water, the marker without fins worked much better. However, It did not move ideally as it still drifted some. To read more about the placement of the markers with their holders, see Section 7.4.

7.3 Tool plate

In the old design the battery box which sticks out from the main hull is visible, see the ~~figure~~ 5. The new design has a bigger tool plate ~~and makes the~~ that encloses the battery box ~~invisible~~, see ~~figure~~ 11 below, ~~and~~ there are room for two markers, gripper, pneumatic box, temperature and pressure sensor.

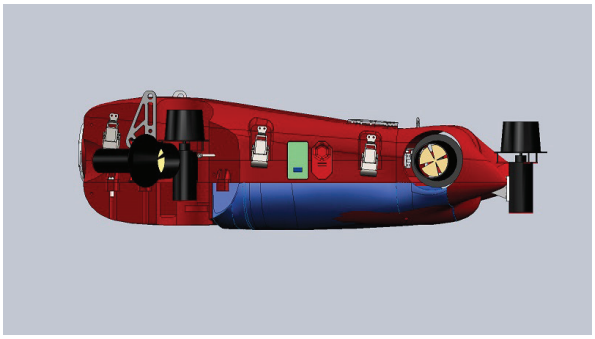

Figure 11: The new toolplate make battery box invisible

The redesigning of tool plate was dependent on the gripper and pneumatic design ~~and~~ since it was decided to make a new ~~advance~~ gripper ~~which meant that~~ than the suggested one ~~would not be used~~ and ~~since the~~ this new gripped didn't have a design ~~therefor~~ it was difficult to redesign and manufacture the tool plate.

The solution was to make a modular design which are independent of the equipment's design.

The new design is a plate with many holes which will be attached to the main hull and to this plate different boxes ~~will~~ can be attached by screws. The tool plate ~~are then~~ have been divided into several parts each equipment have it's own part.

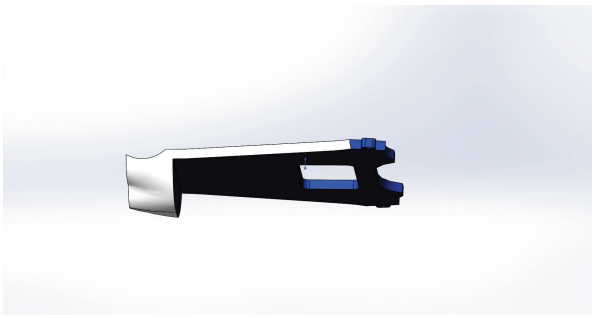

Figure 12: The new design of a modular tool plate

7.3.1 Pneumatics

In the beginning it was decided to use pneumatic system to operate the markers, the torpedoes and the gripper. But since a thesis will be made to build a new gripper which may not use pneumatic system to operate ~~therefor it's~~ it was suggested that the marker and the torpedo could use solenoids instead.

which is much less complicated. Therefor ~~a research will be made to find~~ if the torpedoes could work with solenoid instead. ~~The only~~ thing that could cause a problem using solenoid to operate torpedoes is the space in the front tool plate.

7.3.2 Sensors

Naiad will also be equipped with one pressure sensor and one temperature sensor. Both sensors will be placed in the ~~behind~~ of the tool plate~~, which the only place where they can be placed~~. ~~The design of the place w~~here the sensors will be attach to are not designed yet. ~~But~~ since Naiad ~~will~~ use a modular tool plate, a box will be designed were both sensors will be attached ~~inside and~~ the box will be then screwed to the tool plate.

7.3.3 Markers

~~The placement of the markers should be so that one can have vision over the path of markers. Therefore they should be placed near a camera.~~ ~~T~~here are two cameras, one facing forward and one facing downwards. As the markers are supposed to fall downwards, this leaves one camera to place the markers near. They can be placed in front of or behind the bottom camera housing. The markers are placed between the front tool plate and the bottom camera housing. This space is limited, but as the back of the tool plate is crowded this placement seemed like a ~~better~~ choice.

7.4 Markers

The placement of the markers should be so that one can have vision over the path of the markers. Therefore they should be placed near a camera. There are two camera systems, one facing forward and one facing downwards. As the markers are supposed to fall downwards, this leaves one camera system to place the markers near. They can be placed in front of or behind the bottom camera housing. The markers are placed between the front tool plate and the bottom camera housing. This space is limited, but as the back of the tool plate is crowded this placement seemed like a better choice.

7.5 Front tool plate

Different prototypes were designed to select one final improved design of front tool plate. The idea was to make a simple design which will have all the requirement and at the same time possible and easy to mill. The requirement was to make room for four highlight LEDs, two torpedoes and one sonar, the design should be modifiable and at the same time easy to mill.

Naiad needed to be submersible and the first front tool plate was redesigned and manufactured to make Naiad submersible for the testes. Since this part was temporary and only needed for the testes, it had to be cheap manufactured, that's why this part was divide into 8 parts to make it possible to use the waste materials, which was for free, see the figure 13 below.

All part where glued together and painted to make it waterproof. The design is simple, there are eight empty spaces inside front tool plate which can be used to put heavy material inside so a perfect amount of force could stabilize Naiad and make it submersible. After a few testes the total weight which stabilize Naiad, without wings and tool plated mounted, was calculated to 4.20 kg.

The second version of front tool plate was manufactured by milling as one big part and it is made by plastic. The plastic has a good heat resistance, the impact strength is high, it is high resistance to abrasion and it has 1.25 g/cc density which is much heavier than water [1].

Naiad needed highlights for both cameras, the one facing forward and the one facing to the bottom. In the beginning it was planned and designed that the highlight for the front camera should be placed in the main hull. But since the LEDs using for highlights is getting really hot and needed a cooling system which was difficult to provide in the main hull where all the electronic are placed, therefore the highlight were moved to be placed in the front tool plate instead which was the only place for highlight