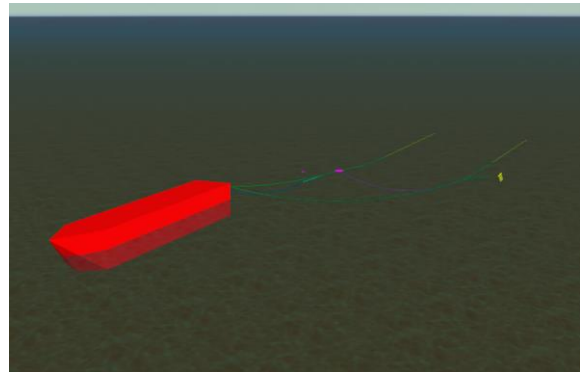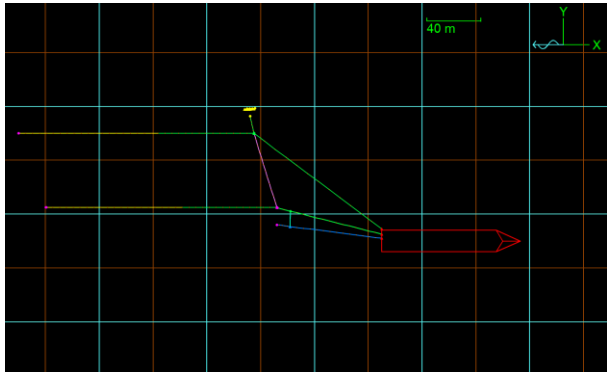# I01 Streamer array



This is an example of a seismic streamer model. The model represents the port half of the system only i.e. two hydrophone streamers plus one air gun towed from a ship.

## Building the model

Ensure that *view by groups* is selected from the model browser (right-mouse click in the *model browser* to find this option).

The diverter is modelled as three elements: a 6D buoy (*towed fish* option, which is the same as a *spar buoy* on its side) to represent the buoyancy tank, a heavy line at the base to give stability, and a wing to represent the lifting surfaces.

Open workspace *I01 Streamer array diverter.wrk* from the *workspace* menu to see a shaded view of the diverter. The wing generates lift and drag forces as the diverter is towed through the water. Open the *Prandtl199* data form from the model browser (in the *wing types* folder). Pressing the *graph* button will show you the lift and drag coefficients versus incidence angle. Selecting any item on the *wing types* data form and pressing *F1* opens the OrcaFlex help, which provides further details.

3D buoys are used to model the Head Buoy and the Airgun. It's acceptable to use a 3D buoy (rather than a 6D buoy) in this situation, as transfer of bending moment between the lines is not important for this example (a 3D buoy has no rotational degrees of freedom, therefore it does not respond to applied moments).
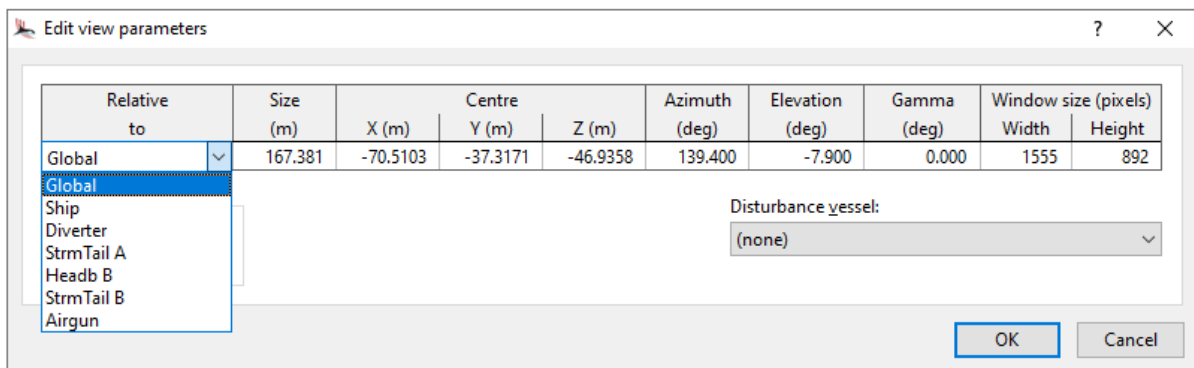
Rather than modelling the two streamers in full, most of each length is represented by a "sea anchor" i.e. a 3D buoy with area and drag coefficient set to generate a drag force equivalent to that of the streamer it represents. Switch to the wireframe view by pressing *CTRL + G*, then click on the 3D buoy called *StrmTail A* in the model browser and press *F3* to locate it – you will be asked if you want to centre the view on this object – click *yes* and the view will change and show the location of the object by making it flash.

Next, double click on *StrmTail A* in the model browser (in the *Streamers➔ ArrayA* group) to open the data form. The buoy properties are only set for the global X direction. Because a 3D buoy cannot rotate, the drag force will therefore always act along the global X-axis. The drag specified is intended to represent only the axial drag of the truncated line. No normal drag or added mass is applied to the drag anchor, as the single clump will not correctly represent the distribution of these properties along the real streamer away from the tow vessel. If these effects are

important, for example if the array is turning, then the streamers would need to be fully included in the model as lines, rather than using the 3D buoy simplification described here.

The motion of the whole system through the water can be modelled within OrcaFlex in two ways. The vessel can be given a constant forward velocity; however this means that the system origins are constantly moving in relation to the global origin. Also, the system will keep moving out of the view window.

To help deal with this, it is possible to lock the view to an object (rather than to global), if you wish. Opening the *edit view parameters* data form (shortcut *Ctrl+W*), you have the option to select what the view is *relative to* (choosing from either global or any vessel, 6D buoy or shape object in the model).



Alternatively, as the system is moving in a straight line, we can achieve the same effect by holding the system stationary and applying a current. This is the method applied here. It should be noted that the OrcaFlex default RAO data has been used, which is not appropriate for a tow vessel. In production models, it would be expected that the real vessel RAO data would be supplied and used for analysis.

## Results

Go to the default view, *Ctrl+T*, and view the simulation replay. Look in elevation view (*Ctrl+E*), as well as plan view (*Ctrl+P*).

Zoom in to look closely at the motion of the diverter. Note that you can zoom in to a certain area of the model view by holding down the *Alt* key and dragging a box around the area of interest.

The workspace file *I01 Streamer array results.wrk* plots time histories of the lift, drag and incidence angle for the diverter wing. Note how the lift is far greater than the drag and that the incidence angle only varies by approximately 2.5°.