K-141 Kursk (by Ceravyn)
v2.0 DiveKit

Assembly instructions

Printed parts required

v_20_Front_plane_pushrod 1pc
v_20_Hull_bow 1pc
v_20_Hull_main (or split parts of v20_Hull_Main) 1pc
v_20_Motormount_bow 1pc
v_20_Plunger_nutholder 1pc
v_20_Plunger_nutholder_plate 1pc
v_20_Plungershaft_joint (optional) 1pc
v_20_Syringes_holder 1pc

Non-printed parts required

30ml medical syringe 2pcs
M5 threaded rod 95mm 1pc
M5 nut 1pc
M3 screw 2pcs
M3 nut 2pcs
DC motor 1pc
Small diameter hose approx. 30mm 2pcs
Small diameter tube approx. 10mm 2pcs

Tools recommended

Hobby knife (to trim the syringe plungers)
Glue
Drill (to ream the holes to their correct diameter)
Small zip-ties (to securely connect the water intake hoses to the syringes)

Before assembling

Assemble the hull temporarely with tape or hot glue, try to get it as watertight as possible but don't use strong glues as we're taking it apart later again. Use grease or hot glue to also seal all the holes temporarely. Leave maintenance hatches open.

Drop all the rest of the parts inside the hull if you don't want to go into trouble of assembling them into their places yet. **Don't attach any electronics yet.**

Weight the hull with all the parts (planes, tower, props) inside to get as accurate weight of the fully assembled hull as possible. Write this down.

Weight your electronics separately and write their total weight down as well.

Find a bucket of water large enough you can test the buyoancy of the submarine. Put the hull of the sub **without electronics** on the water, it should float nicely.

Now start adding weight from the maintenance hatches equally to the front and rear so you'll be able to keep the balance. Coins or similar are very good for this. Continue adding weight one coin at a time until you reach the point where the submarine sinks. Rescue the poor shipwreck from the bottom of the bucket and empty it from the coins and weight them. Write this down.

Now a lil bit of the math:

The ballast of this DiveKit is 60ml in total. 60ml of water weights approx. 60 grams. Therefore we need to ballast the submarine so that once you add that extra weight it will dive.

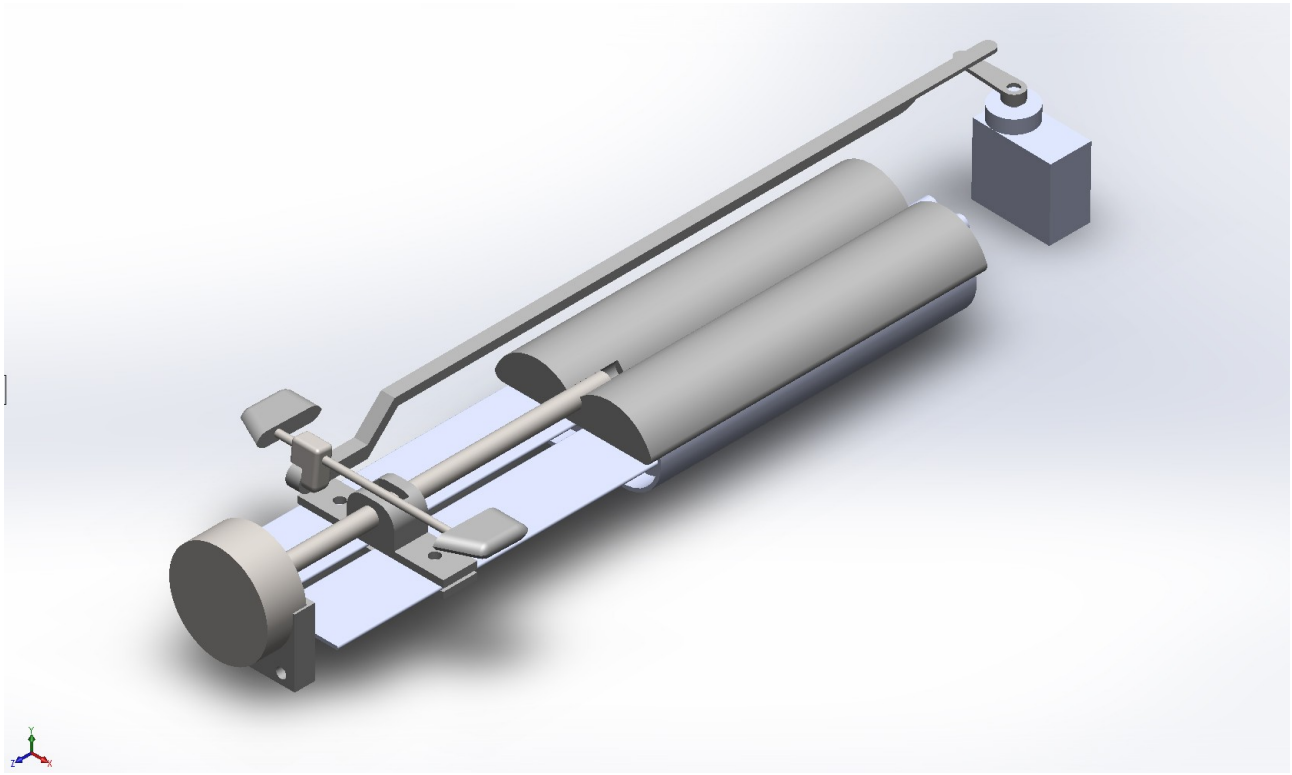
Hull weight + coins used = sinking point

Sinking point – hull weight – electronics weight – ballast (40-50g) = weight you need to add to reach the diving point.

The less weight required in ballasts obviously means the easier the submarine will dive as the ballast doesn't need to be filled fully. It also makes the submarine dive deeper when you can add weight way over the sinking point. However, it also makes the sub swim deeper on the surface and risks unintended dive in case you take even small amount of water in. I found the comfortable ballast weight between 40-50g.

With these calculations done, you can move on to actually assembling the sub.

Main assembly



1. Insert the syringes into the holder part aligning the intake of the syringes approx. To the middle to allow shortest possible hose to the bottom of the main hull without too steep angles that would probably collapse the hose and block water from flowing, fix them securely to place with glue or tape.

2. Secure the M5 threaded rod to the DC motor shaft with 2mm to 5mm joint and glue (or even better, with screws).

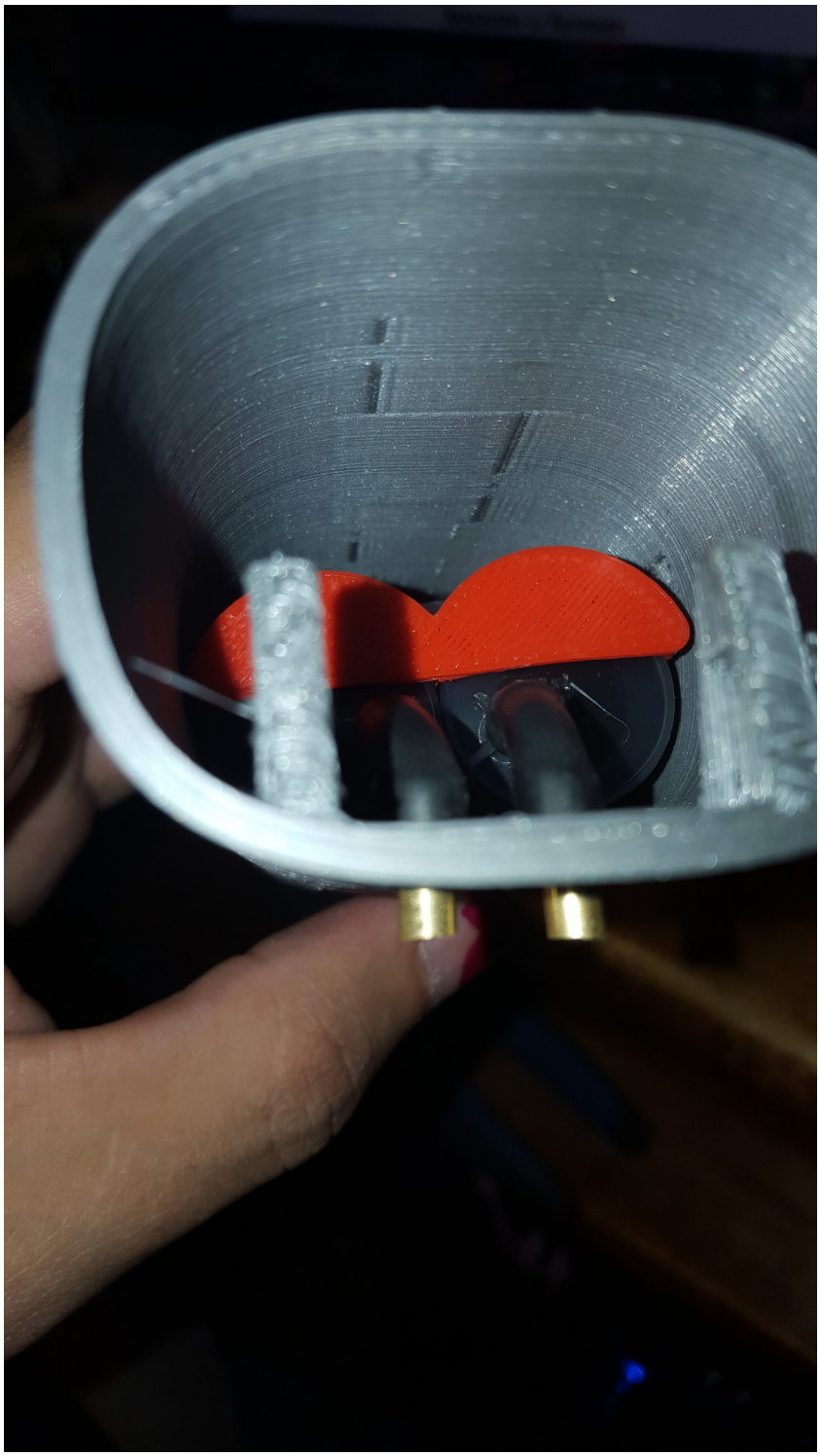
3. Trim the plungers. these usually have 4 supporting walls to counter bending as well as circle shaped end you can push with fingers. You need to remove the end piece, one of the walls completely from the top of the plunger to allow it to pass the syringe holder properly, and opposite one partly to allow nutholder to be screwed to the end of the plunger. See pictures below.

4. Screw holes for the plunger nutholder and secure it to the place with its counterpart and M3 screws.

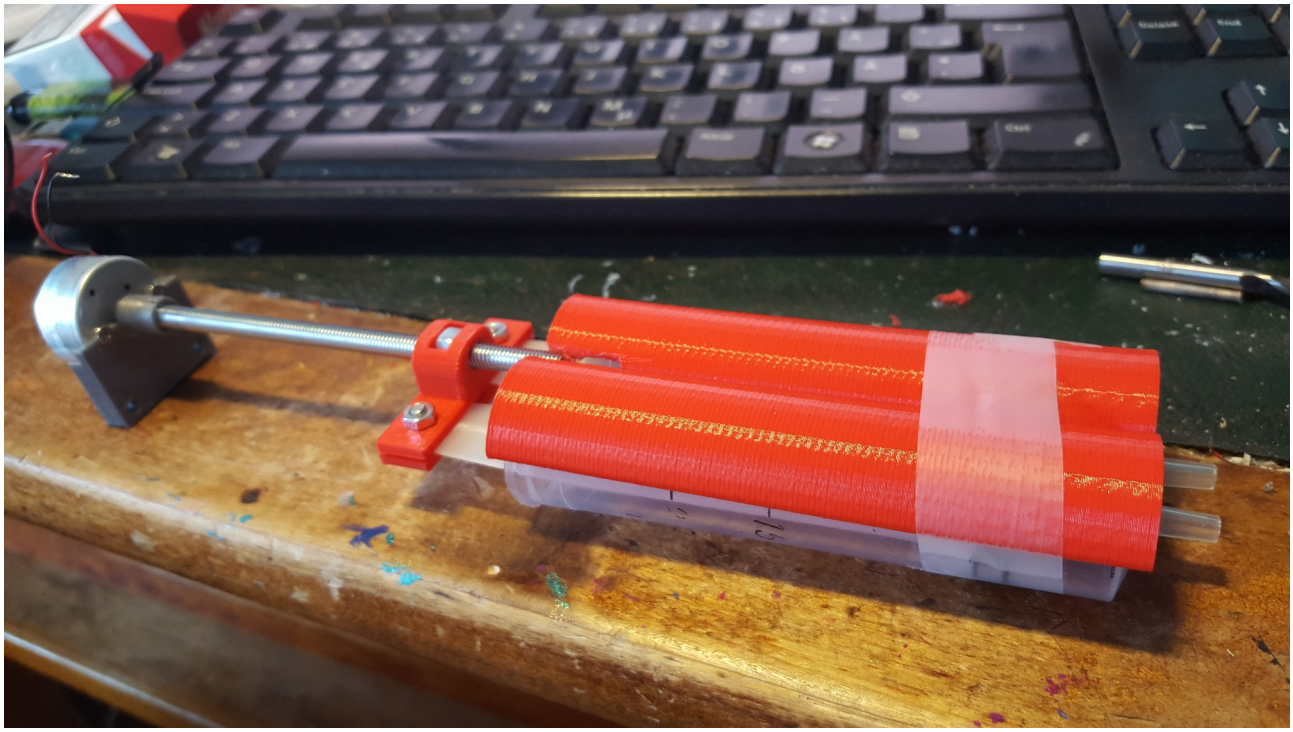
5. Move the front plane connecting joint to the side to allow more space on top of the syringe assembly to fit battery. Connect to the servo with v2.0 pushrod.

Next, Insert the water intake hoses into the syringes and fix the syringes inside the main hull between the two holder walls on the bottom of the hull. Secure with glue.

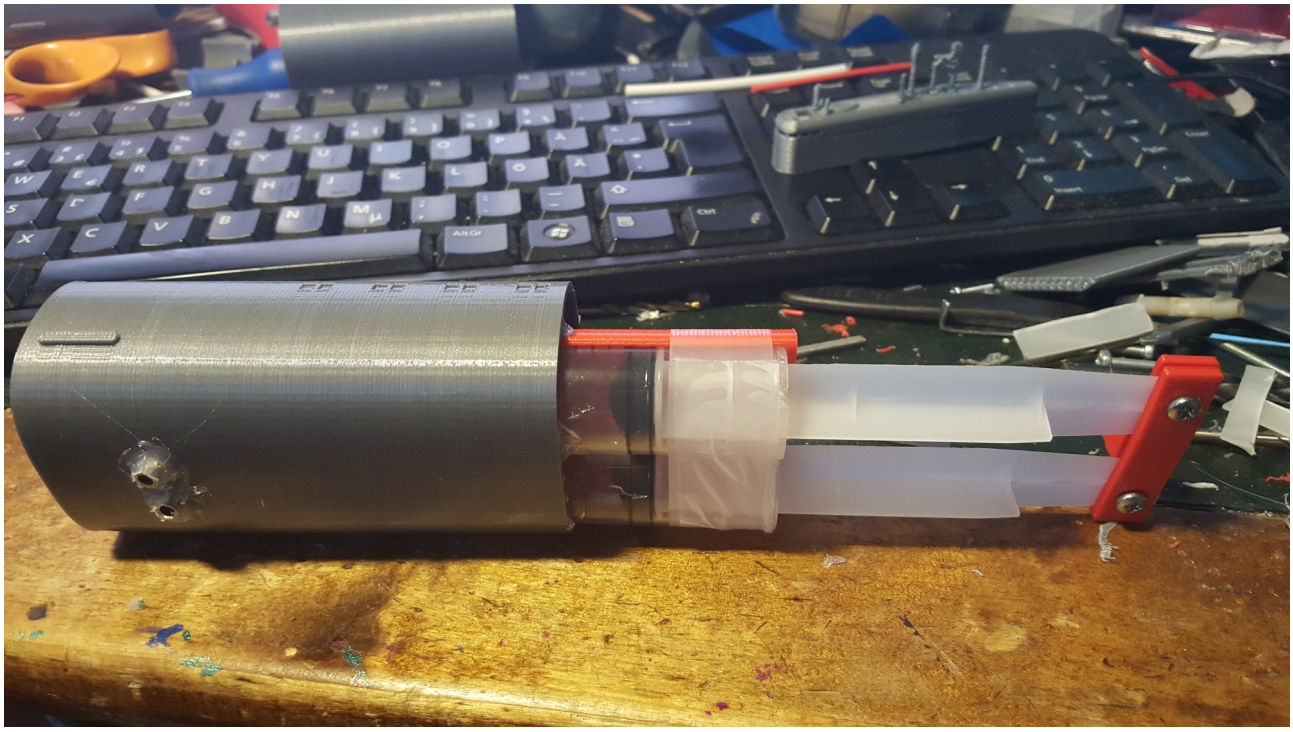
Insert two small tubes to the holes in the bottom of the hull and connect the syringe hoses to these. Secure with glue and pay attention to sealing the gaps so that water cannot leak through the sides.



After the syringes are in place, attach the motor with its mount to the bow section. Make sure the motor wires are long enough to reach your controller and connect the M5 threaded rod to the plungers through front hull. Assemble rest of the hull.



Complete DiveKit on table for testing.



DiveKit attached to the rear split of the main hull. Note the trimmed plungers.

Finishing touches

At this point you should have the whole submarine assembled with DiveKit inside and connected to the electronics. Carefully seal all the gaps and possible leakage points from the hull, but leave the maintenance hatches unsealed for now.

Take out your calculations from the first step. You can also weight the entire assembly now with all the electronics inside and compare that it fits into your previous calculations. (of course within some error margin since you have added glue and possibly other materials)

Since you know the extra weight you need to bring the submarine down, add some coins or similar inside the hull again to bring the total weight of the assembly just below 40-50g from the sinking point as mentioned above.

Seal the maintenance hatches that should be the last possible leakage point in your hull. Use hot glue or similar on the seams to ensure no water can get inside the hull.

Now you are ready to try the system. Place the submarine into water, fill the ballast and watch the submarine dive. Empty the ballast and, given your calculations for the weight are correct, it should surface.

To further improve the quality and safety of this build, you can paint the whole hull with plastidip or similar thick paint to further improve the waterproofing with the loss of some details.

Dive! Dive! Dive!
You have completed the K-141 Kursk DiveKit version.
Congratulations and have fun! :)

- Ceravyn