Maltese Falcon

Towing tank experiments

This report summarises the Maltese Falcon towing tank experiments. It complements the graduation thesis of Daan Geldermans, which includes a research on the Maltese Falcon as a case ship. Photographs of all Maltese Falcon configurations are presented, as well as all procedures regarding the alignment of the model and calibration of the towing tank components.

Photo credit: Onne van der Wal

December, 2018

I want to thank all the people working at the Delft Hydromechanics laboratory, ‘the towing tank section’. A special thanks to Wick Hillige, Jasper Den Ouden and Jennifer Rodrigues Monteiro, who supported me every day of the experiment.

Daan Geldermans

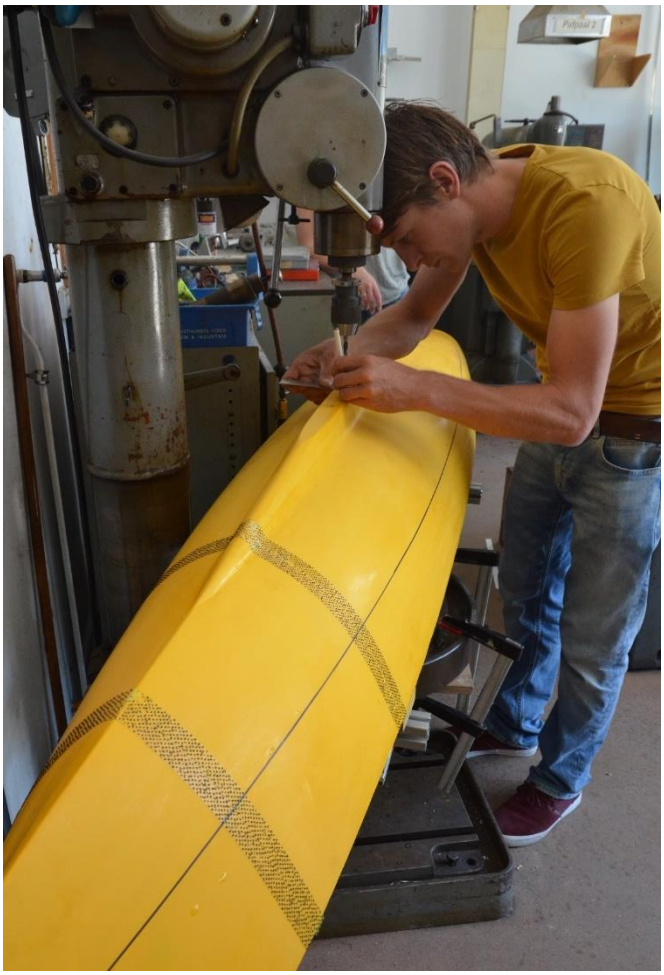
Preparing the model

The Maltese Falcon model was built in 2002 by the Delft Hydromechanics Laboratory and looked like can be seen in the picture below.

The old turbulence strips were removed and the model was sanded to create a smooth surface. Afterwards, the model was painted yellow. The standard colour for the models in the Delft Hydromechanics Laboratory is yellow, to create a clear contrast with the water. After the last layer of paint, Scotch Brite was used to create a rougher surface. Then, the waterline was applied with a permanent marker. The pictures below shows the model in configuration 4.

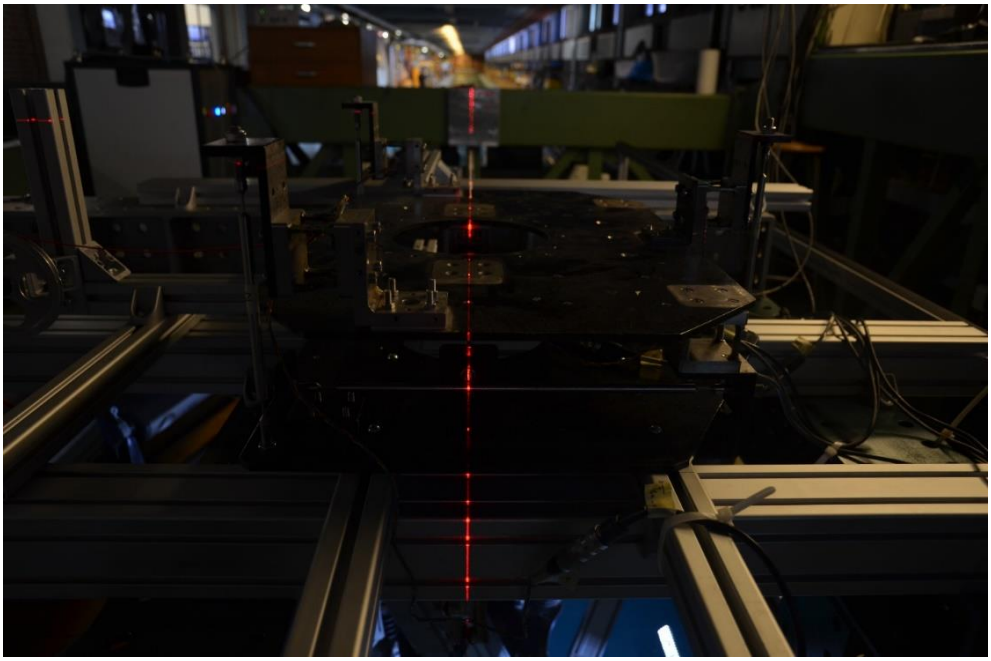
New turbulence strips were made and applied on the hull of the model.

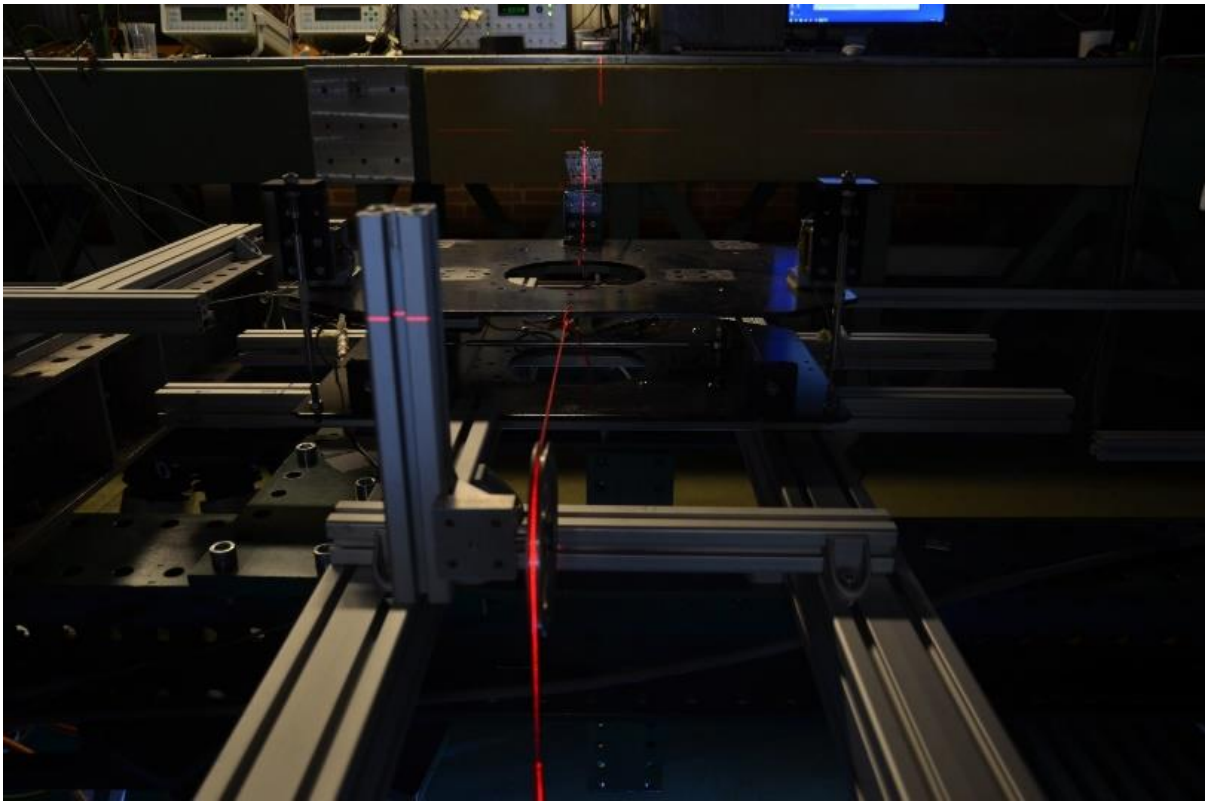
New holes were made to attach the appendages.

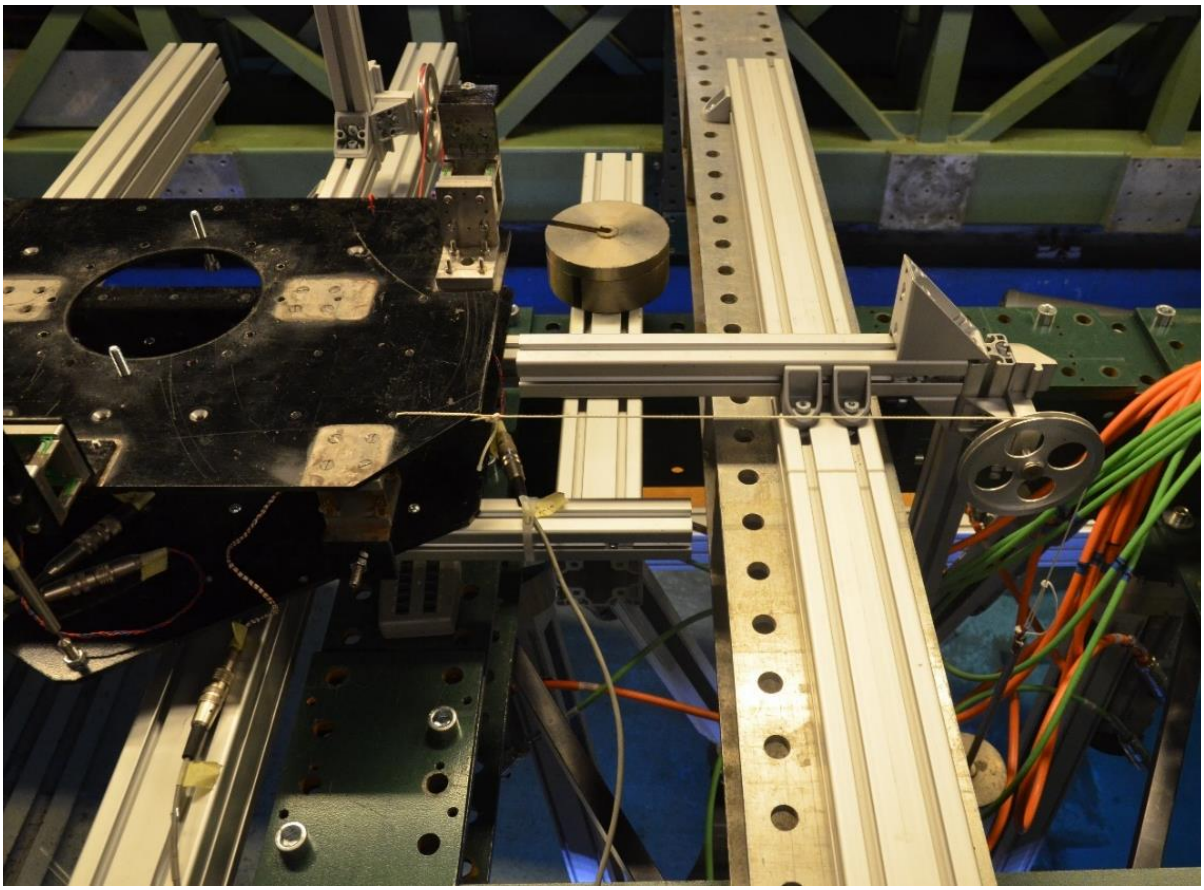


Calibrating the 6DOF frame

While the model was being prepared, the 6DOF frame was calibrated. The force tranduces were already calibrated individually, by Rep Boonstra. Now, the combination of all six foce transducers mounted on the 6DOF frame were calibrated. Forces in sheer X-, Y- and Z-direction were applied to asses the measurement error of the frame. This was done by carefully building a setup with pulley blocks, being able to use weights to increase the force pulling in a certain direction. The laser was used to precisely apply the force in the X- or Y-direction. It can be seen that the laser exactly covers the string on which the weights will be attached. The forces in Z-direction will be measured by simply putting weights on top of the frame.

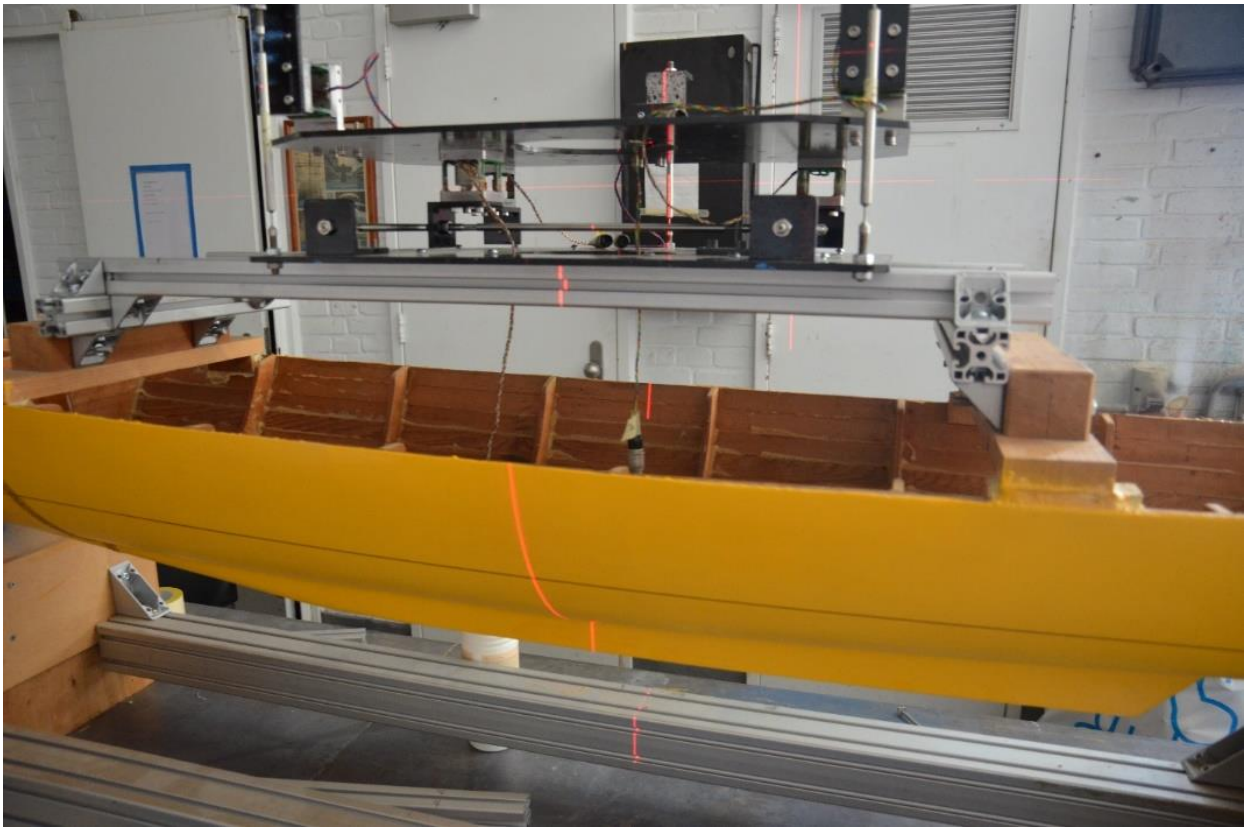


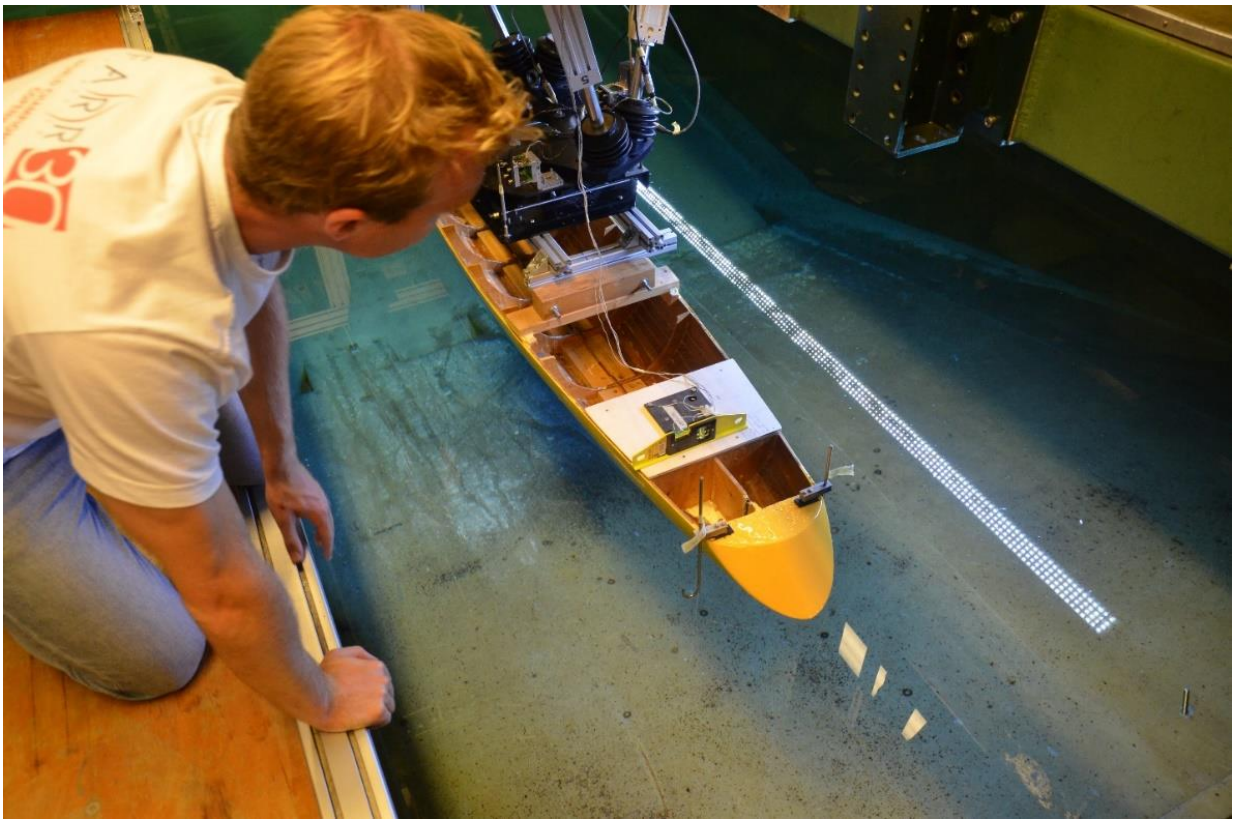




Aligning the model

First the two longitudinal bars of the model frame were positioned precisely parallel to the waterline. Then, the 6DOF frame was aligned exactly above the LCB of the model. Before the model was put in the water, the waterline pointers (or so called ‘hooks’) were positioned at the waterline. These can be seen on the second picture, at the aft of the model. The waterline pointers were used at the start of every day, to check if the model was laying precisely on the waterline. Another daily procedure was measuring the height and the temperature of the water in the towing tank.



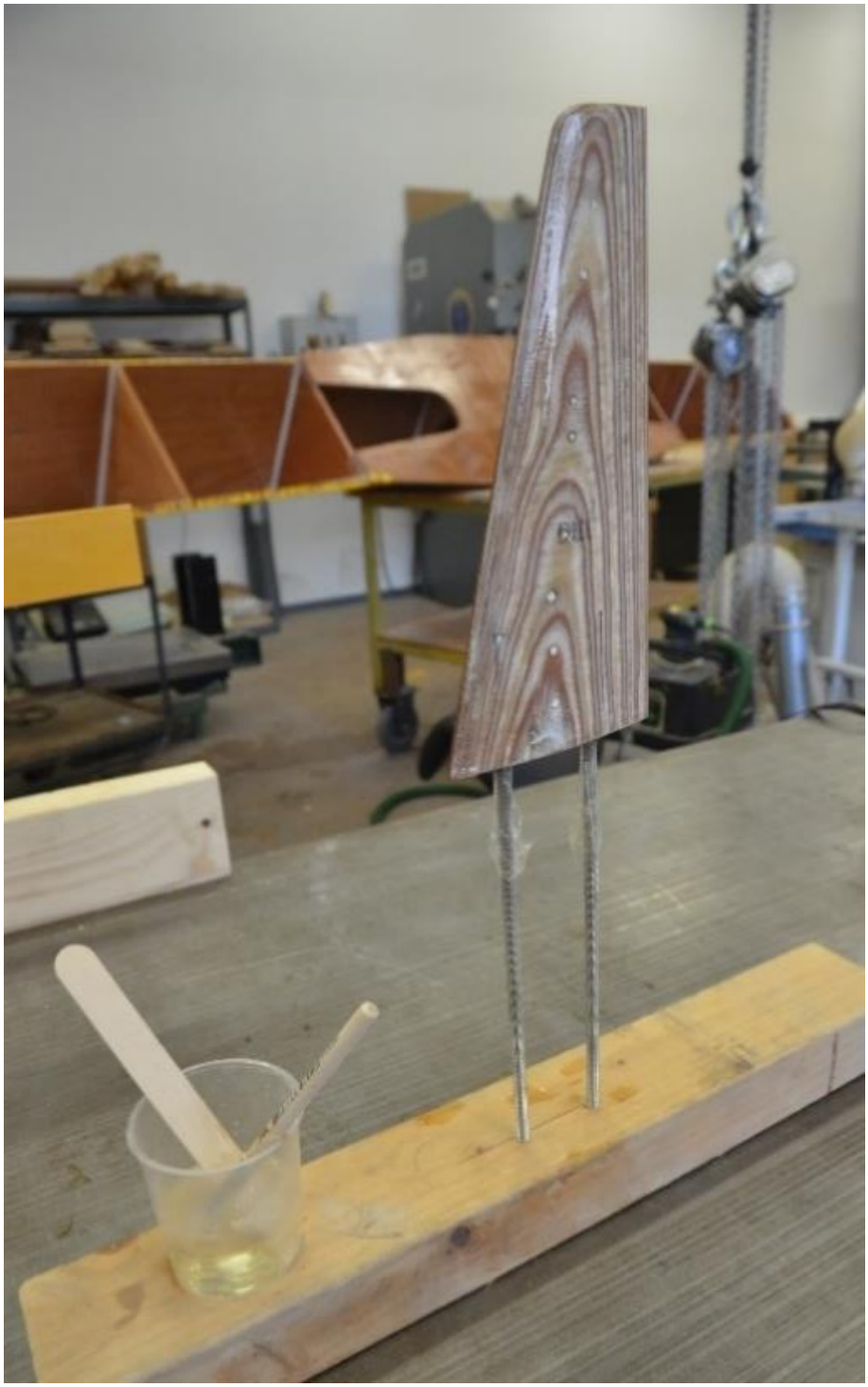


At first, a total mass of 20kg was placed at the bottom of the model. But, it soon became clear that the model was quite shaky during the runs. The standard deviations measured by all force transducers confirmed this, when it was compared to several runs with no added ballast. So, it was decided to start the experimental runs with no added ballast in the model.

The appendages

A new keel and two new centre boards were constructed. Jasper den Ouden made these from slices of wood, cut out by a laser cutting machine.

CB2



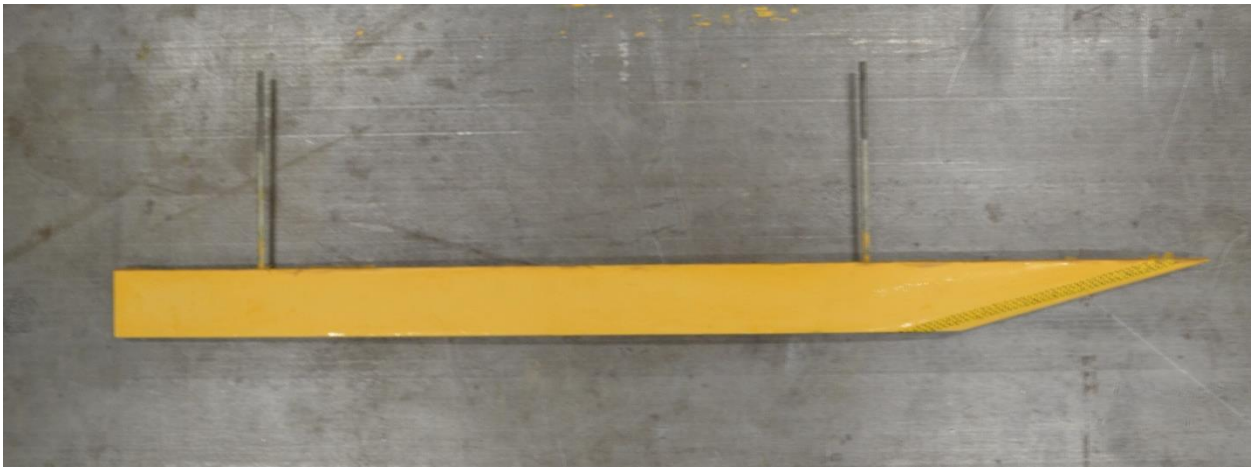
Keel2

CB2

Keel2

CB1 and CB2

Keel2



Aligning the appendages

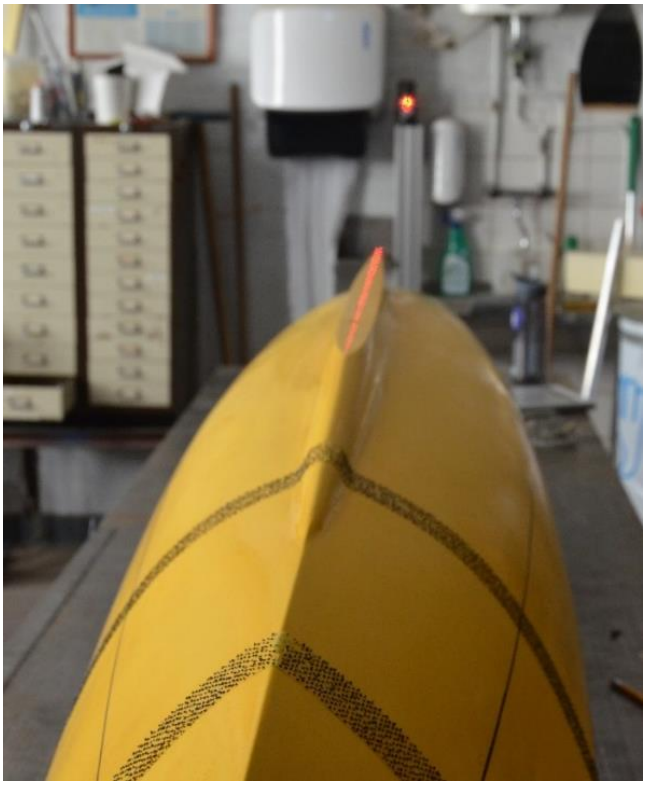
Each time an appendage was added or removed to change configuration, the same procedure was followed.

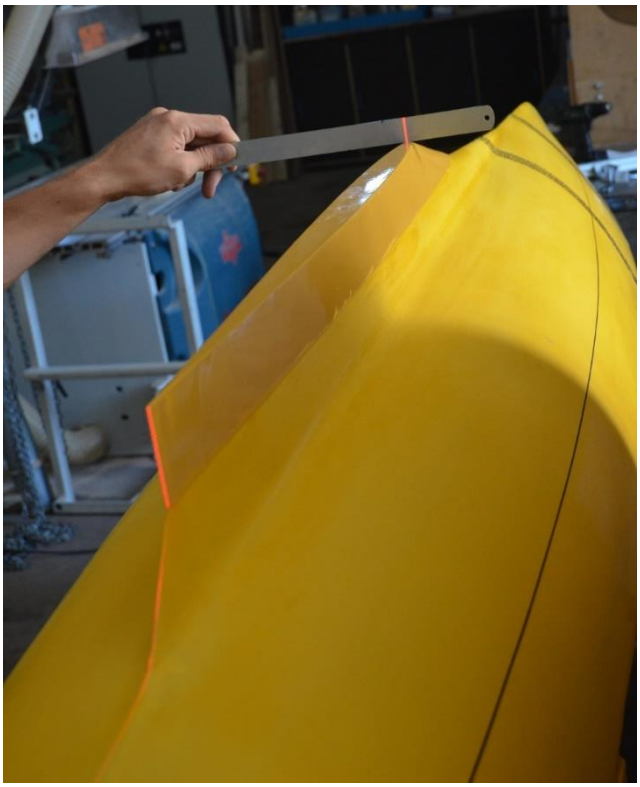
Step 1

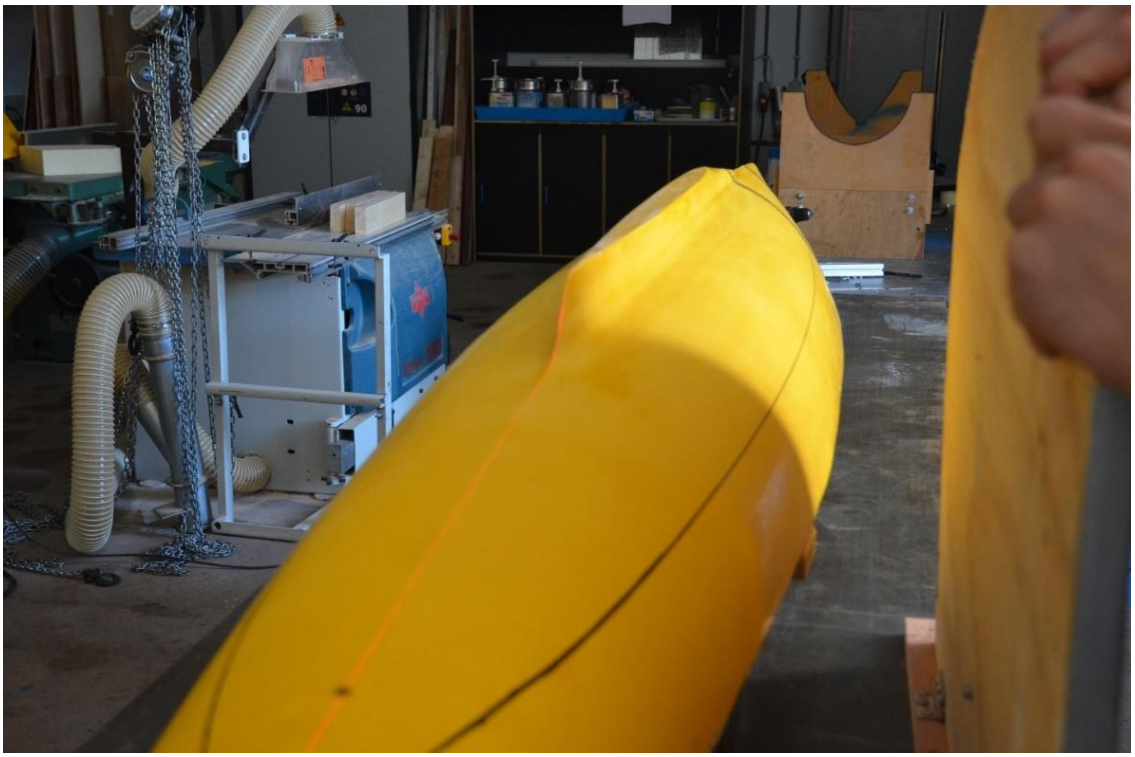
Aligning the laser with the working table, such that the laser is perfectly in the middle at both ends.

Step 2

Aligning the model to the laser. The two main markers were the trailing edge and the leading edge of the keel.





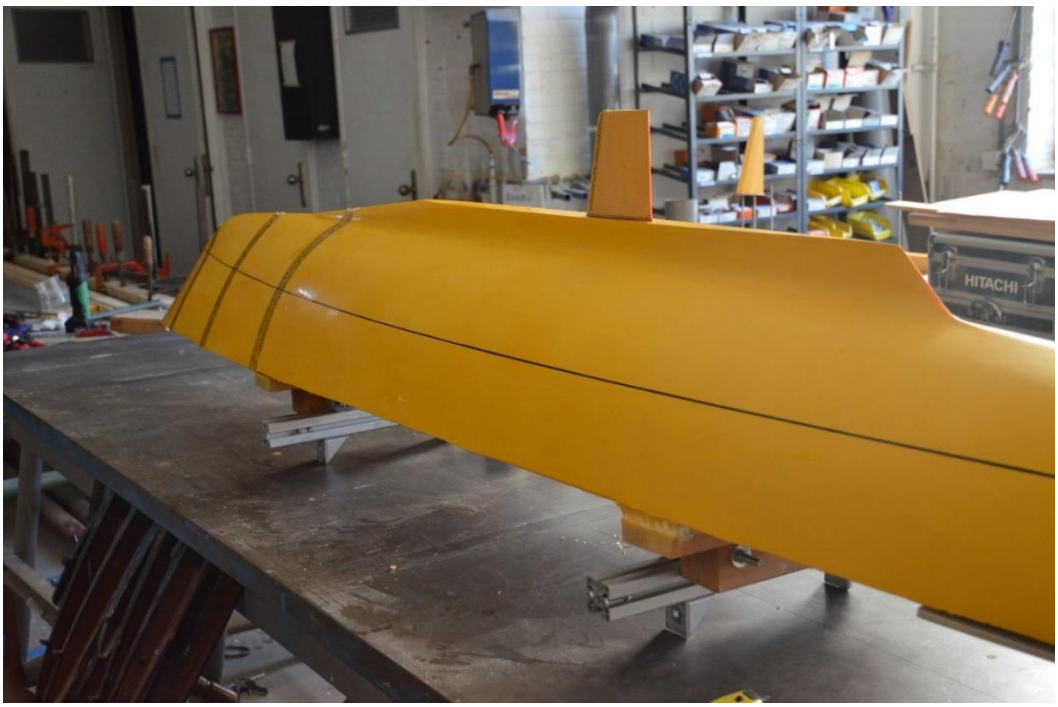


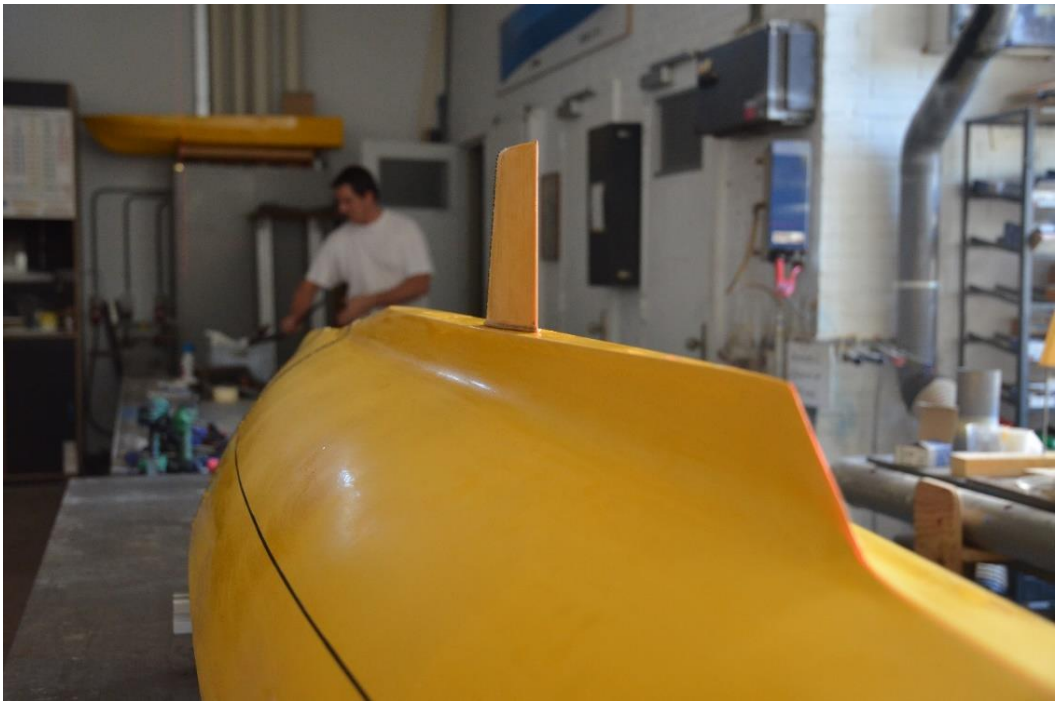
Step 3

The last step is adding the appendage and aligning it from top to bottom with the laser.

Configuration 5

Bare hull + keel1 + CB1



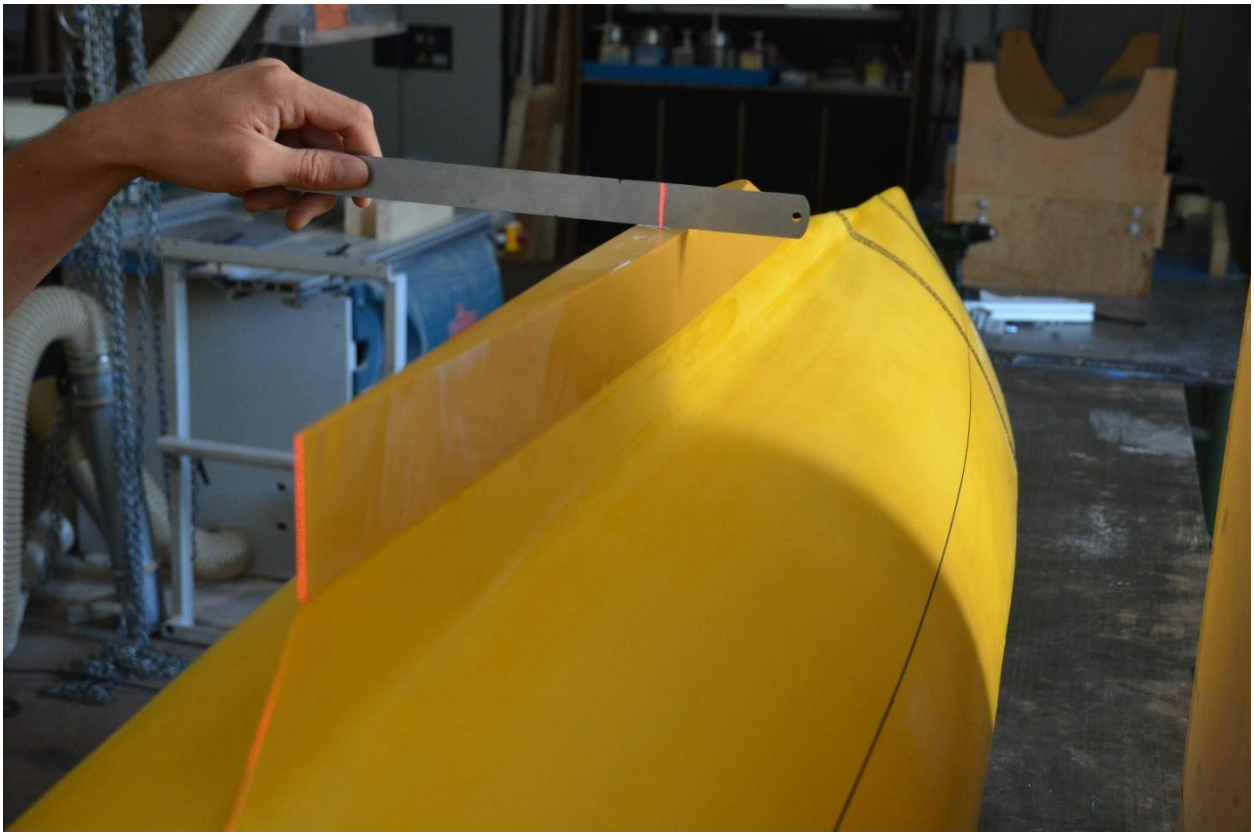


Configuration 6

Bare hull + keel1 + CB2

Configuration 7

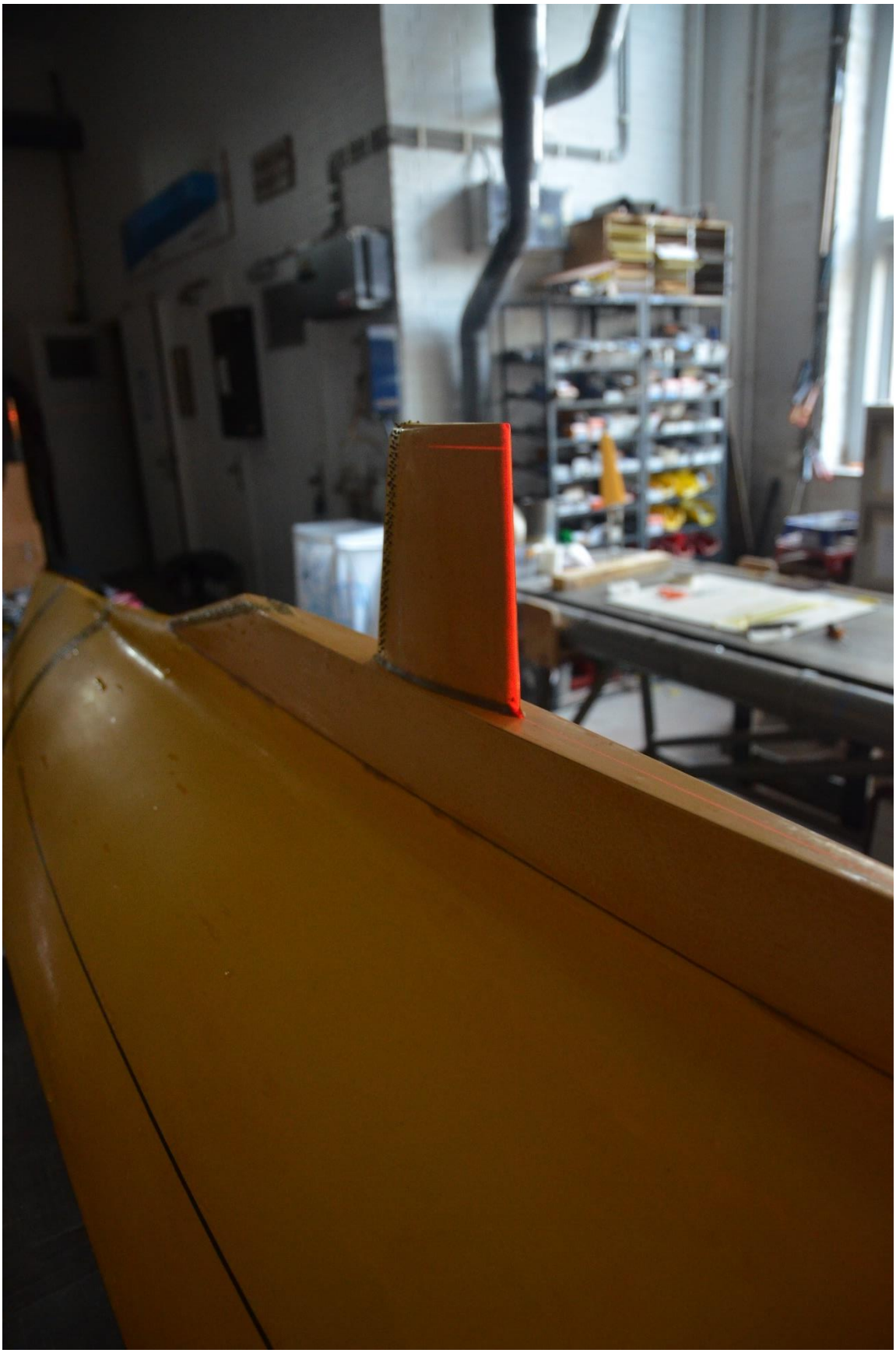
Bare hull + keel1 + keel2

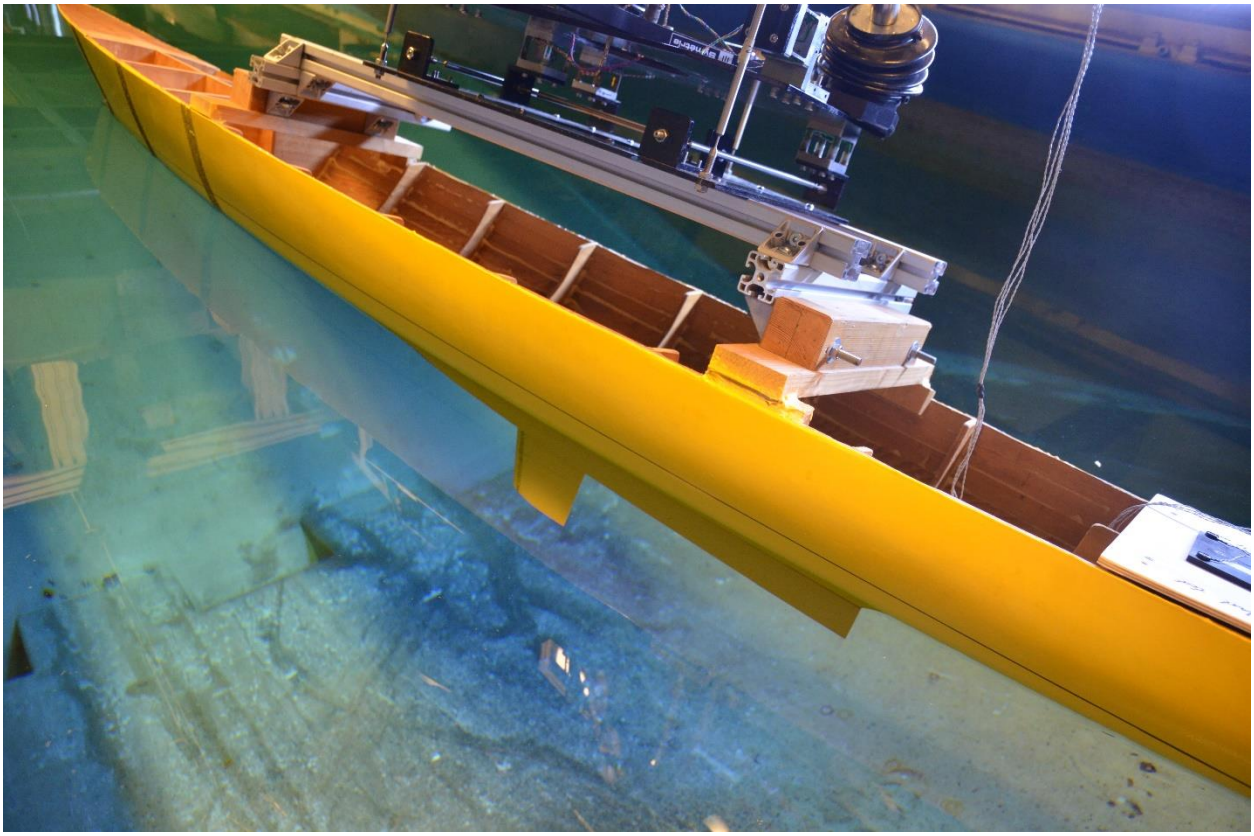


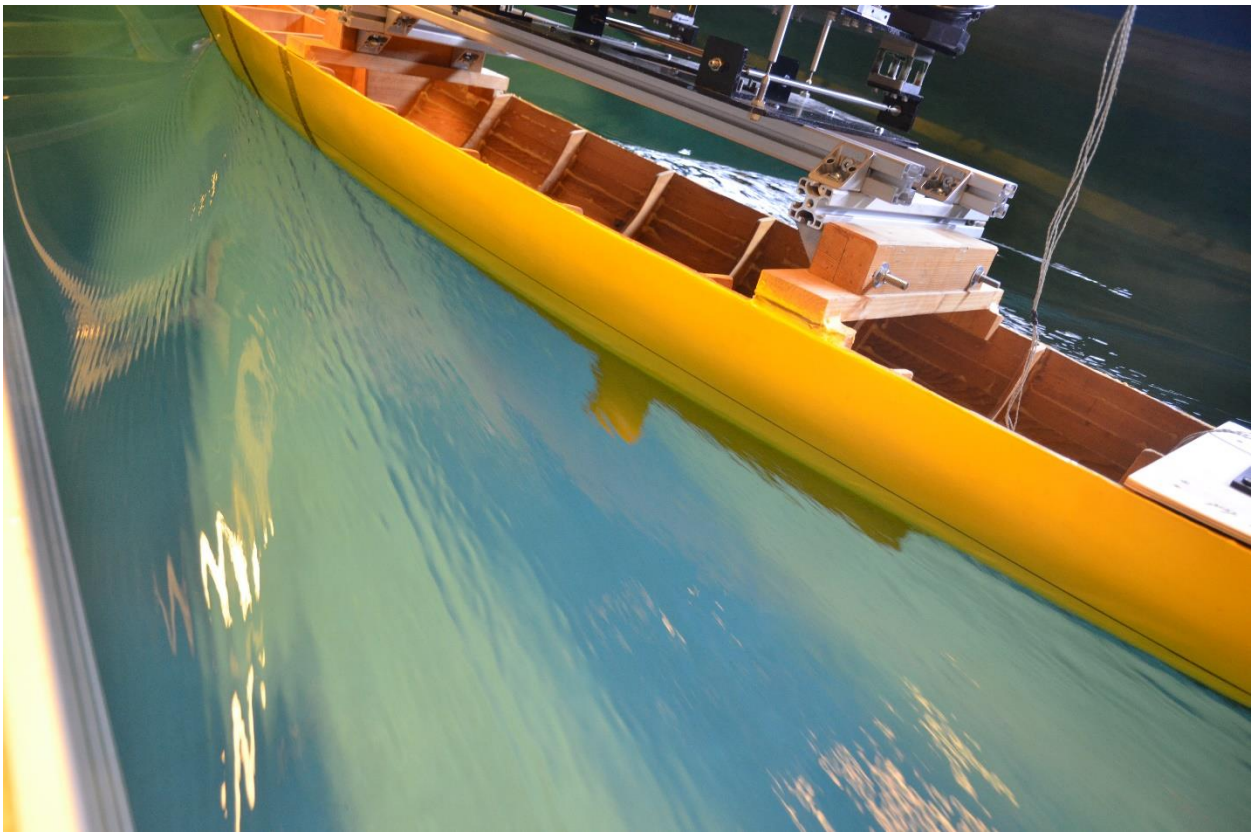
TUDelft
PUSH

Configuration 8

Bare hull + keel1 + keel2 + CB1

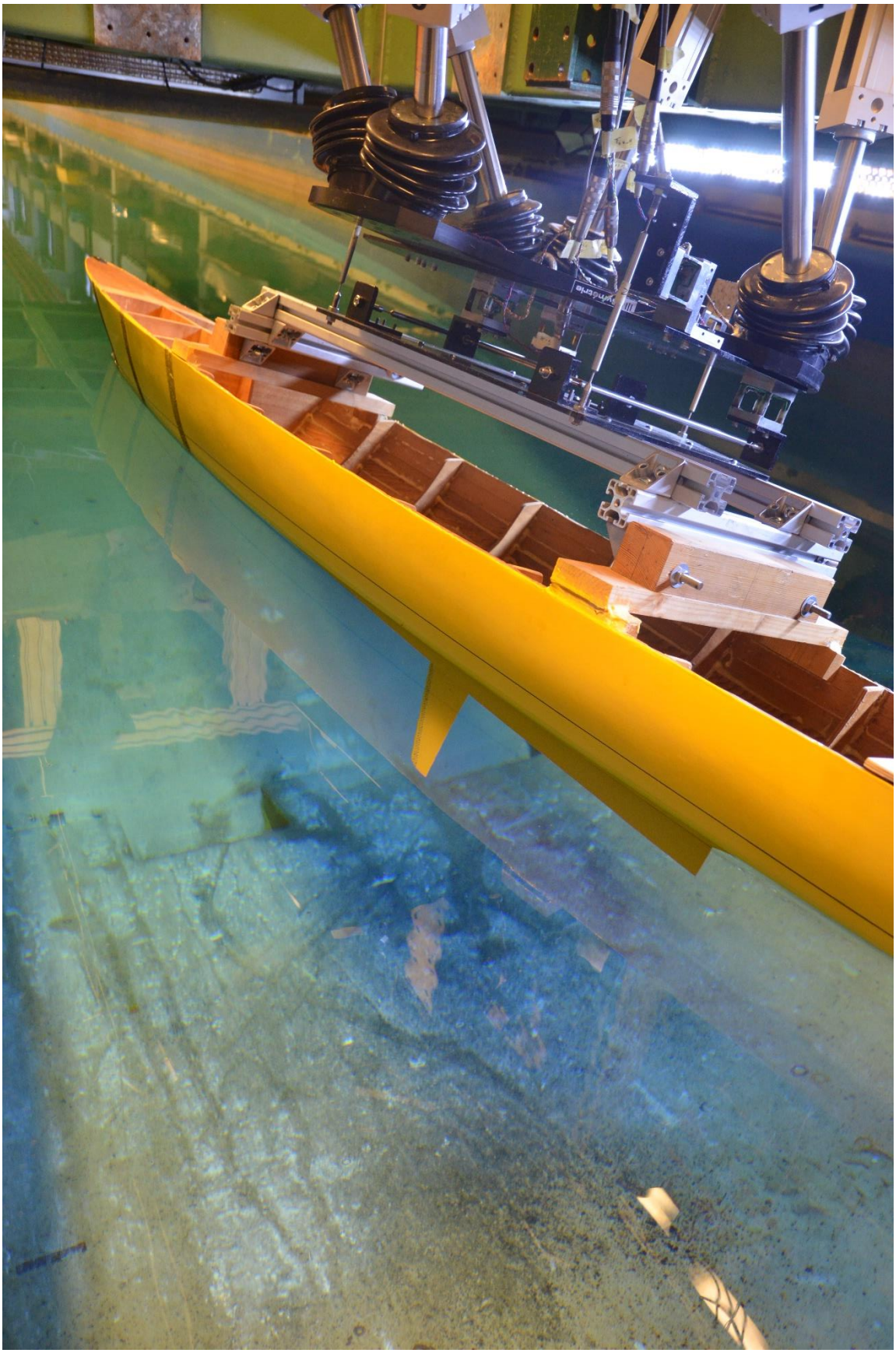






Configuration 9

Bare hull + keel1 + keel2 + CB2



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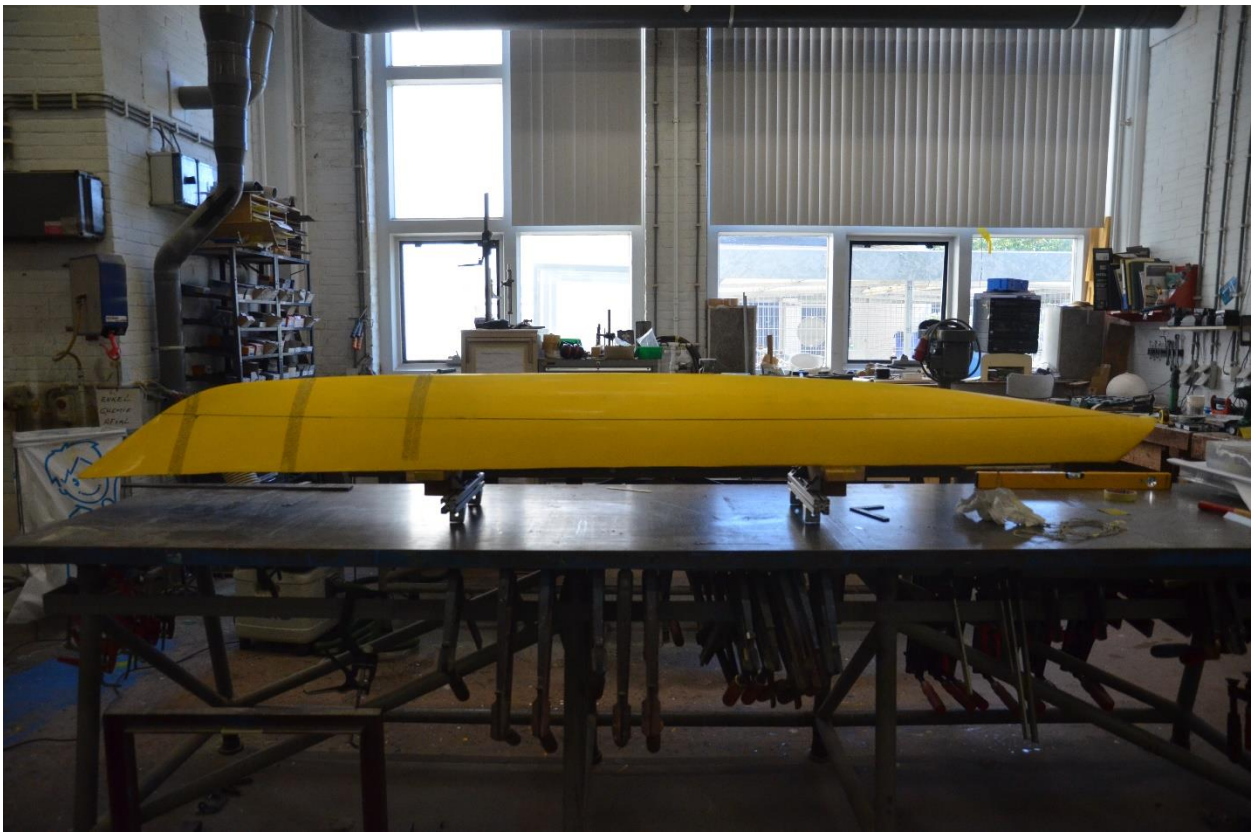
Configuration 1

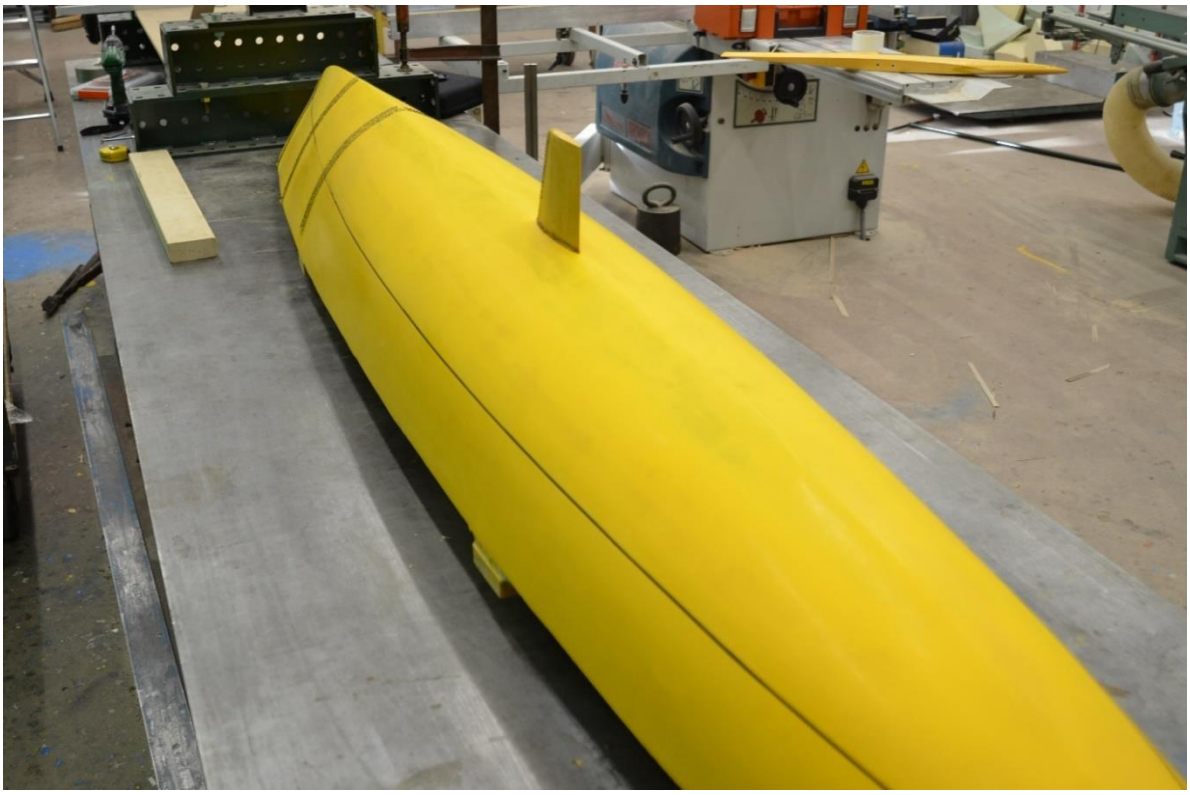
Bare hull

After all runs with keel1 and keel2 had been done, keel1 was removed from the model to create the bare hull configuration.



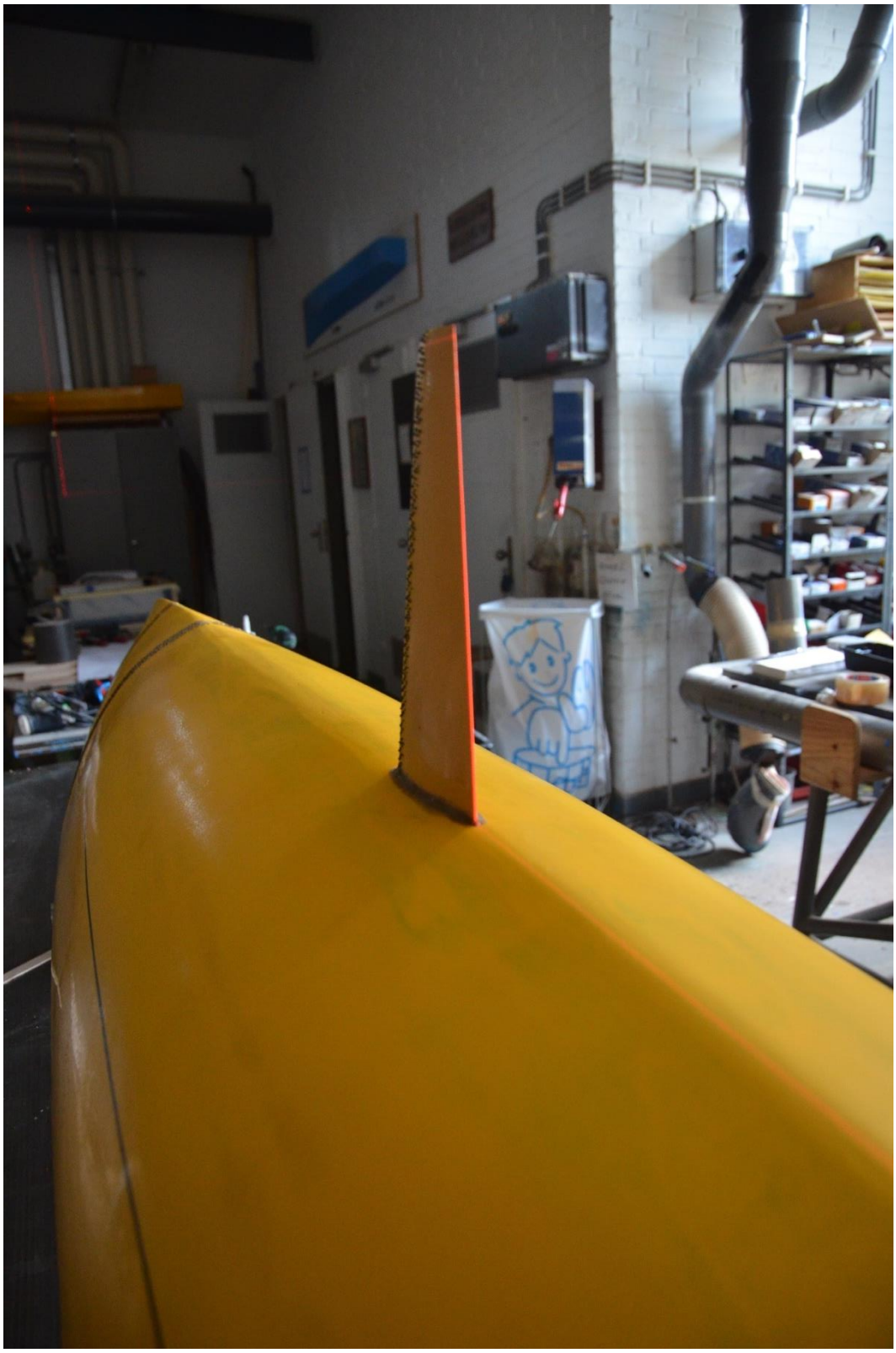
Configuration 2

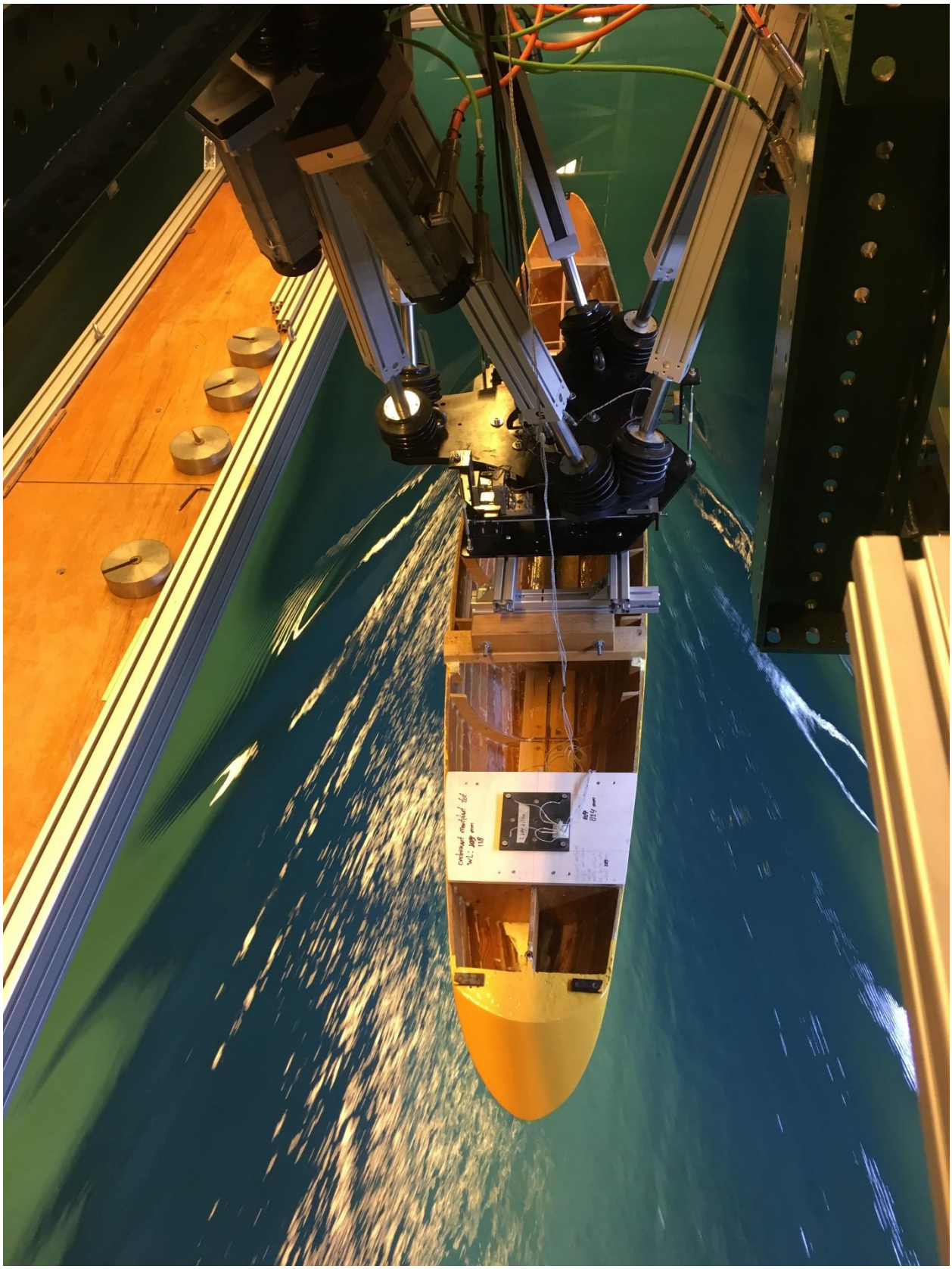
Bare hull + CB1



Configuration 3

Bare hull + CB2





Farewell