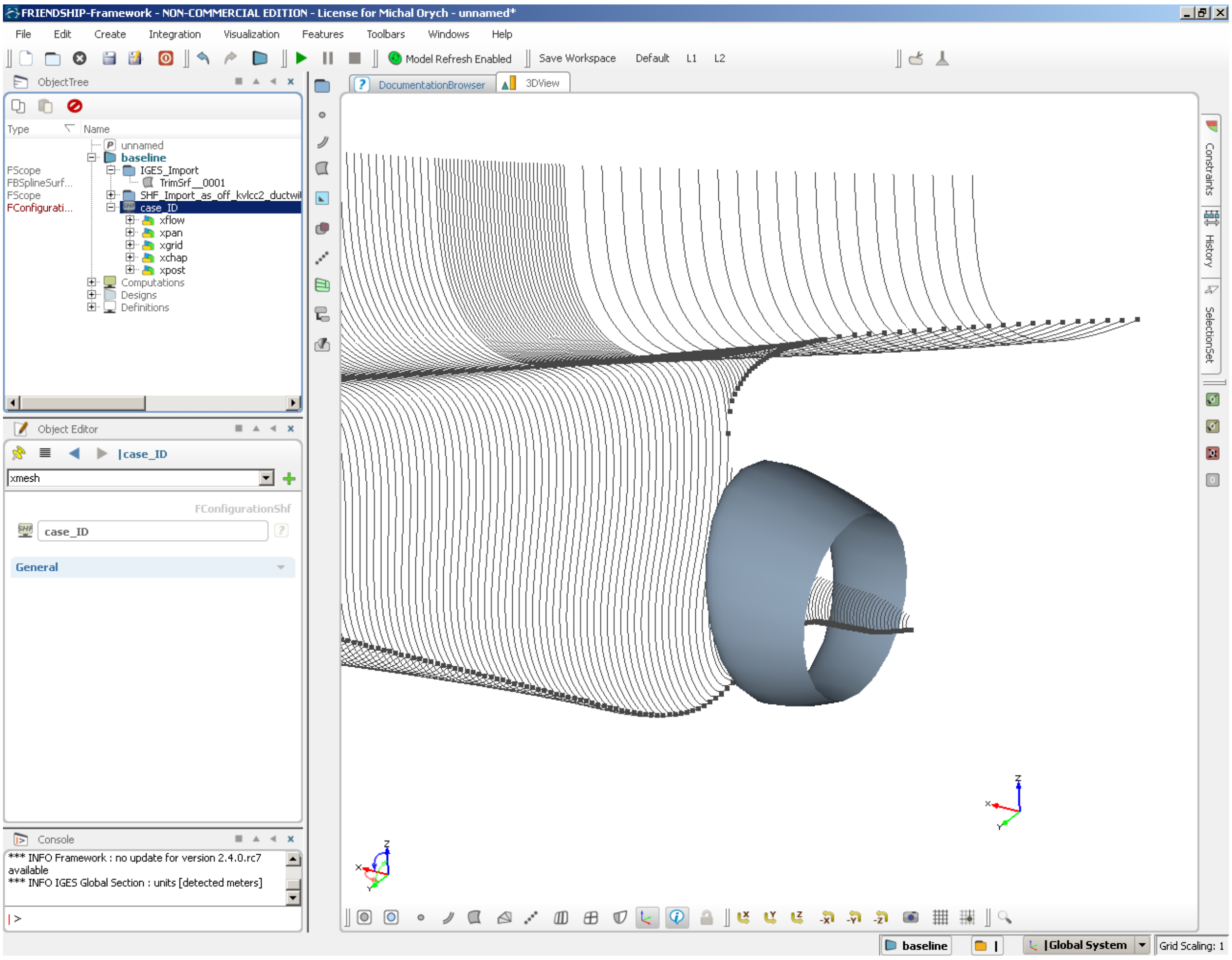
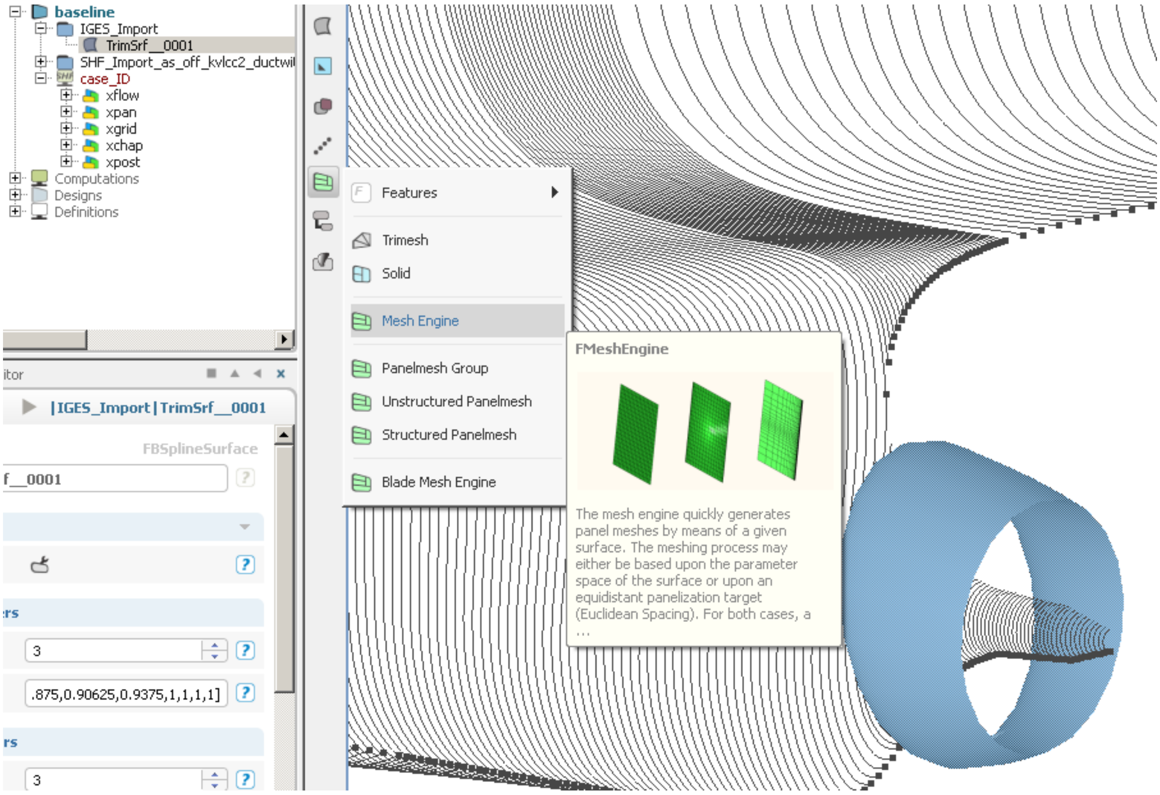
Tutorial 3 part 1 – Appendage modeling

1. Import case_ID SHIPFLOW configuration from Tutorial_Advanced_3/source
2. Import duct.igs IGES file.
3. Save the project as kvlcc2_ESD.fdb
4. Check the setup, make sure you see the offset sections and duct surface on your screen.

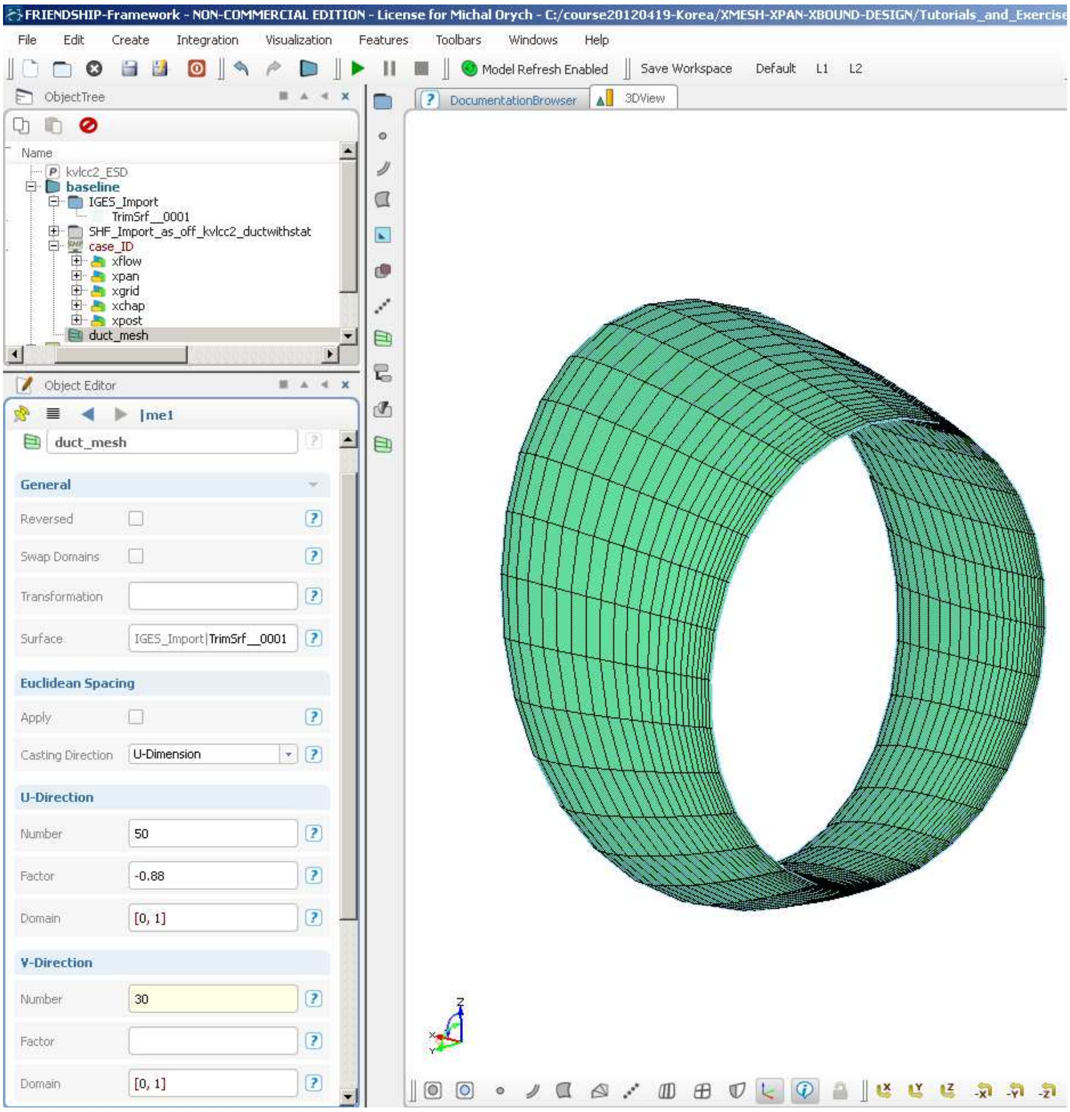


5. In order to create a volume grid for the imported duct grid we shall first make a surface mesh using the surface and thereafter use a hyperbolic grid generator to expand this mash into 3D.

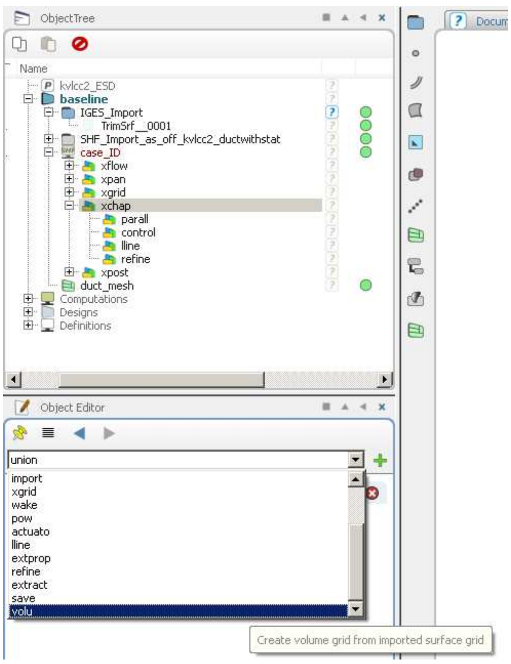
6. Select the duct surface and create a mesh using Mesh Engine, name it duct_mesh



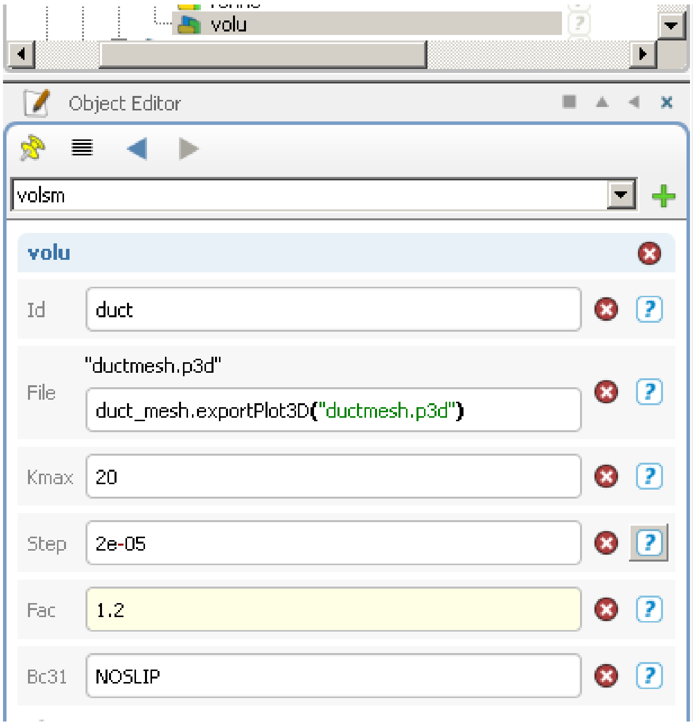
7. Switch off visibility of the offset sections and imported duct surface, notice that the mesh that was just created is extremely coarse and does not represent the object accurately.
8. Refine the mesh dimensions and use stretching factor according to the example below



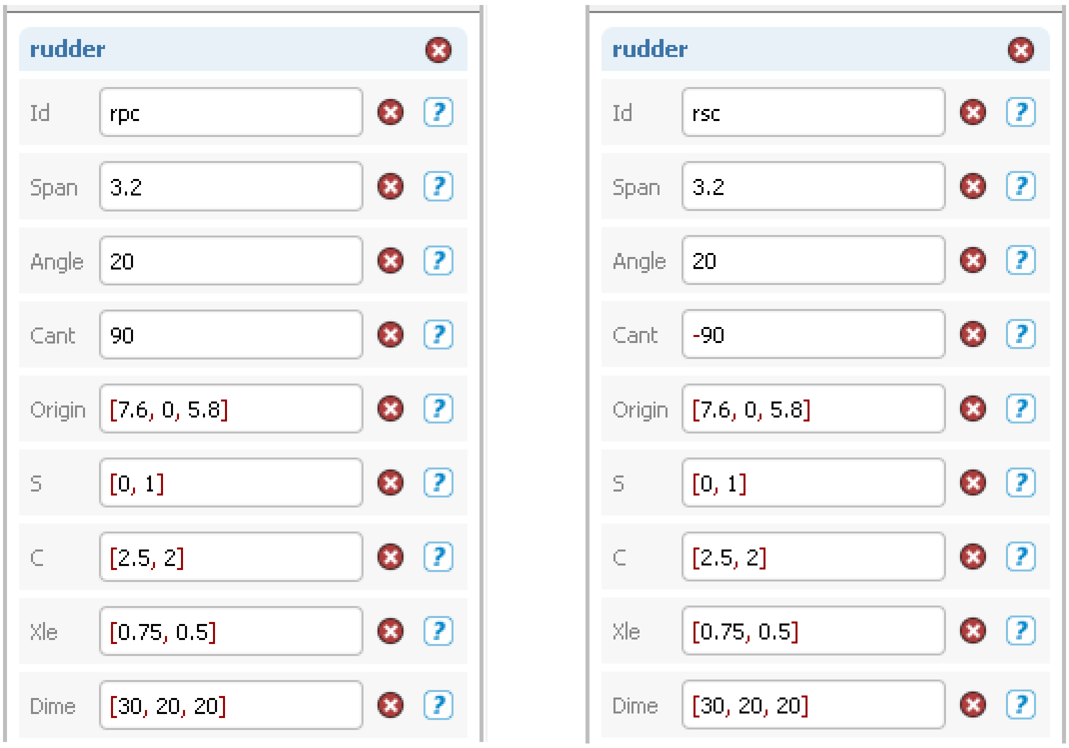
9. To the xchap configuration add volume object



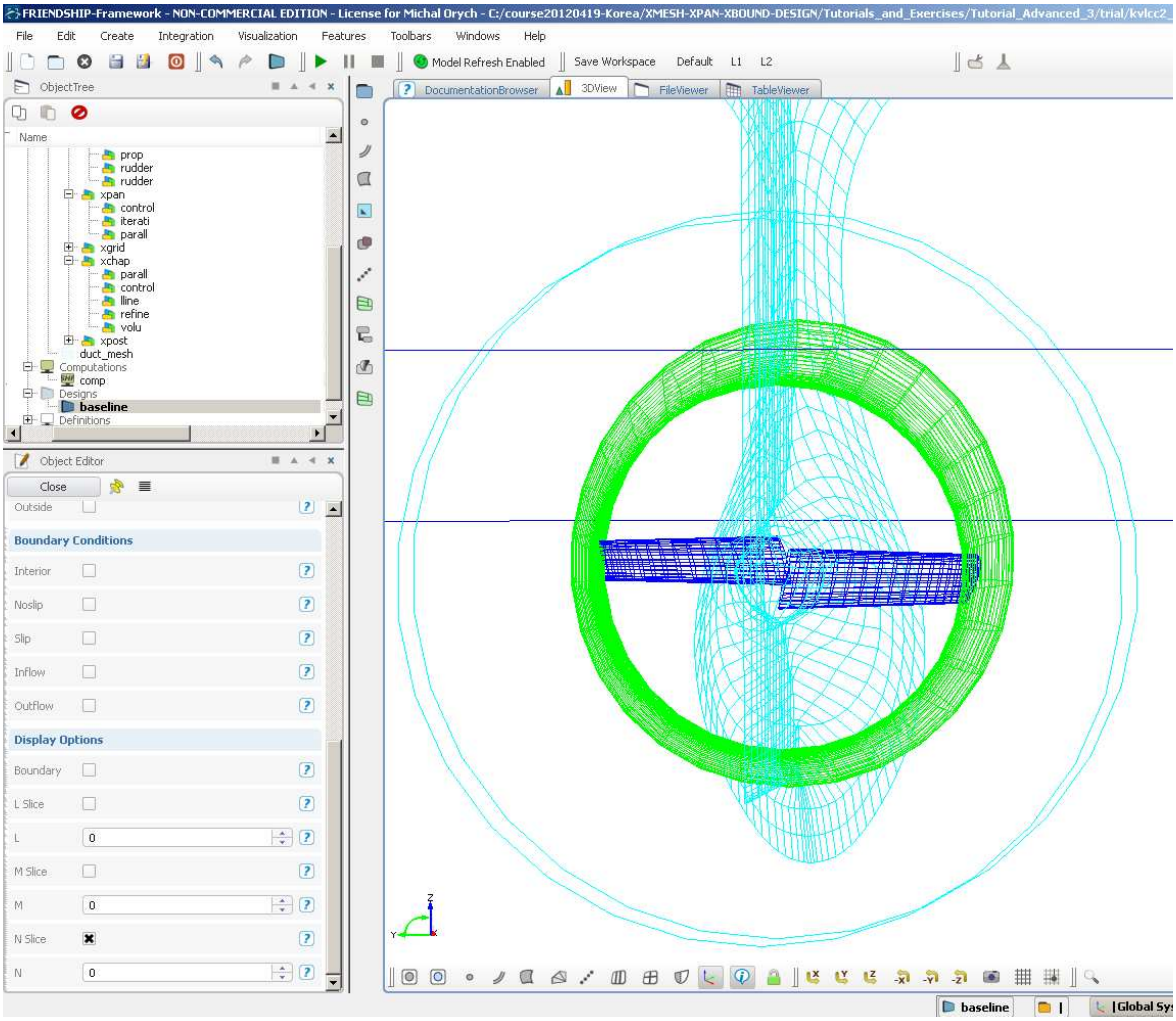
10. Now we will use the duct_mesh to create volume grid, apply settings according to the illustration



11. The setup of the duct is ready but we should add support for this structure. We will use two wings created using rudder objects.
12. In the xflow configuration add two rudder objects with the following settings



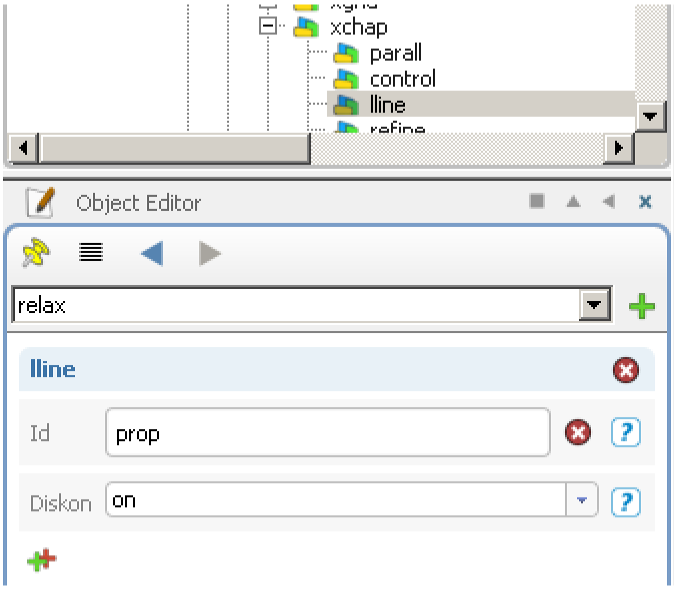
13. Make sure that the number of xchap iteration is set to 0 and start the computations.
14. When the computations are finished, display surface meshes on the duct and supporting it blades as well as on the refinement of the hull. The correct set up should resemble the one below.



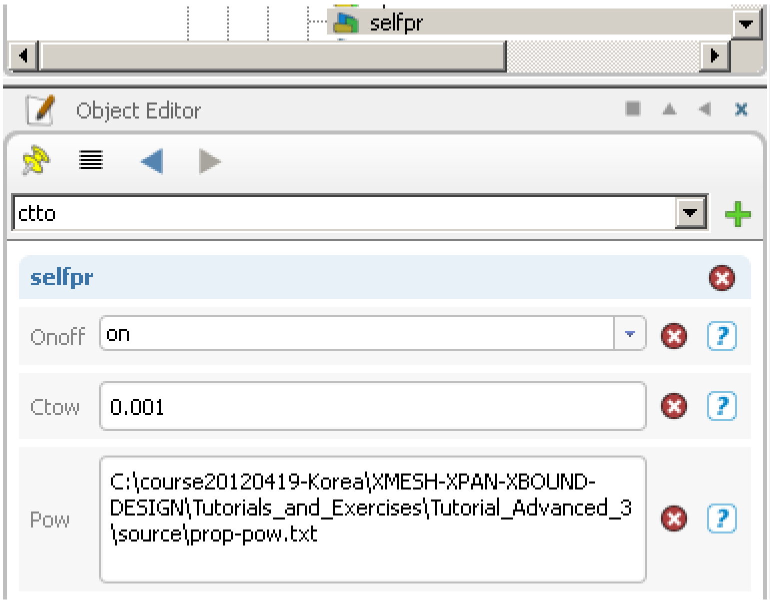
* Note that the grids used in this tutorial is not fine enough for design applications.

Tutorial 3 part 2 – Appendage optimization

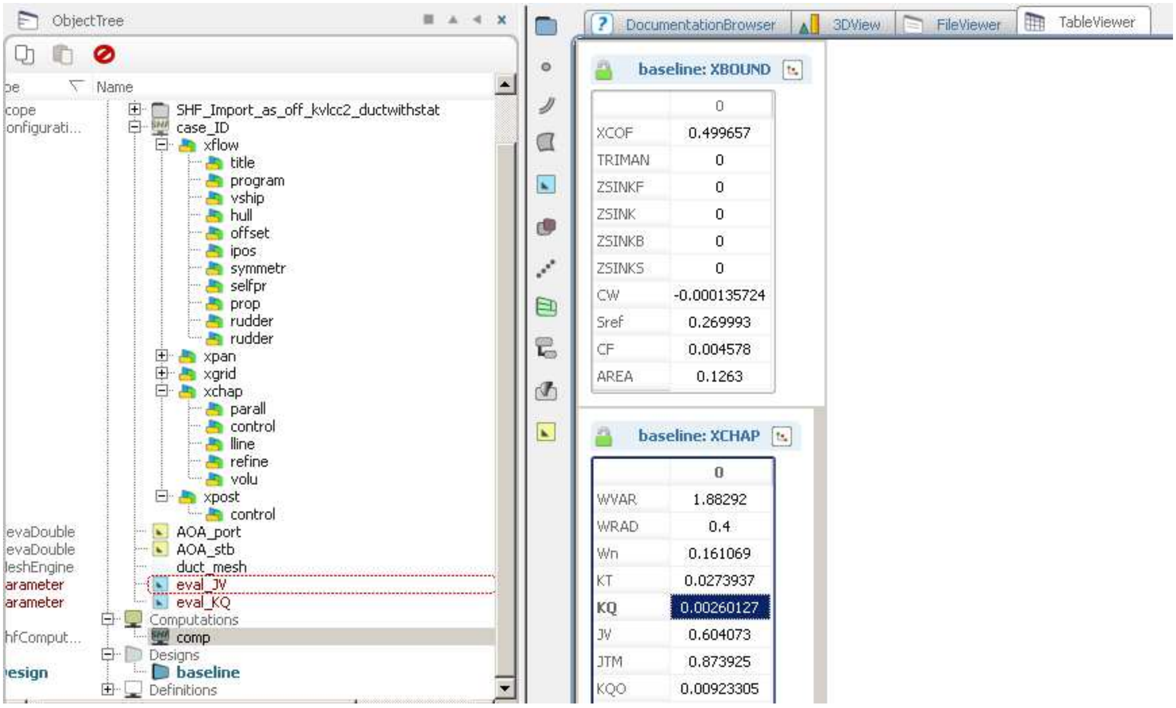
15. Continue the work from the previous part or open the file kvlcc2_ESD.fdb located in \XMESH-XPAN-XBOUND-DESIGN\Tutorials_and_Exercises\Tutorial_Advanced_3\intermediate
16. We will optimize the supporting blade angle of attack using systematic variations with Ensemble Investigation.
17. First we will have to prepare a self propulsion setup in order to have objective function for the optimization.
18. Turn on the propeller.



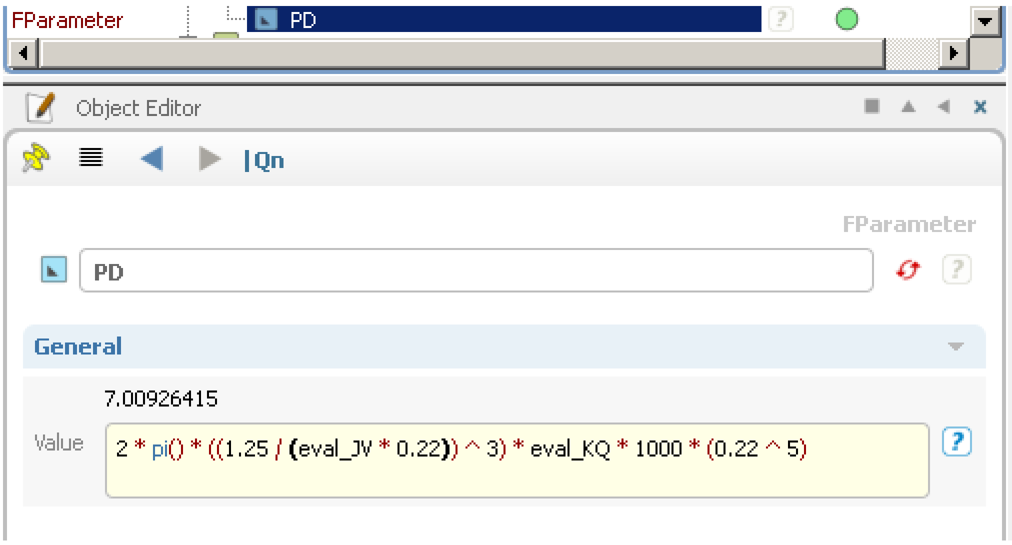
19. Add selfprop command to xflow configuration and use the settings as below, make sure that the Pow command points to the right file which was in source directory for this Tutorial.



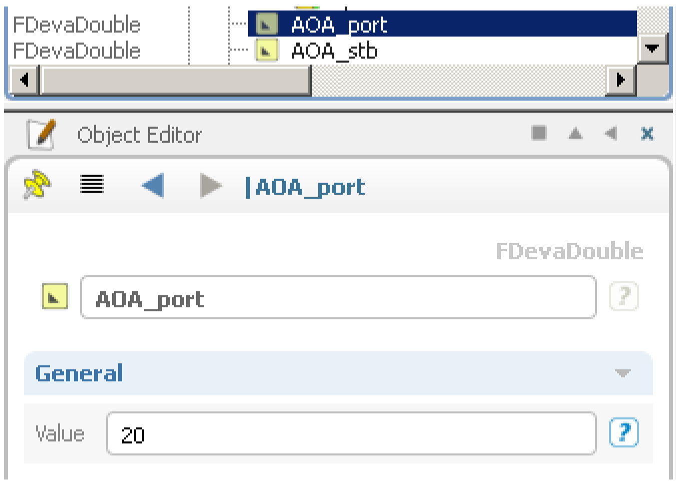
20. Set number of xchap iterations to 10 and start the case, it should take about 10 minutes on a laptop
21. When the calculations are finished go to the TableViewer and by double clicking on the KQ and JV create parameters.



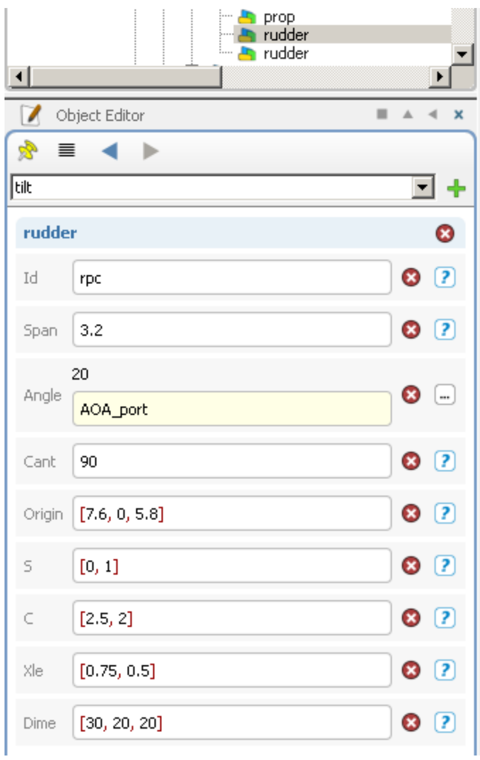
22. Now add additional parameter PD that will represent delivered power using the following formula

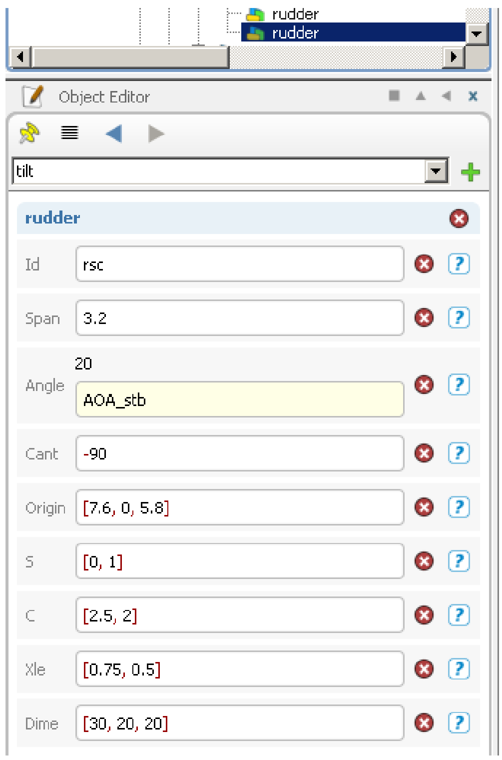


23. Create two Design Variables which will be used as input for angle of attack, name them AOA_port and AOA_stb and set both to 20.

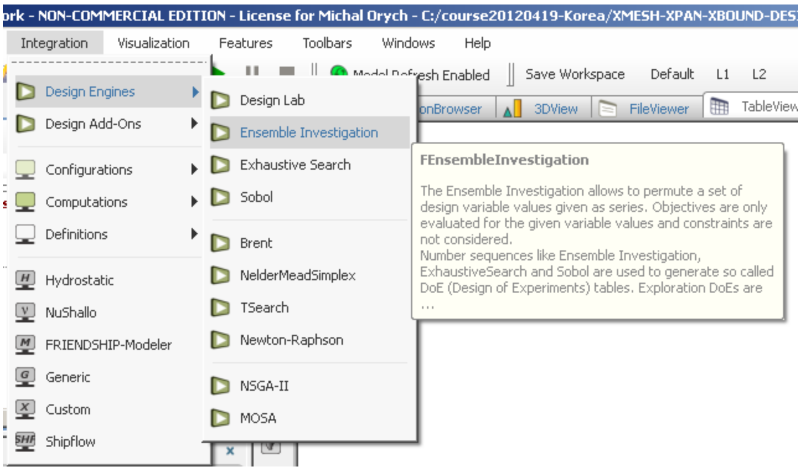


18. In the xflow | rudder configurations replace the Angle with the Design Variables

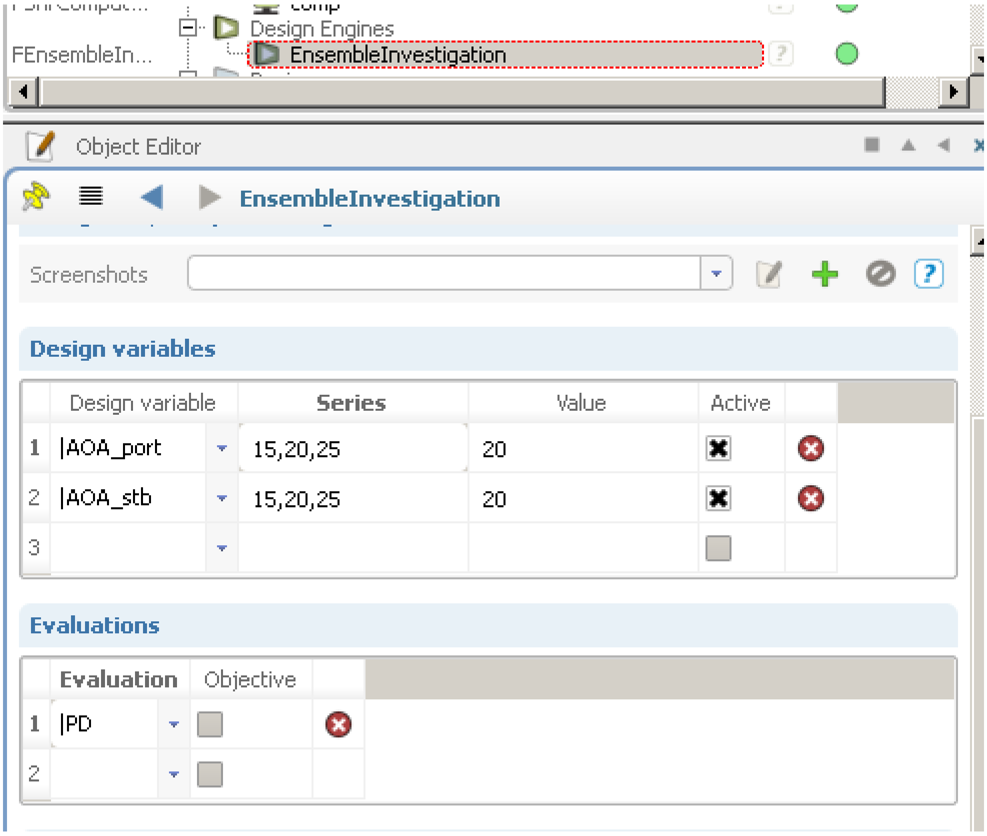




19. Add Ensamble Investigation

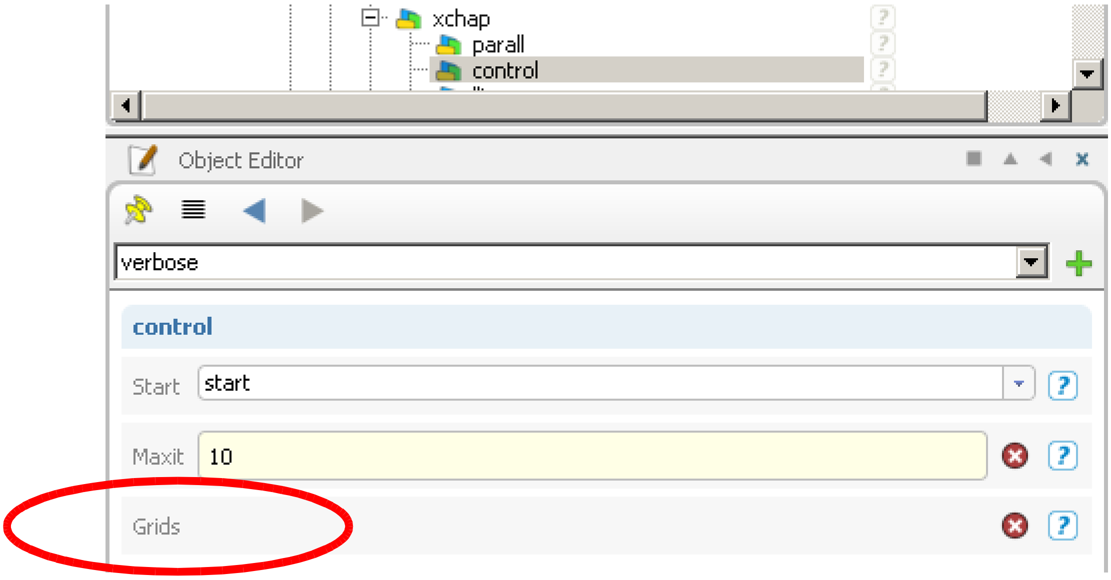


20. Use both AOA_port and AOA as Design Variables and add variation +/- 5 degrees
21. Use PD for Evaluation of the results.



22. There will be 9 different variants created if you run this case and each should be run until convergence. Moreover, the grids should be much finer to give good results so we will only look at the grid modifications.

23. Go to xchap configuration and in control add grids command to prevent from running the solver. Also use xchap only in the xflow|program configuration. Now you can start the Ensemble Investigation.



24. When the computations are finished check the different variants and verify that the angle of attack was varied appropriately