The Squid Hunting
Solar CarouSol Kit

Cruising the ocean floor, one hunts the other through a kelp forest; the other flees.
Who... is hunting whom?

🎓 Intermediate skill level - ages 12+

☀ Solar powered (no batteries needed)

⚒ Basic soldering & tools required

⏱ 1-2 hours build time

Introduction

Inspired by Jules Verne's book "20,000 Leagues under the Sea" this kit matches a whimsical deap-sea submarine against a mysterious Giant Squid.

But as is the case when man ventures into territories unfamiliar, is he the hunter or the hunted? Hence the name of this kit is "Squid Hunting", implying that either can be viewed as the aggressor in this story.

This kit lets this question play out as a solar-powered diorama, with light powering the submarine's propulsion which spins the dueling pair around a kelp forest rich with sea-life.

We have designed the *Squid Hunting* to be a self-activating, solar-powered sculpture. Unlike other solar-powered devices, our SolarEngine™ technology allows us to extract useful energy from light levels otherwise unusable by solar cells.

In direct sunlight, activation happens in seconds. Indoors, in a location like an interior office with fluorescent fixtures, you can expect motion every 6 minutes. As long as there is sufficient light to read by, this device *still works,* activating only when it has stored enough power to create useable motion.

We hope you enjoy the little story our model tells, and have fun with both the mechanical and electrical assembly. As with all Solarbotics' kits, we guarantee a successful "no-fear" build. Enjoy the process even if you experience a broken or lost part. Contact us, and we'll set things right!
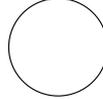
PARTS LIST

4 x Laser cut wood panels
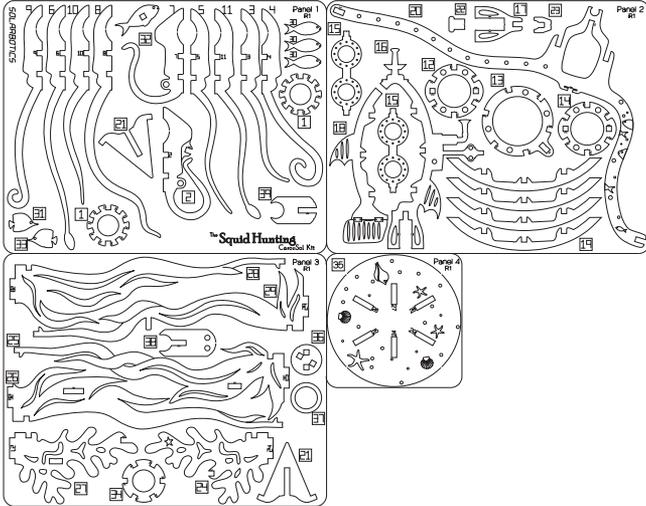
1 x Rotation point & screw

1 x Spinning surface

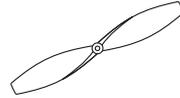1 x 2.0cm (3/4") counter-balance bearing

1 x Motor

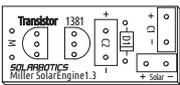1 x 1.0cm (3/8") marble

1 x 0.5cm (3/16") magnet

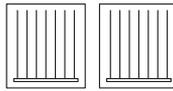2 x 30AWG wire

1 x Propeller

1 x Solar Engine:

1 x SolarEngine circuit board

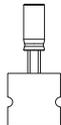1 x Double-sided sticky tape (DSST)

2 x SCC3733 solar panel

1 x Diode

1 x 0.22F capacitor*

1 x 22µF capacitor*

1 x TR2222 NPN transistor

1 x MCP112-195 voltage trigger

Don't mix these two parts up! (See Step 1.2)

TOOLS REQUIRED

- White glue / wood glue
- Wire strippers (30AWG capable)
- Soldering Iron
- Solder

ASSEMBLY STEPS

Start by assembling the SolarEngine. This clever circuit allows solar energy to be harvested and used in low light levels - much lower than is usually possible.

There *is* soldering required, so if you are new to the process, review the "how-to" link on the right.
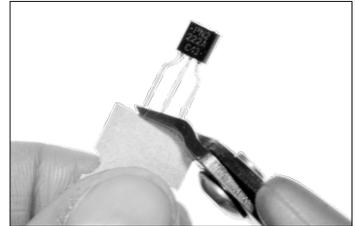
Intro to soldering

youtu.be/iGzXGtH3adw
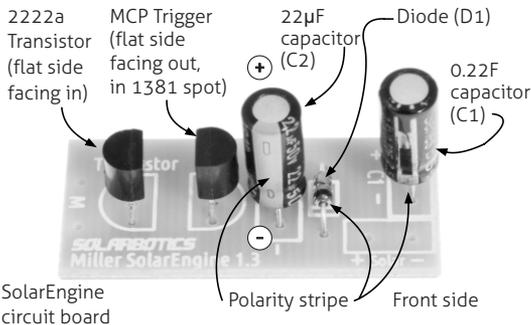
Step 1. SolarEngine Circuitry

1.1 Collect your electronics, being:
* transistor
* trigger MCP112 (also looks like a transistor)
* 22µF capacitor (has paper tape on the legs)
* 0.22F capacitor
* diode
* circuit board

Remove any tape from the parts

1.2 Install and solder the parts in as shown below. Pay *particular attention* to the capacitors. They are similar in physical size, but in fact are **10,000x** different electrically. 22µF installs near the middle, where 0.22F (220,000µF!) is at the end.

2222a Transistor (flat side facing in)

MCP Trigger (flat side facing out, in 1381 spot)

22µF capacitor (C2)

Diode (D1)

0.22F capacitor (C1)

SolarEngine circuit board

Polarity stripe

Front side

Back side, after soldering

⚠ **MATCH** the orientation markers on any marked leads. Anything with a stripe is negative ("-"), and are installed in the hole nearest that symbol. These components <u>do not</u> work backwards!

1.3 Cut two 6.5cm (2.5") pieces of wire (one of each color) and remove 3mm (1/8") of insulation from each end. Place your solar panels face down and edge to edge as shown.

We are wiring these in parallel (+ to +, - to -), so solder the positives of the panels together, and the negatives of the panels together.
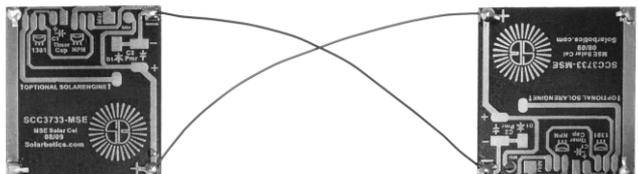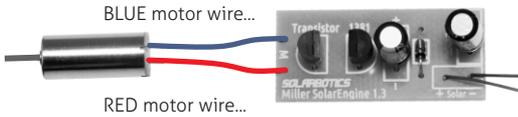
ASSEMBLY STEPS

1.4 We're going to test the electronics before final installation. Start by temporarily soldering the remaining wire to the SolarEngine to one of the solar panels.

These connections are temporary
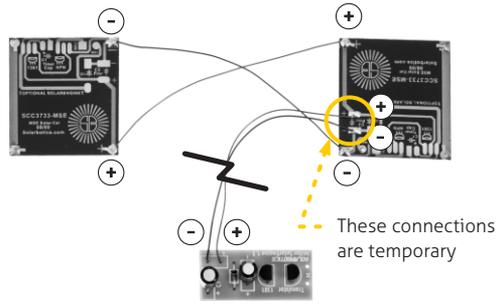
1.5 Locate the motor and solder it to the SolarEngine as shown. Pay close attention to the color of the wire!

BLUE motor wire...

RED motor wire...

⚠ Don't cross up the motor wiring. It will still work, but your model will spin backwards!

1.6 Let's test the propulsion setup to make sure all is good. Gently press the prop ~1mm onto the end of the motor as shown. Backwards, it *still works*, but with only about half as much thrust.

⚠ Install the prop with the **small** diameter on the propeller hub facing **away** from the motor.

desired air flow

smaller diameter

bigger diameter
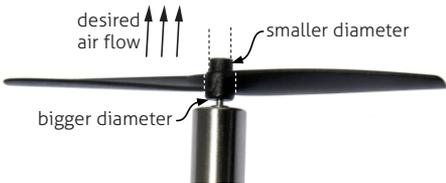
Place the solar panels under direct sunlight or incandescent light and wait 2-8 minutes, with the motor/prop free to spin. When it activates, you should feel it push air *away* from the motor. If not, reverse the motor wire connections.

If you haven't seen any action after 10 minutes, consult the Troubleshooting section.

If all tests out okay, **remove the propeller** from the motor, which will make final assembly easier.

1.7 Desolder the temporary wires from the solarcell that connects the solarcell pair to the Solarengine. We will later thread these wires from the solarengine through the framework back to the solarcells during final assembly.

ASSEMBLY STEPS

Step 2. Assembling the Squid

As the parts are all labeled and marked on the panel, the build is a simple process of find, prepare, and assemble. The parts are cut so you only have to carefully rock them out of the panel to break them free.

2.1   Remove the **2 squid mounting rings (1)** and **6 squid arms (2-7)** and remove cutouts.

Match each arm into the mounting ring slots, starting with squid arm (2), and having all the remaining arms "flow" in the same direction (limbs rearward).
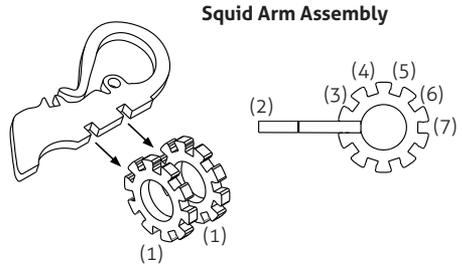
Squid Arm Assembly

2.2   Locate the the remaining **4 squid arms (8-11)**, and the **3/4" ball bearing.**

While cradling the ball in the cup formed by the first set of limbs, slot the remaining limbs around the bearing, finishing the squid assembly.
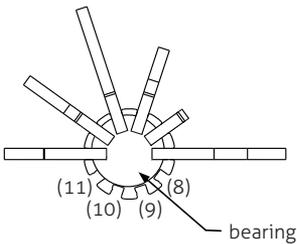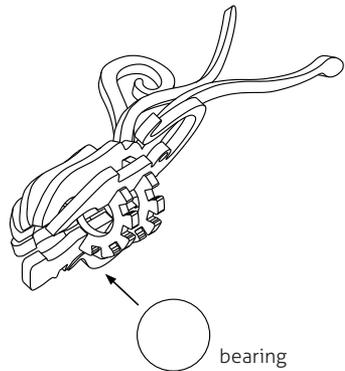
2.3   With all two tentacles and 8 arms (yup, we checked) installed, your squid should look like this. Put him/her/it aside, and we will start on the submarine.
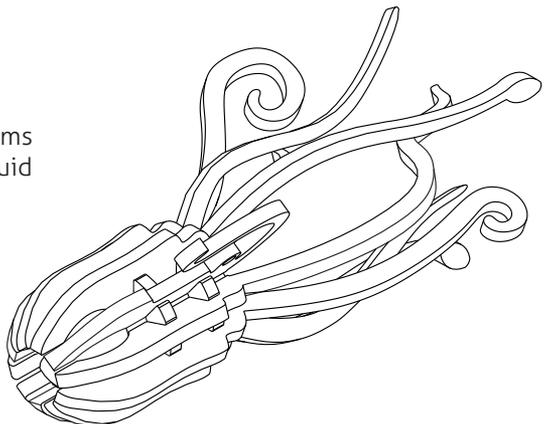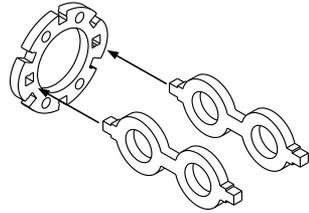
ASSEMBLY STEPS

Step 3. Assembling the Submarine

3.0   Remove the **submarine ring (12) and 2 side-window portals (15)** and remove any stuck cutouts. Insert the sub windows into the square holes on the sub rings.

⚠ The little "rivets" on the portal windows should face outwards when properly assembled.

3.1   Remove the **main submarine ring (13)** and remove cutouts. Arrange the ring so it slides over the portals and rests in between in the middle.
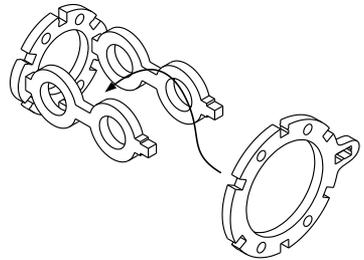
3.2   Remove the **submarine ring (14)** and remove cutouts. Mount it to the square pegs at the end of the side portals so it sits tight and snug.

Mounting Tab Side
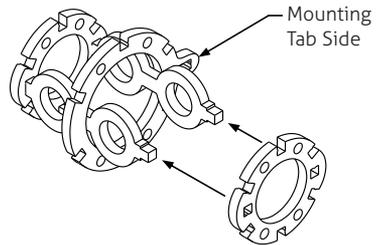
3.3   To prepare the first rib for installation, locate the **top submarine rib (16)** and **motor fin (17)** and remove any cutouts. Slide the motor fin onto the rib as shown.
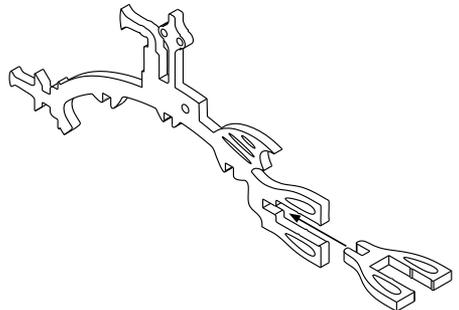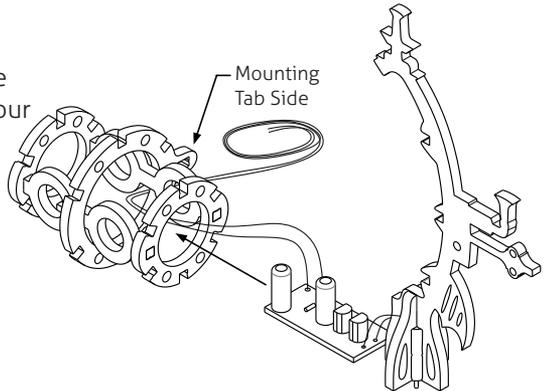
ASSEMBLY STEPS

3.4 Locate the **SolarEngine and motor assembly.** Slide the pager motor into the slot created by the top rib and motor fin.

⚠ The wires of the pager motor should be straddling the fin on the top rib so one wire is on each side when the motor is fully seated.
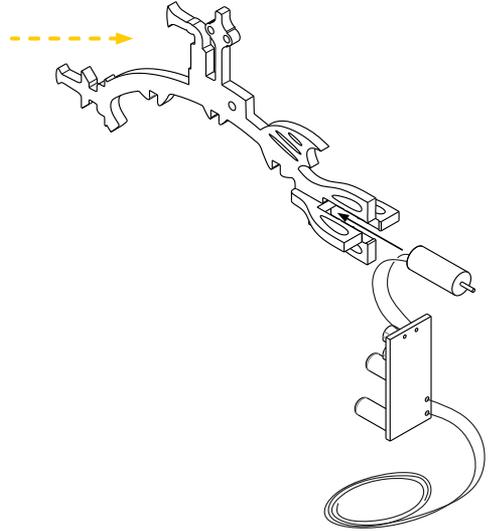
3.5 Feed the wires of the SolarEngine through the ring assembly. You want your wires to exit just ahead of the middle mounting ring.

Finish with the SolarEngine module sitting in the middle of the ring cavity.

Mounting Tab Side

3.6 Seat the top rib into the top slots of rings, making sure the two are fully mated together.

⚠ It's important to keep the rectangular mounting hole on the right side of the sub as shown in the diagram.
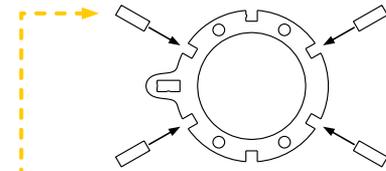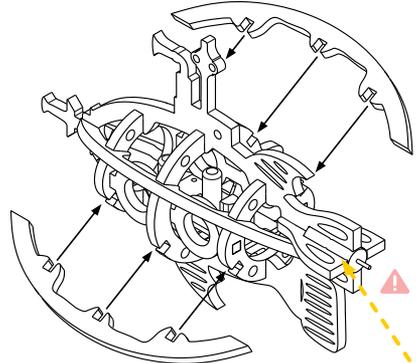
Mounting Tab Side
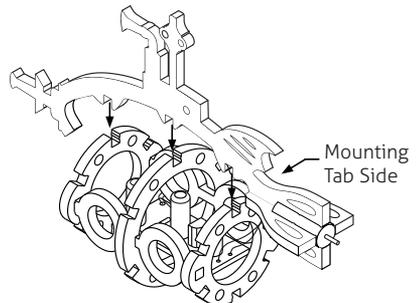
ASSEMBLY STEPS

3.7 Remove the **Bottom submarine rib (18)** and remove cutouts. Insert the rib into the ring slots, making sure it is fully seated.
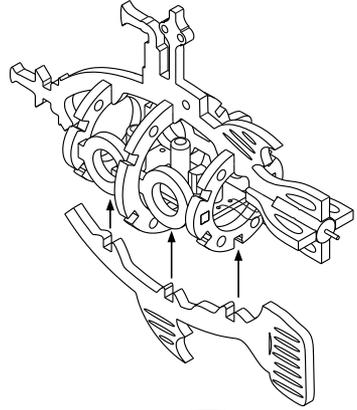
3.8 Remove the remaining **4 submarine ribs (19)** and insert them into the slots of the sub rings, ensuring they are fully seated.
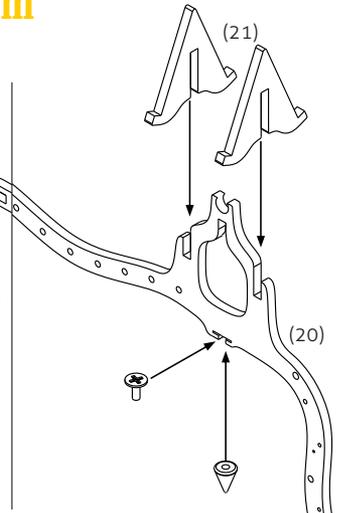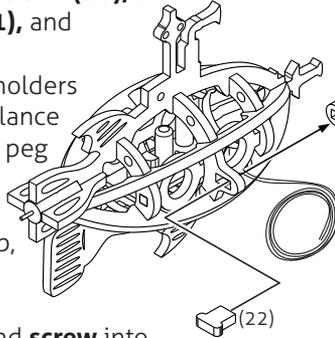
⚠ The top ribs may install easier if you slide the motor fin (17) out just a bit.

Step 4. Assembling the Balance Arm

4.0 Locate the **balance arm (20), 2 solar panel holders (21),** and **connector peg (22)**.
Mount the solar panel holders into the slots on the balance arm. Use the connector peg to pin the submarine to the balance arm as shown (peg through sub, then into balance arm).

Install the **spin point** and **screw** into the balance arm slot. Finger tighten them together into the slot.

(21)

(22)

(20)

ASSEMBLY STEPS

4.1   Complete the submarine by attaching the propeller back onto the motor like in **Step 1.6** on page 4 of this manual.

4.2   Start threading the wire-pair through the balance arm. **Leave 25mm (1") slack** at the sub to allow easier SolarEngine access.

Feed the wire through the small holes along the balance arm. These wires will be used to connect the solar panels to the SolarEngine in the next step.

⚠️ Snug the wires tight from hole-to-hole on the balance arm for a clean appearance.

Leave 25mm (1") slack

Thread wires through holes and snug up
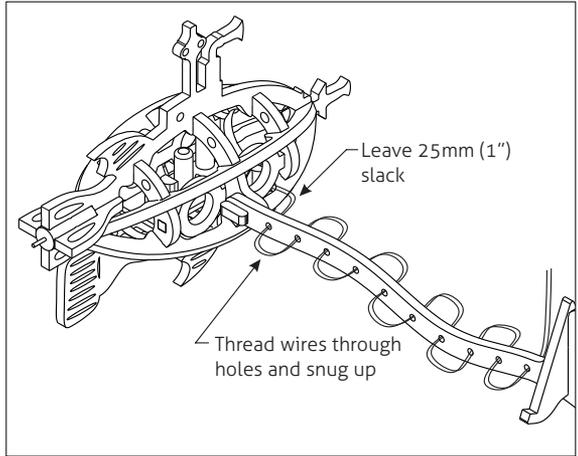
4.3   Re-attach the solarcell wires (check **Step 1.4**). You may trim any excess wire to tidy up the installation, but you can simply tuck excess up underneath during final assembly.
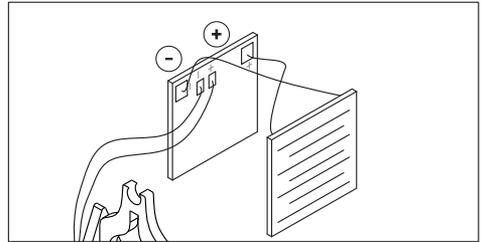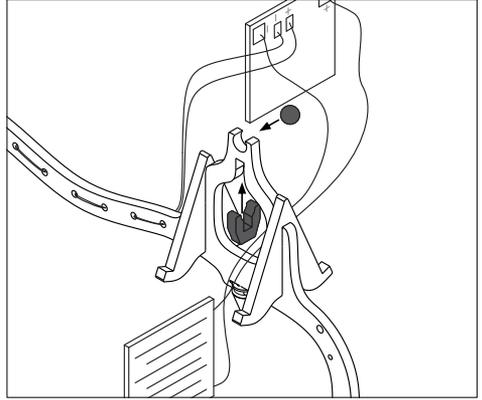
4.4   Continue the solarcell assembly by sliding one of the solarcells through the slot in the middle hole.
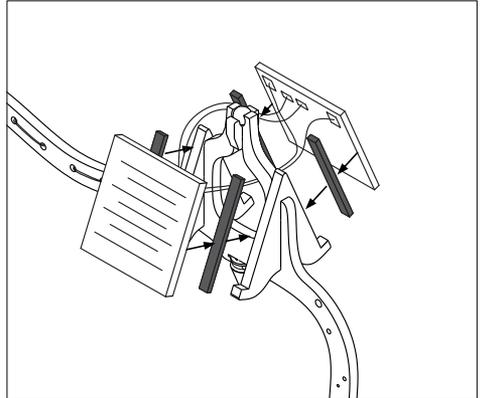
9
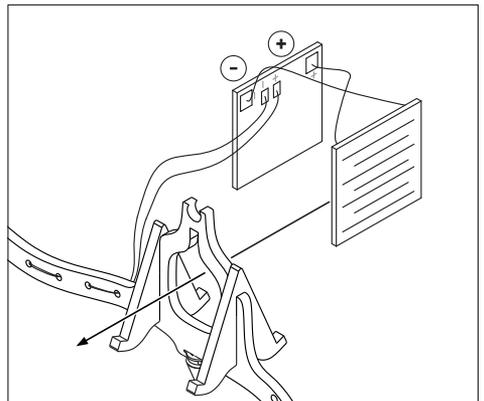
ASSEMBLY STEPS

4.5   Locate the **magnet holder (23)** and **the magnet**. Position the magnet into the circular cutout and slide the magnet holder up and around it, trapping it in place.
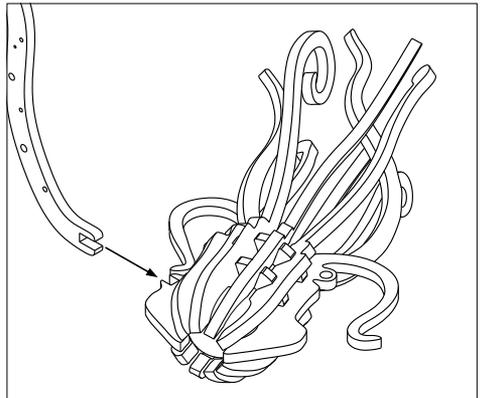

4.6   Cut **four 3mm (1/8") wide strips** from the **double sided sticky tape**. Peel the protective paper off and mount the solar panels to the panel holders.

Hide any extra wire in behind the panels.

4.7   With the sub and balance arm complete, complete the "main characters" assembly by slotting the assembled squid into the slot at the bottom of the balance arm.
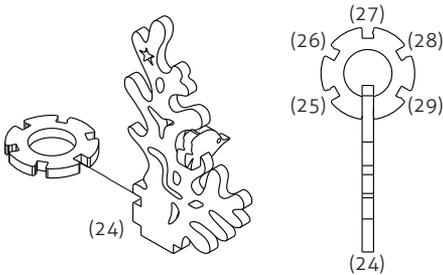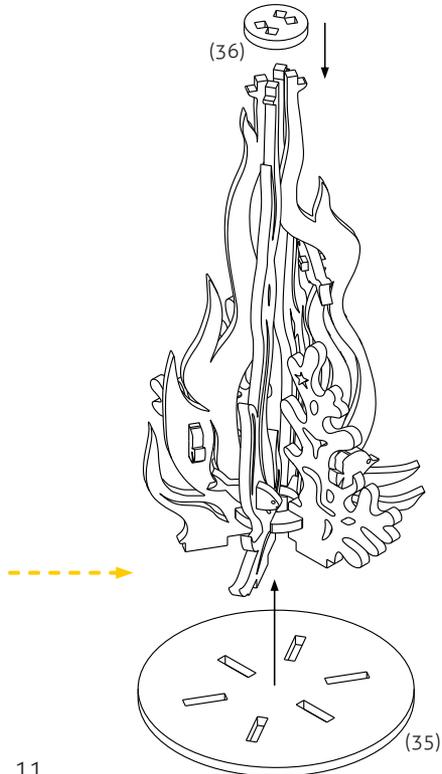
ASSEMBLY STEPS

Step 5. Assembling the Tower

5.0 Remove the **kelp tower arms (24-29)** and **fish (30-33)** and remove any stuck cutouts. Place the fish into their positions.

(32)

(30)

(31)

(30)

(24)

(27)

(33)

(29)

(26)

(30)

(25)
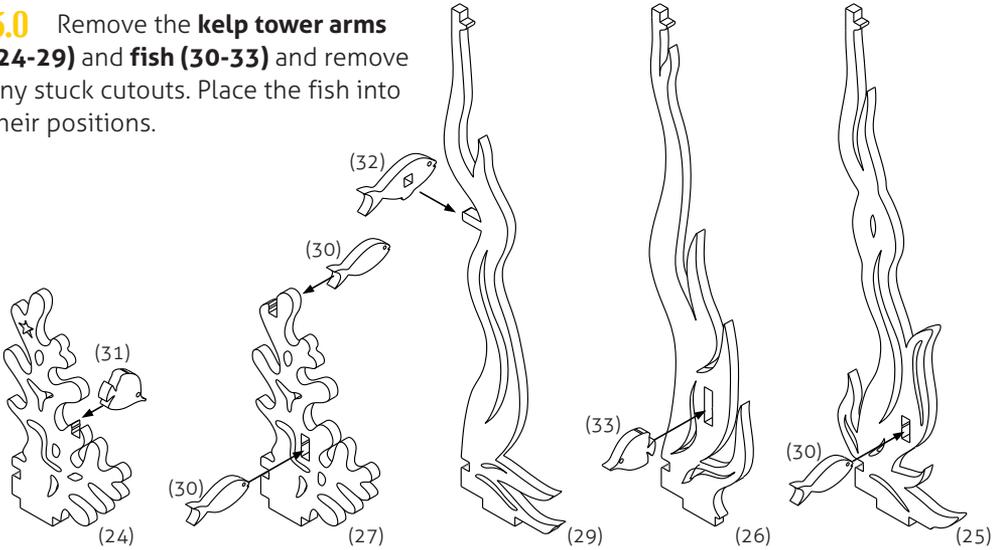
5.1 Locate the **tower ring (34)** and install each kelp frond into the slots as numbered below, starting with (24). The other short frond (27) must go directly across from it.

(24)

(27)

(26)

(28)

(25)

(29)

(24)

(36)

5.2 Locate the **tower base (35)** and **tower cap (36)** and remove cutouts. Install the kelp frond assembly into the base. The base slots ensure the tall fronds line up properly with the tower cap.

Align and install the tower cap, and press the whole assembly vertically together.

(35)

ASSEMBLY STEPS

5.3   Find the **spinner surface** and place it face down (dome up) on a hard surface. Place the **spinner ring (37)** over the dome, and press it on so it "force fits" onto the dome with edge of the spinner dome flush with the ring.

dome side up

press ring down onto dome...

...flip over!
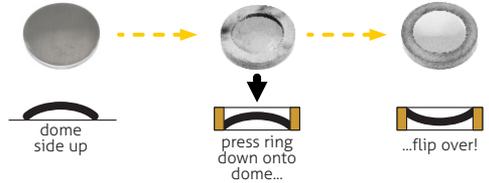
5.4   Flip the spinner surface over, and generously glue the assembly to the tower cap.
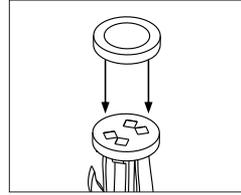
5.5   **Finish your project by balancing the arm on the spinner surface, and give it some light. Within minutes, the prop will come alive, powering your undersea pursuit. Have fun with your kit!**

ADDITIONAL ENHANCEMENTS

Optional Ceiling Hang-point:

Suspend your "Squid Hunting" from the ceiling, especially if you have a skylight or light-fixture nearby (our tests show 7 minute cycles near an office fluorescent fixture).

Build the suspension point with the **holder (38), catch (39)**, and **steel bearing**. Insert the bearing into the holder, slide the catch down to trap it in, and hang it up. Lift the "Squid Hunting" up to the ball, and the magnet will easily suspend the assembly.
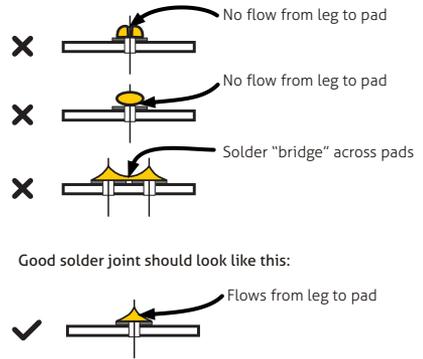
(39)

(38)

bearing
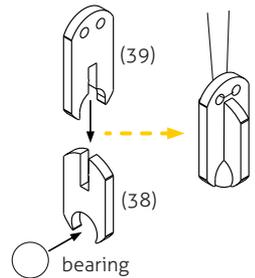
Select the hanging location carefully. A fall from ceiling height will most likely end disastrously for the kit!

- A drop of oil on the rotation point <u>dramatically </u>increases coasting "spin time".
- Feel creative? After everything is assembled and tested, paint the CarouSol kit however you like! But do avoid the solar cell, electronics and spinning surface/spinning point.

TROUBLESHOOTING

First, the Basics:

- The SolarEngine powering the motor depends *directly* on light intensity. Test with sunlight or under an incandescent or halogen (*not* fluorescent) lamp. If you have a voltmeter, check that the voltage on the solar cells is slowly climbing.
- A bad solder connection is the most often reason for a circuit failure. Inspect your soldering for parts not connecting (too little solder) or parts connecting when they shouldn't be (too much solder).

✖ No flow from leg to pad

✖ No flow from leg to pad

✖ Solder "bridge" across pads

Good solder joint should look like this:

✔ Flows from leg to pad

SolarEngine troubleshooting:

- The easiest mistake is mistaking the transistor for the MCP, because they look the same. Read the labels on the parts to make sure they haven't been swapped.
- Backwards components don't work. Double-check their orientation. Find one? Use a solder-sucker or solder braid to remove the solder , wiggle it free, and reinstall.
- Are your solar panels connected correctly? They are like batteries, and won't power your project if either (or both) are connected backwards.

It's not sitting horizontal:

- Check for missing or extra parts and cut-outs. The balance was carefully designed, and an extra bit will throw off the balance.
- If necessary, add a small scrap of extra wood to the submarine or squid until it's balanced, and glue them in place in a hidden area.

The submarine is tipped forwards or backwards:

- Ensure the rotation point is installed right in the middle of the balance arm. If you need further adjustment, loosen the rotation point and slide it a bit to the low side to help correct the fore/aft balance.
- Is everything installed? Missing parts can easily cause a shift in balance.
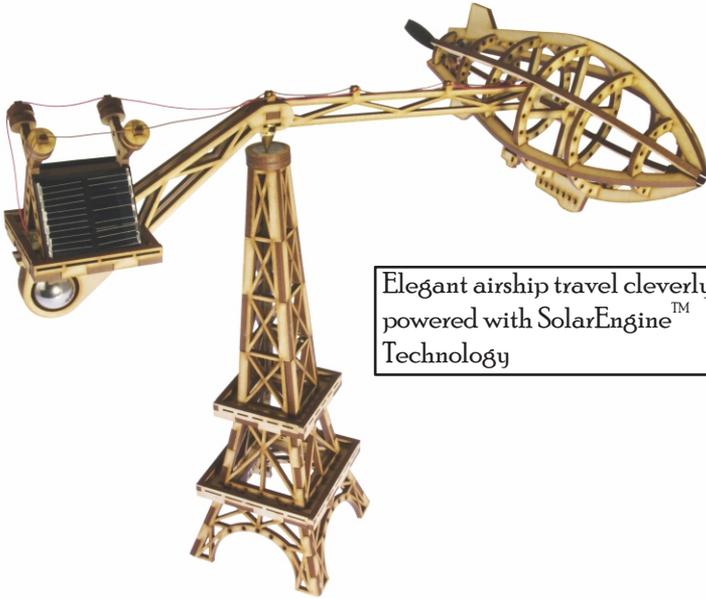- Any forgotten cut-outs you forgot to remove? They also affect the balance.

The submarine travels backwards when the SolarEngine activates:

- Your submarine has the propeller mounted on the back, and should push it forward. Only reversing the motor wires will make it travel the right direction.
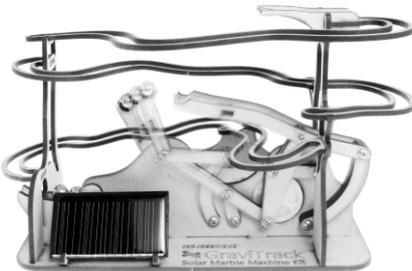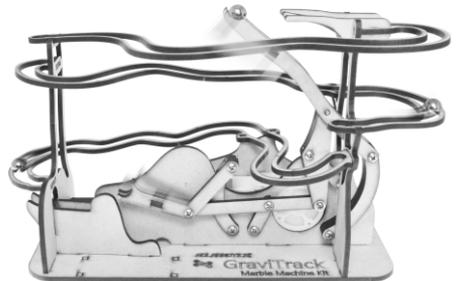
The Paris Flyer
Solar CarouSol Kit

Elegant airship travel cleverly
powered with SolarEngine™
Technology

The GraviTrack

Marble lifting motion feature two arms
and an elegant mid-flight hand-off.

Solar Edition

Battery Edition

Build a deep-sea submirsible

Construct a lively kelp forest

Assemble the Squid

No batteries - it's solar powered!

Build as a desktop or hanging mobile

Solarbotics "No Fear" Warranty

Aggressive feline interaction damage? Obtuse canine posterior oscillation disaster? Plain old damage during construction? No issue. Contact support@solarbotics.com and we'll make sure you get the replacement parts (most often free of charge) to have a successful build experience! We guarantee a successful build!

Visit us online for more info and cool stuff:

www.solarbotics.com

Questions or comments? Let us know!

✉ support@solarbotics.com

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RoHS

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