modified to reflect this new functionality and to change the mechanism by which frames can be renamed. The scriptable Frame System command was extended as well to reflect these changes.

Bug Fixes

- Fixed an issue in the Load Case definition form in which changing the load case from fixed trim and/or heel to free trim and/or heel was not being correctly applied.
- Fixed an issue in which changing the mass density used for hydrostatics and stability calculations was not being correctly applied.
- Fixed an issue when deleting an Orca design where the "current" design was always being deleted instead of the selected one. In addition, the name of the design was added to the confirmation dialog to ensure the correct design is deleted.
- Fixed an issue when editing a design but not changing the name which would result in an error message indicating failure to rename.
- Fixed an issue in the Points Of Interest form in which changes to a point's location were not being reflected in the form (and hence not being realized in the design)
- Fixed some issues in the Orca reporting objects related to Rhino model orientation vs internal object orientation.
- Fixed several issues in the tank capacities table analysis; (a) corrected the free surface moment which was missing gravitational acceleration; (b) addressed some sign issues related to model orientation; (c) added a workaround to a Rhino bug which cause the tank tables to continue beyond the top of the tank; (d) allow reported sounding/ullage values to be negative for tanks with sounding tubes that don't reach the top of the tank but request output to the top
- Fixed a bug in which some unit conversion factors were not being properly parsed internally
- Added a check to Explode Compartments to return without doing anything if the selected compartment only has a single space.
- Fixed an issue when exporting Orca subdivision history to a file in which Move Face operations were not correctly written.
- Fixed an issue in the Orca Subdivide command when using the "Box" or "ExtrudeCrve" option and then changing back to a planar subdivider

type afterwards.