

## How to operate the towing wagon in MC-lab:

This paper will briefly describe how to operate the towing wagon, for towing purposes, in the MC-lab. In figure 1, a picture of the towing wagon is presented.

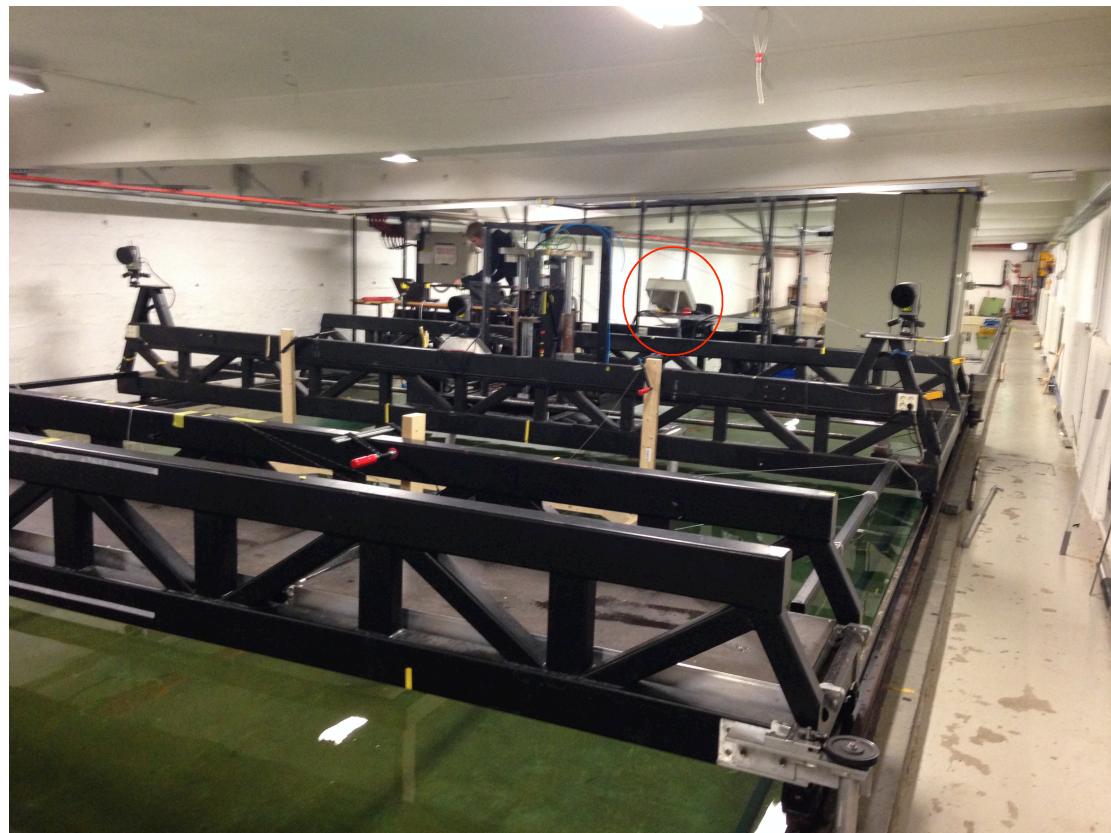


Figure 1: Towing wagon in the MC-lab. Control of the wagon is done using the computer marked in red.

Control of the wagon is done on board; see the red circle in figure 1. For our purposes, to perform towing tests of CS Enterprise 1, only a certain computer

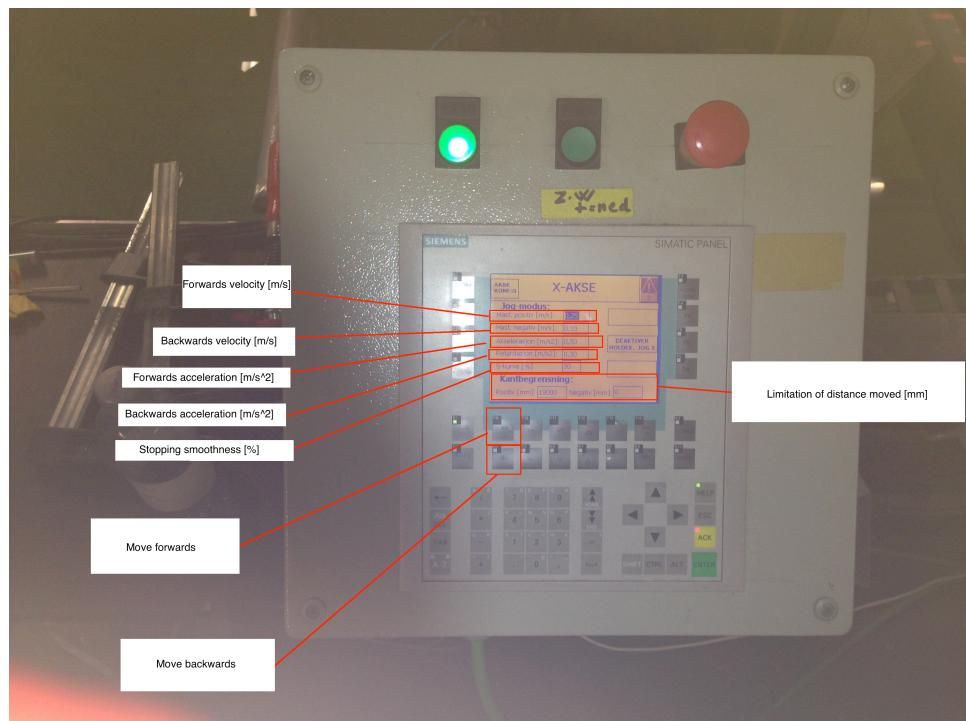


Figure 2: Computer to operate the towing wagon

commands are used. Further, in figure 2, a close up of the computer is shown. An explanation of the different commands, used for our purposes, is presented below.

### **Movement of towing wagon:**

The towing wagon can be moved approximately 20 meters in total. The end is located closest to the MC-laboratory.

- Move forwards: Press the button marked as *move forwards* (see figure 2).
- Move backwards: Press the button marked *move backwards*.
- Stop: If forwards, press backwards button. If backwards, press forwards button.

In both forwards and backwards direction, the velocity can be set between 0 m/s and 2 m/s. In addition, the acceleration can be changed between 0 and 0.5 m/s<sup>2</sup>. How aggressive the wagon is stopping can be regulated to a value between 0 % and 100 %, where 100 % is the most aggressive.

Moreover, it is possible to limit the distance covered by the wagon. Consequently, it can be stopped before it reaches the end of the basin. This is necessary for example when the wagon has a high velocity. The limit can be set between 0 mm and 20 000 mm.

### **Typical settings:**

For a typical towing run, the wagon has a velocity in forwards and backwards between 0 m/s and 1 m/s, depending on the towed object. The acceleration is set to 0.3 m/s<sup>2</sup>. The stopping smoothness is set to 30 %. Finally, the distance for the wagon to cover is between 0 mm and 19 000 mm.

### **NOTE:**

When the wagon is moving, no one is allowed to move on the sides of the basin.