Paramarine Tutorial 4

In this tutorial we will learn how to perform the stability analysis of our design. We will define loading conditions, and for each one of them we will calculate the intact and damaged stability. Furthermore, we will revisit hydrostatics to present some alternative tools for hydrostatic analysis.

Stability

1. Create a concept placeholder and name it analysis. Under the analysis placeholder insert a stability placeholder and name it stability
2. Go to the stability placeholder – insert – Basic Stability – stab_settings and leave default
3. Under the stability placeholder - insert – Basic Stability – hull_envelope
4. Expand the hull_envelope. Go to buoyant_bodies, right click – insert – body_pointer and select the hull as an object
5. The four points (AP & FP baselines and AM FM datum) are used to represent the perpendiculars at the baseline, and the draught marks at their lowest points.
6. Give the x values for the perpendiculars (AP,FP) and marks (AM,FM)
7. Alternatively, you can link with hull_min_X and hull_max_X under dimensional_data in Intellihull for AP and FP baselines
8. We will link the wind profile after we create it
9. Under the stability placeholder - insert – Basic Stability – basic_ship
10. Link with stab_settings, hull_envelope, and water_density
11. We will link later the datum to the long_weight_distribution_approx
12. Create a stability placeholder and name it loading conditions
13. Go to loading conditions – insert – Basic Stability – loading_condition and name it light, or full, etc.
14. Expand a loading condition and link it to the basic_ship and the water_density
15. Right click on tanks_on – insert – tank – link it to a solid tank
16. Set fluid type and fullness
17. You can follow the same procedure and add weights
18. Under stability insert a stability placeholder and name it stability runs
19. Under the stability runs insert 3 stability placeholders, each one for a loading condition (ballast, half, full)
20. Right click on ballast placeholder – insert – Basic Stability – GZ
21. Link stability_settings and loading_condition
22. Right click on heel_range – insert – select a-b for next – give the range of heel angles
23. Double click on gz_curve to see the results
24. Right click on ballast placeholder – insert – Basic Stability – GZ_visualizer
25. Expand and link with GZ
26. Expand hydrostatics to see the results
27. Right click on ballast placeholder – insert – Warship Stability Criteria – NES_109_shape
28. Expand and link the GZ_curve

29. Follow the same procedure and add a NES_109_wind. For this one we need to develop a wind profile
30. Check if it passes the criteria
31. Follow the same procedure for the other 2 loading conditions

How to create the wind profile

1. Under the geometry folder insert – geometry placeholder – name it wind profile
2. Under the wind profile add 2 diagonal points covering all the ship profile in order to define the sheet
3. Then insert – solid modeling – sheet – name it inverse
4. Right click on inverse – operations – rectangle – choose the 2 points that we defined earlier
5. Right click on inverse – operations – subtract – choose the hull solid
6. Repeat the same procedure for the solids of accommodation, process facility, moonpool
7. Then insert – solid modeling – sheet – name it wind profile
8. Right click on wind profile – operations – rectangle – choose the 2 points that we defined earlier
9. Right click on wind profile – operations – subtract – choose the inverse sheet we created earlier
10. Now you have your wind profile for all the ship. But we actually need what is above the waterline. So go to the point p1 and set for z the minimum draft that we will have. Or even better we can define different wind profiles according to the loading conditions we will have since the draft is variable.

Hydrostatic analysis

1. Insert a geometry placeholder under the analysis concept placeholder
2. Insert – Geometry analysis – CSA_hull
3. Link the hull with the Intellihull_surface
4. Go to waterplane – d – link with draft from the loading condition you want to study
5. Go to mid_section – linkwith intellihull output_curves midsection, or just a give a value
6. Alternatively, when you have defined a hull_envelope under the stability placeholder, you can just right click on stability – insert – Basic Stability – hydro
7. Link the hull_envelope and the water_density
8. Define a range of drafts and trims
9. Expand outputs to see the results

Damaged stability analysis

1. Under stability insert a stability placeholder and name it damage conditions
2. Right click on damage_conditions placeholder – insert – Basic Stability – damage_summary
3. Create 3 damage cases, one for aft, one for midship, and one for fore section
4. Go under i.e. aft_damage – right click – insert – select damage and give it a name of a space or a tank

5. As an object select a solid that represents a space or a tank
6. Follow the same procedure and add more compartments
7. Go under stability and insert a stability placeholder - name it damage stability runs
8. Insert 3 more stability placeholders for each loading condition, as we did for the intact stability
9. Right click on one of these placeholders – insert – Basic Stability – GZ
10. Do the same as in intact stability, but also link the damage_case with one of the cases created
11. As before add a NES_109_damage criterion and check if it is satisfied

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