

InSight Mars Lander Scale Model

Instructions version D1, model design © 2019 Michael Mackowski

This 1/24th scale paper model represents the general arrangement of the InSight lander spacecraft as it appeared after landing on Mars in December 2018.

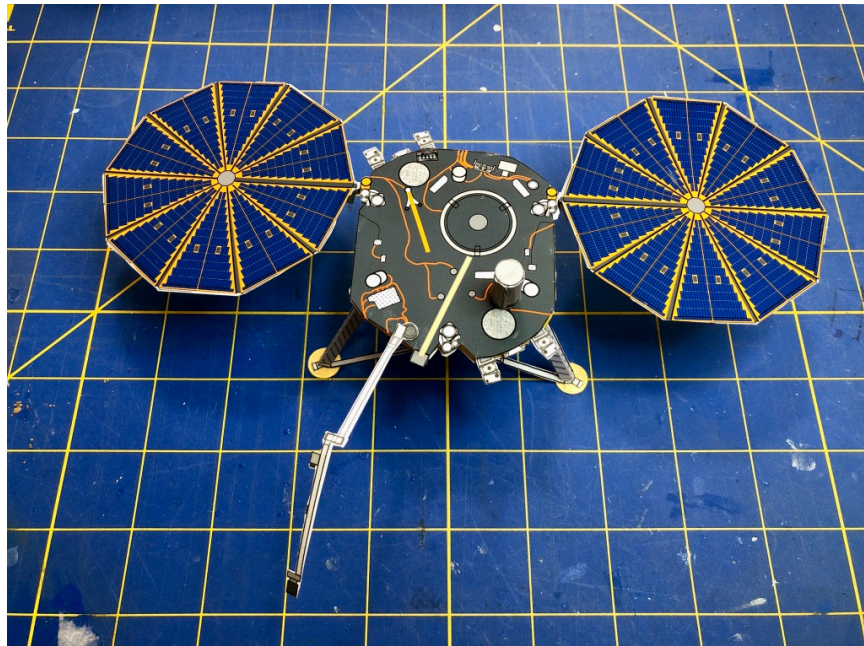
General Instructions

Tools and materials needed:

- Scissors
- Hobby knife
- White glue (optional: glue stick, Alene's Tacky Glue)
- Optional: removable low-tack tape, small clamps

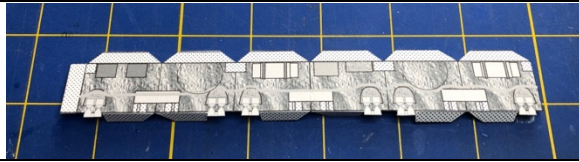
The model should be printed on heavy cardstock and can be cut out using scissors or a hobby knife (e.g., X-Acto). As the plans are pdf files, make sure your print at 100% if you want to have an accurate 1/24th scale model. The dashed lines on the drawings indicate folds. To get a sharp fold, lightly score the paper (before or after cutting) with a dull pointed object like an orange stick (cuticle stick for cosmetics) or a dried ballpoint pen. Alternatively, a dull hobby knife can be used with care and a very light touch, being careful not to cut all the way thru. Most of these scores are on the front (printed) side, and where a score on the reverse is required, that is noted on the drawing (often with red dashed lines). Note that not all scores/folds are shown, as the obvious ones (main bus structure panels for example) are indicated by features of the drawing itself.

Areas on the drawings that are filled with a dot or hatched pattern are usually gluing surfaces. White glue (e.g., Elmers) is recommended, while a glue stick is recommended for the solar panels. You may need to hold the pieces together for a few minutes to allow the glue to set. This can be done by hand, small clamps, rubber bands or low tack tape. Remember to use only a little bit of glue, as the more you use, the longer it takes to dry.

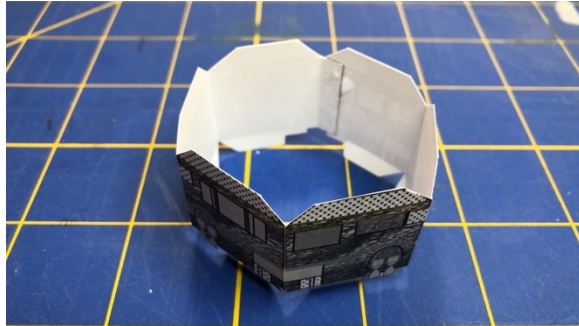


Building Your Model

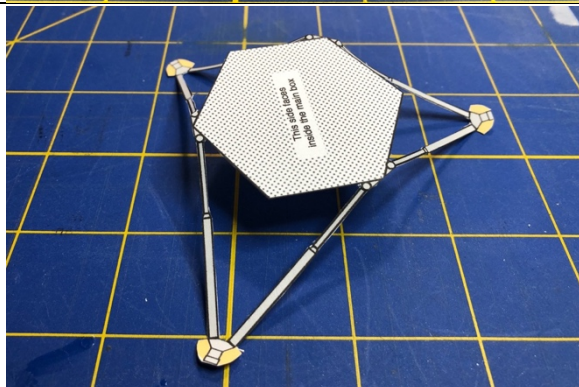
Start with the main body. After cutting it out, score the top and bottom attach flaps being careful not to score or fold the engine nozzles.



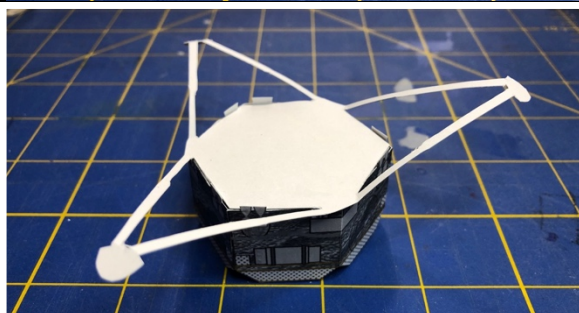
Then fold it into a hex shape and glue the end tab to the opposite panel.



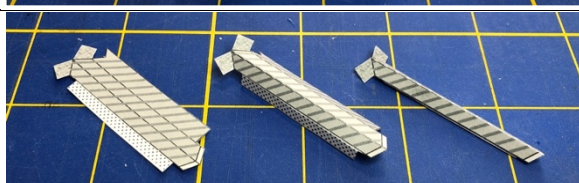
Carefully cut out the leg braces and lightly score on the front (near the main box panel) and the back (at the foot pads). Fold the legs downward towards the center and tilt the footpads upwards.



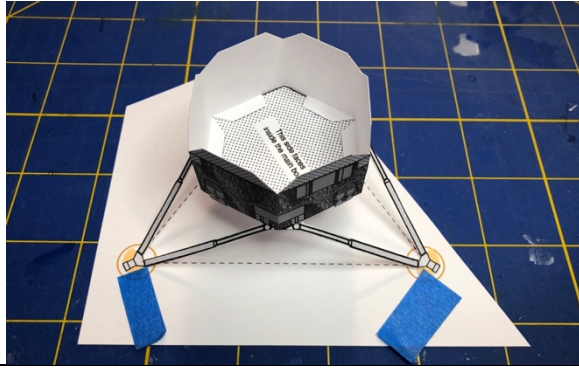
Glue the leg braces to the main body using white glue on the body tabs. Make sure to leave the engine nozzles popped out. Be careful to align the legs with the engine nozzles corners.



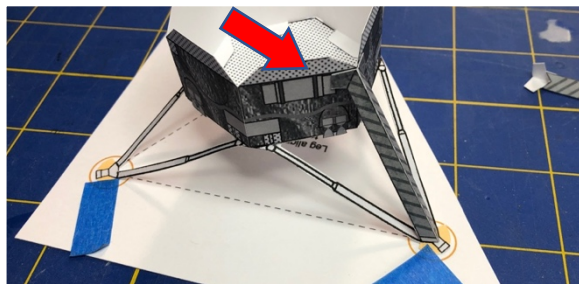
Cut out the three legs and score them to fold into a triangular cross section. There are two tabs on the one end that attaches to the main body. Score these lightly on the back side and fold forward. The photos show this process, left to right.



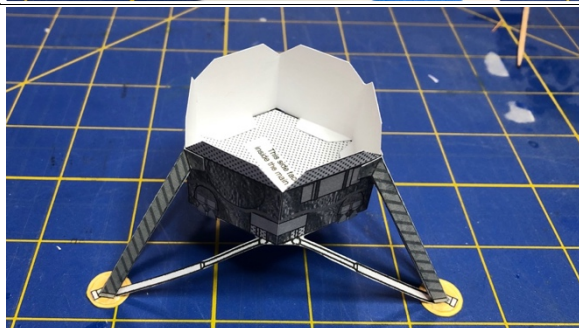
Using low-tack tape, secure the leg-body assembly to the leg alignment guide as shown in the photo.



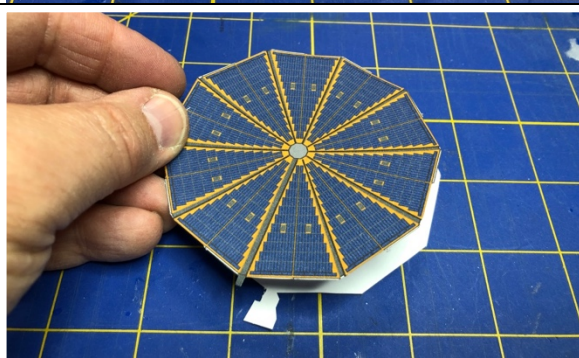
Next glue the top of each leg to the upper corners of the main spacecraft box (arrow). Don't glue the other end to the footpad ends of the trusses yet, but just make sure they are lined up properly.



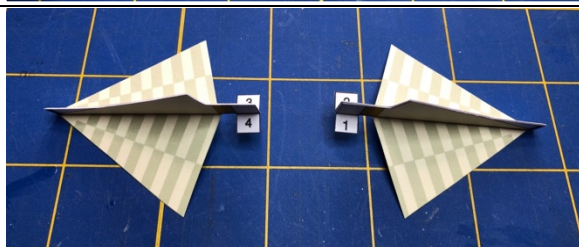
Finally use a drop of white glue at each footpad and attached the end of the main leg to each leg truss footpad. Then cut out the three circular landing pads and glue those on using the leg alignment template as a guide. This will form a sturdy set of legs.



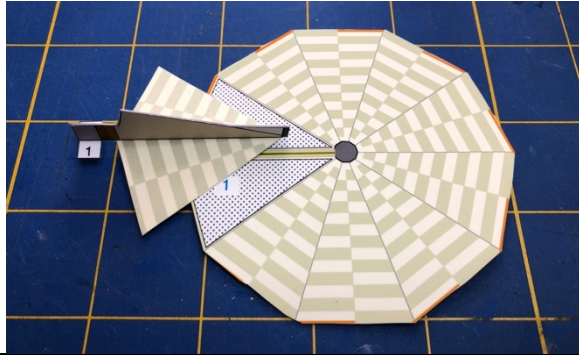
Cut out the solar panels (upper surface and the undersides) and use a glue stick to attach the top to the bottom. It is okay to cut the solar panels apart from the top deck. It is shown together on Sheet 3 to provide a reference as to the correct location. Keep a note of the left and right panels (the left and right tops and bottoms are printed next to each other).



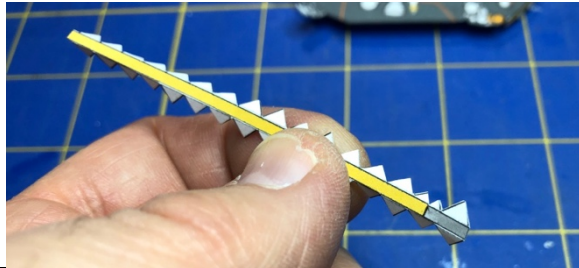
Cut out the solar panel backside supports, score them on the back, and fold them inwards. Glue the pairs (1 and 2, 3 and 4) to each other (a glue stick is recommended).



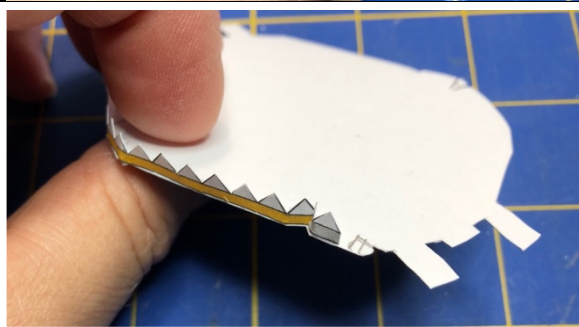
Glue the rear supports to the panel back surfaces as shown in the photo.



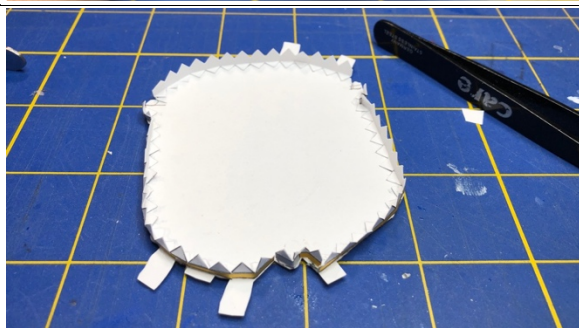
Cut out the top deck panels (top and bottom). Cut out a couple of honeycomb edge strips (long gold strips with sawtooth attach points). Score them on the front along the edge and fold back just one edge.



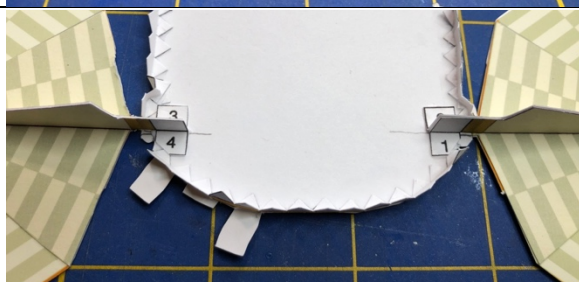
Using a bit of white glue on the edge of the top deck panel, line up a short length of the honeycomb edge and glue it to the underside of the top deck surface.



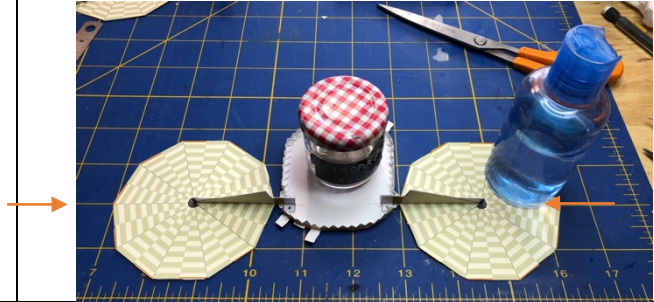
Repeat as needed until you have the gold honeycomb edge all the way around the deck. Leave small gaps where the solar panels attach. Note the three gray (metallic) sections (see top deck detail) and line up gray sections of the edge strip at those locations. There will be extra lengths of this edge material.



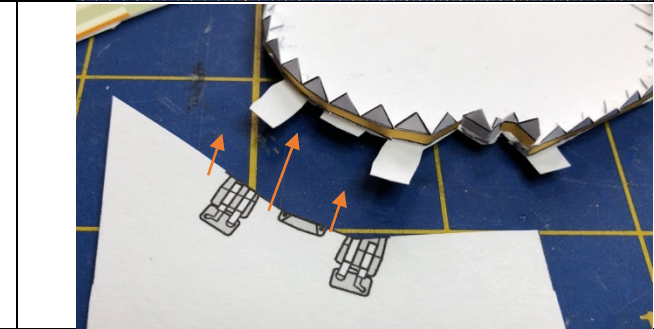
Now glue the solar panels to the inside of the deck upper surface (use white glue), being careful to align them at the orange-gold hinge points seen on the top surface detail.



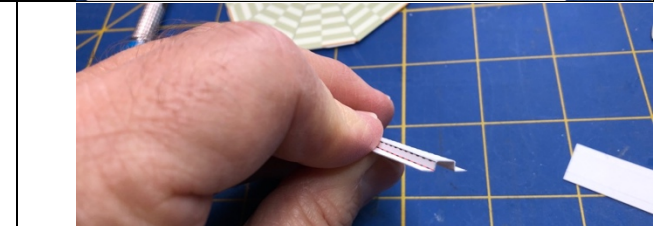
Make sure they line up straight (arrows). If you want, use some heavy objects to keep everything flat while the glue dries. Let the glue set before disturbing.



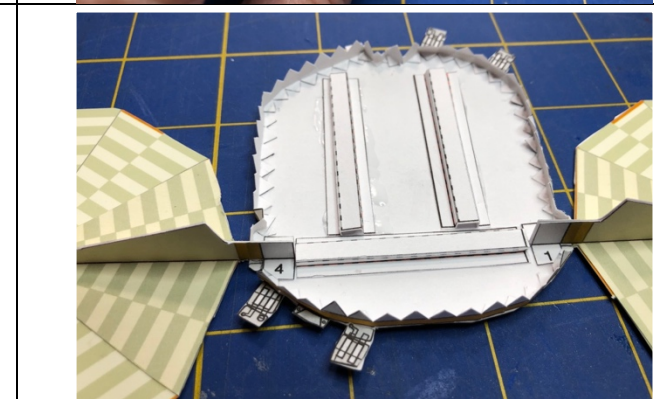
While the solar panels set up, cut out the back side details of the thruster brackets and glue them as shown. Note only one end is shown in the photo.



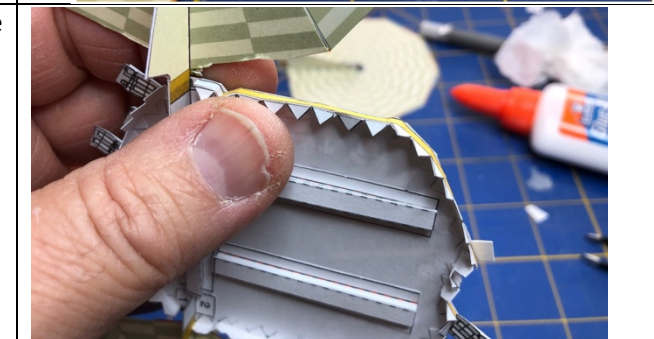
Next, cut out three sections of stiffening beams and fold into a hat section.



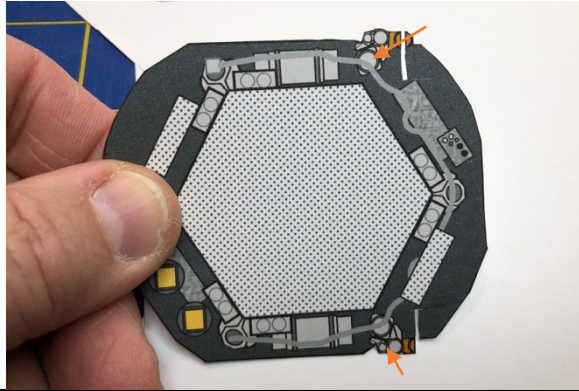
Glue these to the inside of the deck upper surface. These will serve to stiffen the deck structure.



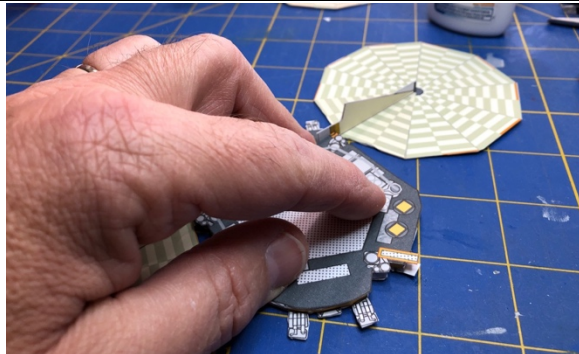
Carefully fold the sawtooth features down all along the edge of the panel.



Line up the bottom surface of the deck and check to make sure there is a large enough slot cut out (arrows) to allow the solar array hinge mechanism to fit through.



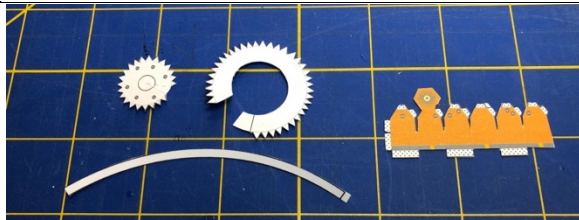
Now glue the bottom deck surface to the top surface – edge - solar array assembly. Start by applying glue only to the stiffening beams so you can line up the top and bottom surfaces. Apply pressure with your fingers until this is set up.



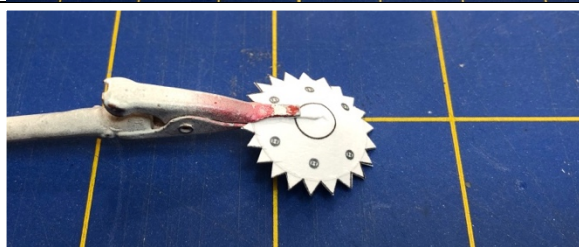
Finally use a toothpick to apply glue all around the honeycomb deck edge sawtooths and the top deck surface. Do maybe a third at a time to ensure the glue sets up and everything is flat and square.



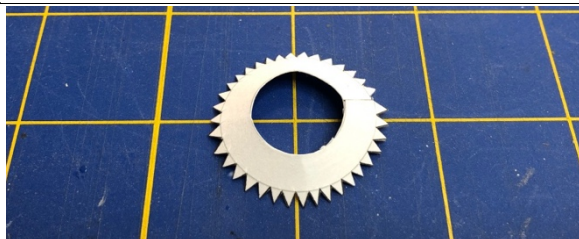
While the deck assembly is drying, cut out the seismometer and its wind cover. There are a lot of creases to score, so use a dull hobby knife to carefully prepare these folds, including around the circular pieces to fold the triangular attach tabs.



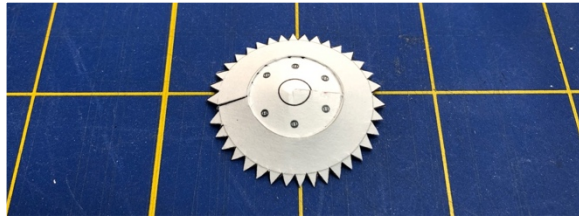
Start with the small center part of the wind cover. Make a slit to the center, gently curve it into a shallow cone, and glue one edge over the hatched portion. The photo shows a small clamp holding the glue joint.



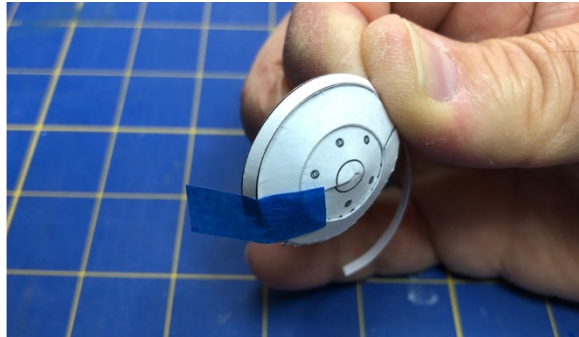
Next, wrap the larger partial-donut shaped piece around itself, forming a shallow conical section, and glue the tab to the other end.



Glue these two pieces together by applying a bead of white glue along the underside of the conical section. Make sure to center the small one within the larger one.



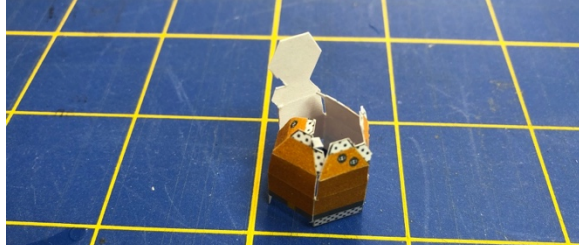
Fold down the sawtooth attach tabs around the outside of the prior assembly (wind cover). Then wrap the narrow, curved piece around the outer edge and use a clamp or low-tack tape to temporarily hold it in place. Then glue it to the triangular attach tabs, a little at a time.



Be careful to keep it aligned so it wraps around the entire wind cover squarely.



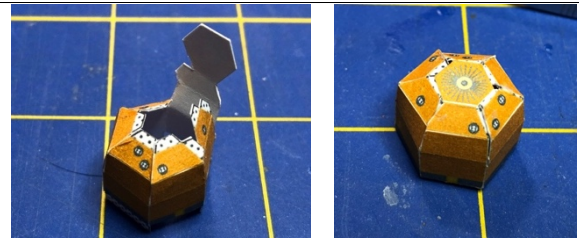
The seismometer (SEIS) itself is small with a lot of tricky cuts and tabs and folds. After cutting and scoring, wrap it around itself and make a hex shape.



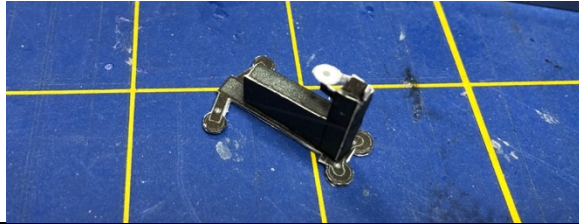
Then start at a section next to the one with the top center cover, and glue its little tab under the adjacent section. Let it dry (maybe five minutes) and do the next section.



Continue this process (be patient) until you have a hexagonal dome, then fold down and glue the top center section.



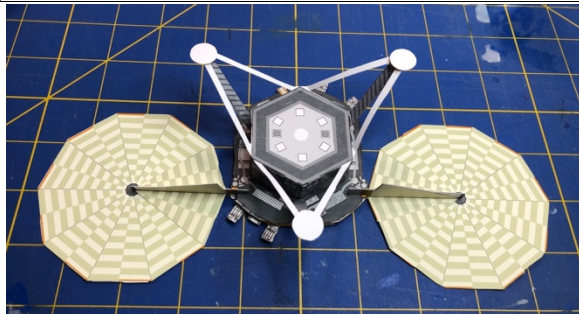
Cut out the parts for the heat probe. It has an L-shaped box portion and a base with small round footpads. The separate small part forms the inside of the narrow tall section. Cut out three of the bases and stack them to get some thickness. Then glue the entire assembly together.



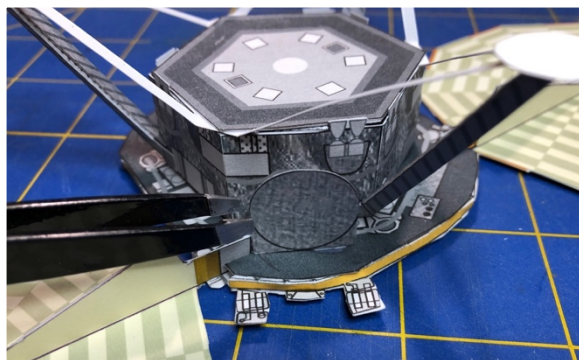
The communications antenna is built by gently curling it into a cylinder, gluing the ends together, and then folding over and gluing the lid. A helpful intermediate step is to shape it into a nice cylinder by inserting a pen or pencil and rolling it in your fingers while the glue is still soft.



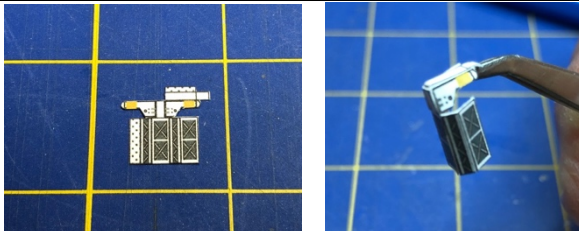
Now glue the deck and solar panels to the main structure. Make sure you line up the legs so two are near the solar panels. Note there are rectangular tanks on the side of the main structure that are on the same sides as the solar panels. Glue this before attaching anything to the top of the deck so you can apply some pressure to this assembly, so it dries nice and flat. Also glue on the underside panel.



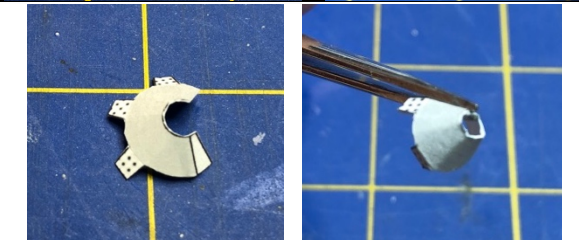
Next, you can cut out and glue the fuel tanks to the underside of the main deck.



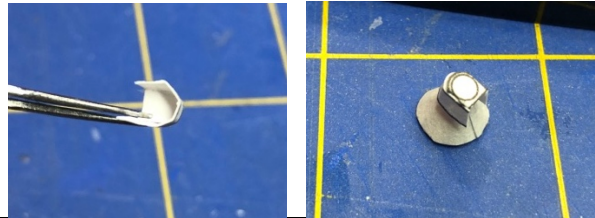
Now we'll build the remaining small details for the top deck. Start with the two tiny weather sensors. The bottom portion folds around into a long box, while the top is a bit narrower and wraps 90 degrees the other way. There is a small tip that curls around towards the bottom. The small blue lines on the parts page indicate scoring locations. Make two of these.



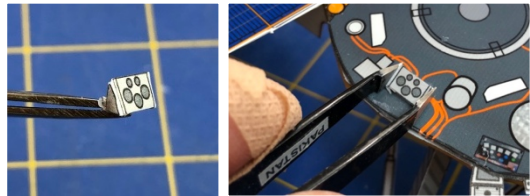
There are two radio science antennas mounted near the weather sensors. These consist of a cone and a base. Cut out the cone, curl it, and glue it at the overlap to form a small cone.



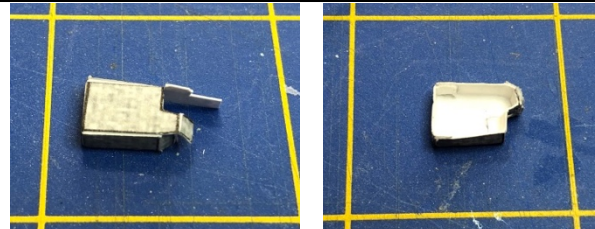
After cutting out the base, wrap the long thin section into a U-shape, and glue it to the tab. Fold the circular end cap over, then glue it to the back of the cone antenna. Make two of these.



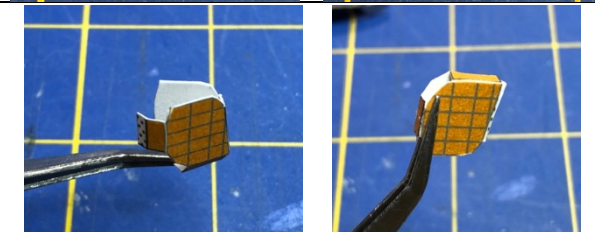
The connector bracket is rather simple, albeit small. Fold the sides and tabs around the back, and it will be glued directly to the deck.



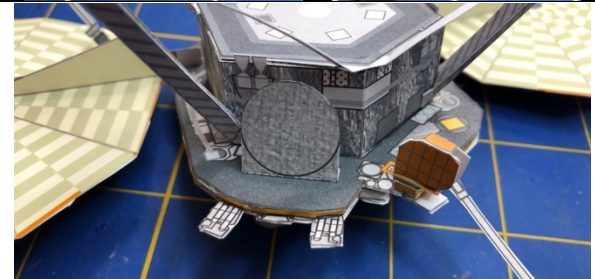
There is a shallow electronics box. Cut it out and fold the sides down, gluing the square ends to the tabs first (left photo). Then fold the L-shaped end and glue the tabs under the edges as needed to make this shape (right photo).



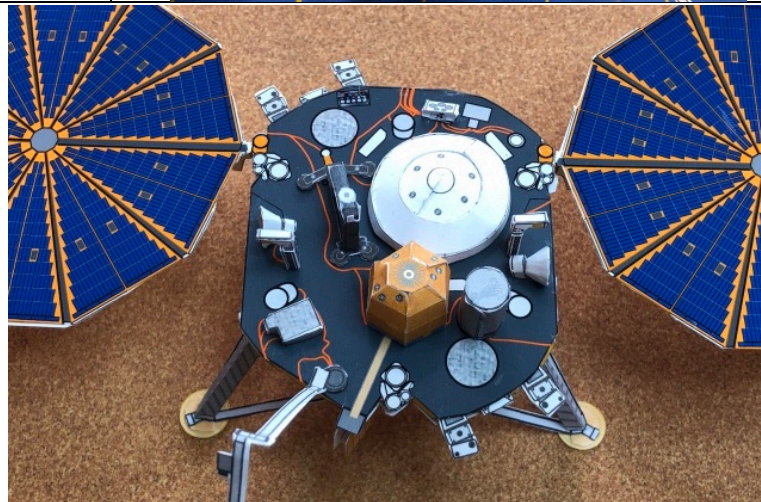
There is a cable spool hanging on the bottom of the deck. Cut this out and fold it into a shallow box.

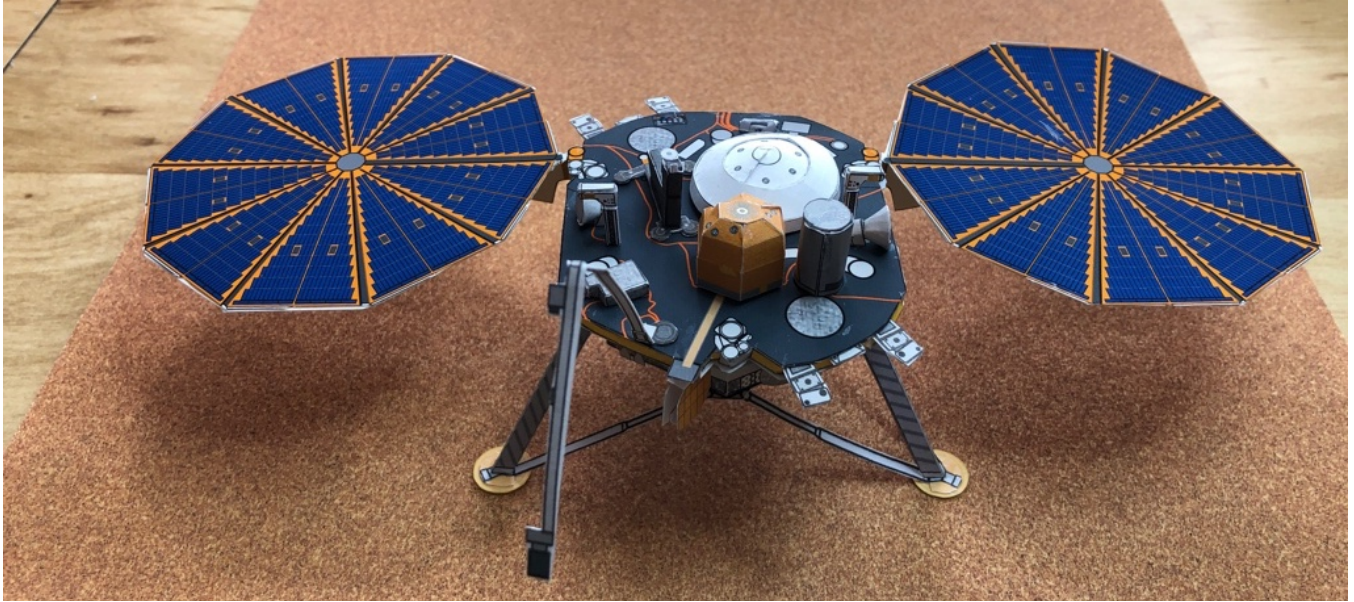


Attached the spool to the hatched area on the deck underside.



This shows the top deck with everything installed and SEIS and heat probe stowed. The robot arm is simply two layers glued together to give it a little strength. Note there is a small hatched circle to indicate where to attach to the deck.





Optionally, you can build the SEIS with the wind cover shroud deployed on the surface. This has an additional gold-orange curtain (below). Parts are provided to build both a stowed and deployed SEIS. The heat probe can be shown deployed as well. Note there are extra (orange) flat cable parts provided for the deployed configuration.

