

# Mars Reconnaissance Orbiter

1:48 scale

- READ ALL THE INSTRUCTIONS AND INSPECT THE PARTS SHEETS FIRST. Score fold lines and cut out the parts.
- High Gain Antenna (HGA): cut the reflector and cover on the radial lines indicated; overlap to the dotted line to form shallow cones. Check the fit against the blue circle – the cones should just cover the circle. Roll the HGA edge into a ring and glue. Bend every third tab inward and glue the blue circles onto each end to hold the edge in a circular shape. Bend the remaining tabs down slightly, apply glue, and fasten the reflector and cover to the edge.
  - Cut out the HGA mast and glue the two pieces back to back. Roll the HGA mount and HGA mast mount parts 1 and 4 into rings and glue.
  - Review the picture on page 4 for the front truss shape. Fold on the black lines to make a trefoil box. Glue the lower section (wide part with solar array mounting holes) first. Then glue the upper section of the mast mount and close the “box top” above the gray circle.
- Main Bus: fold on the black lines to form a hexagonal box. Glue the sides first, then close the top and glue, carefully aligning the edges.
  - Instruments: fold and glue the boxes for the aft equipment boxes, CRISM, radar bracket, and optical navigation camera. Roll the cylinders for the CRISM, ELECTRA, optical nav camera, and Mars color imager. Fold the small triangles inward and glue to close the tops on the CRISM, ELECTRA, and color imager. Glue the corresponding cylinders to the small circles on the CRISM and nav camera boxes. Roll the rectangle on the Mars climate sounder into a cylinder and close the ends with the attached circles. Fold tabs outward (toward the printed side) on the mounting bracket, then fold in half and glue. Glue the tabs at one end to the cylinder the long way, aligned with the black marks on the cylinder ends.
  - Thrusters: fold the small thrusters into wedges. Fold over the dark square and glue to the back of the orbit insertion thrusters; cut out when dry.
- Connector truss: this is a difficult piece and will require some attention to fit – it’s modeling a fabric drape over the structure. Cut out the ovals for the HIRISE and context cameras. Fold the connector truss on the black lines, note the two folds that go inward. **Do not make the optional folds yet!** Glue the truss together, joining the ends indicated by the large arrows. **Dry fit the parts before applying glue at each following step so you can see how they fit and where pressure is needed to align the parts.**
  - Fit the truss to the main bus first. Apply glue to the tabs on the panel with the holes in it and the two on either side. Fit these to the bottom and two long sides of the main truss and hold in place until the glue sets – let the remaining sides run free (the bottom of the main truss is the panel with most of the instruments). After the glue sets, apply glue to the remaining three tabs and press them into alignment on the main bus – let the upper portion of the connector truss run free and adjust the folds as needed to get it aligned with the main bus.
  - Fit the front truss to the assembly. It’s best to do this in one step. Apply glue to the tabs and place the front truss into position, starting from the bottom – where the instrument holes are. Carefully press down on the front truss, keeping the edges of the connector truss aligned, until it’s flat – you will see some bending of the connector truss panels (remember, it’s modeling a fabric drape) – hold until the glue sets.
  - Roll and glue the HIRISE light baffle into a cylinder (printed side inward) and fold the tabs in. Glue the optics into the baffle on top of the tabs. Roll the barrel into a cylinder, checking to make sure the baffle fits inside tightly, then glue. Insert the baffle into the barrel and glue. Roll and glue the context camera into a narrow cone. Roll the star trackers into narrow cylinders.
- Install the instruments and thrusters: install the instruments in the indicated positions, referring to the diagram on page 4 for detail. The small wedge shaped thrusters are mounted with the large end outward. Roll the thrust mounting ring into a circle and glue. Apply glue to the edge and mount over the large gray circle on the back of the main bus. Fold the legs of the orbit insertion thrusters down and secure inside the thrust mount ring. Insert the HIRISE and context cameras into the holes in the connector truss and secure. Drill out the small holes on the ends of the radar mount and insert a thin dowel, wire, or rolled paper cut to the indicated length for the radar antenna.
- HGA installation: glue the HGA mount to the HGA mast, then glue the gold side of the HGA (reflector) to the HGA mast – centered with the seam on the reflector aligned with the low gain antenna arm. Bend down the three support arms on the mast and glue the tips of the arms to the HGA. Bend the low gain antenna down until it touches the edge of the HGA, then bend the tip forward and glue to the HGA edge.
  - Assemble the HGA mast mount gimbal as indicated with parts 1-4. Glue the mast mount to front truss in the indicated position, then glue the HGA/mast assembly to the front truss. For a simpler assembly, glue part 1 only to the front truss and glue the HGA/mast assembly directly to that.
- Solar arrays: fold and glue together the front and back of each array, trimming as needed. The folded edge will be the top of the arrays. Drill out the mounting holes on the arms of the front truss. Cut a dowel and split the ends as indicated, then push the dowel through the holes in the front truss. Insert and secure the ends of the arrays into the slots in the ends of the dowel – the arrays should droop 15 degrees (see diagram for details).
- Base: It’s easiest to display this with a tripod. Cut two identical dowels and split the ends, position on the base to hold the solar arrays. The model will tend to rotate around the arrays so cut another dowel and position it to support the main bus in the desired orientation.

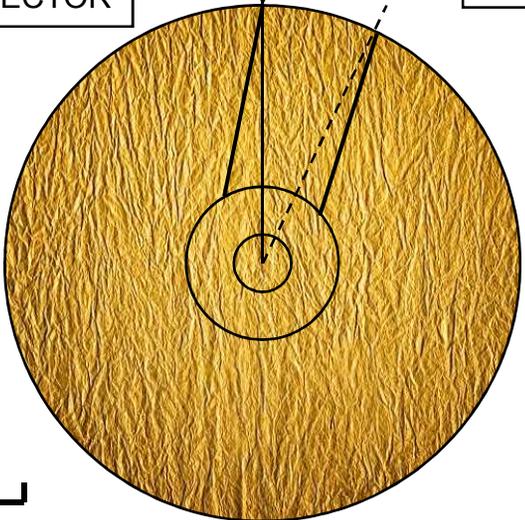
# MARS RECONNAISSANCE ORBITER

1:48

REFLECTOR

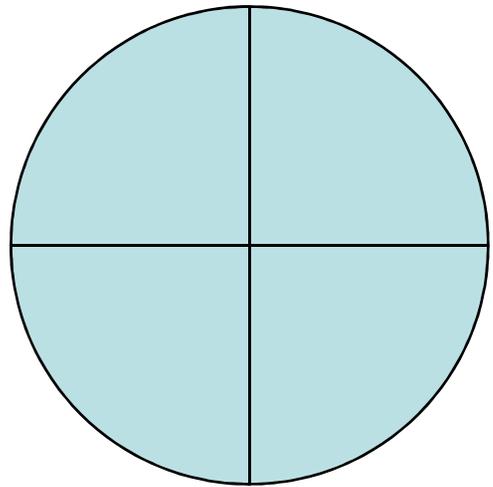
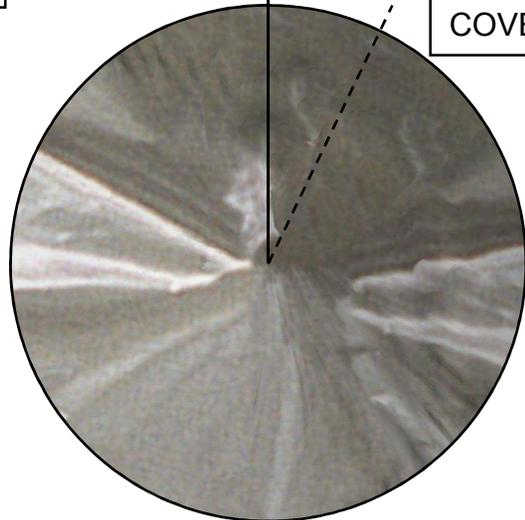
HGA

cut



COVER

cut



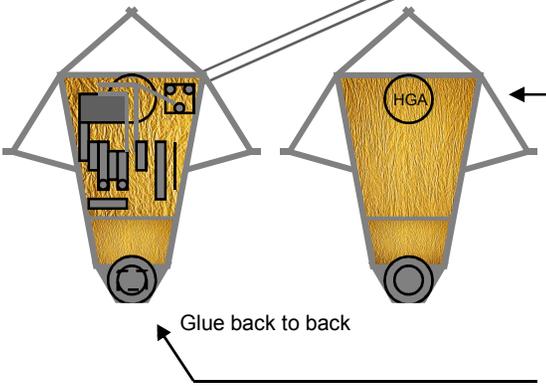
1 inch

Overlap HGA reflector and cover to form shallow cones this size

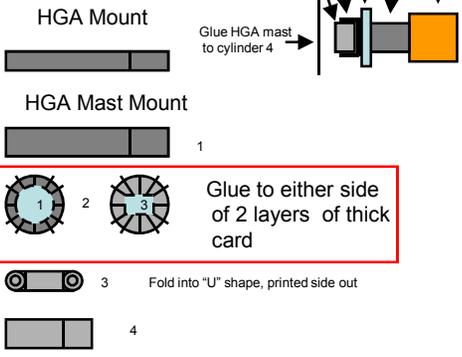


HGA MAST

LGA-align with seam on antenna dish, bend tip forward

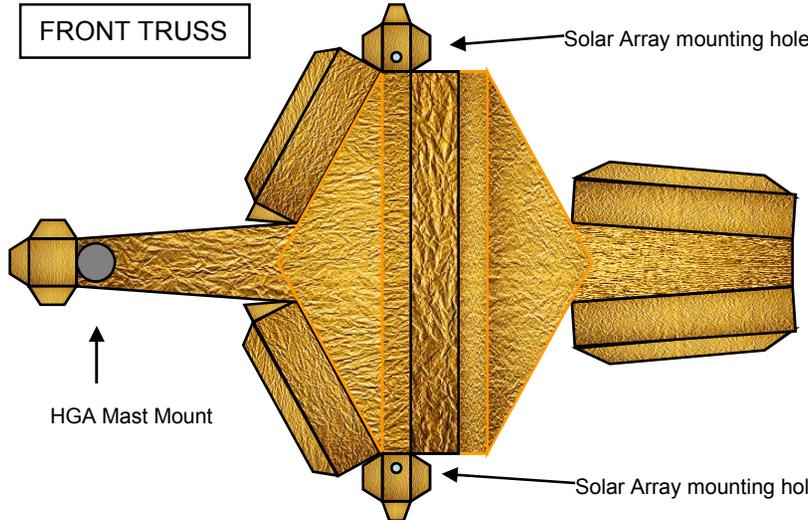


Glue back to back



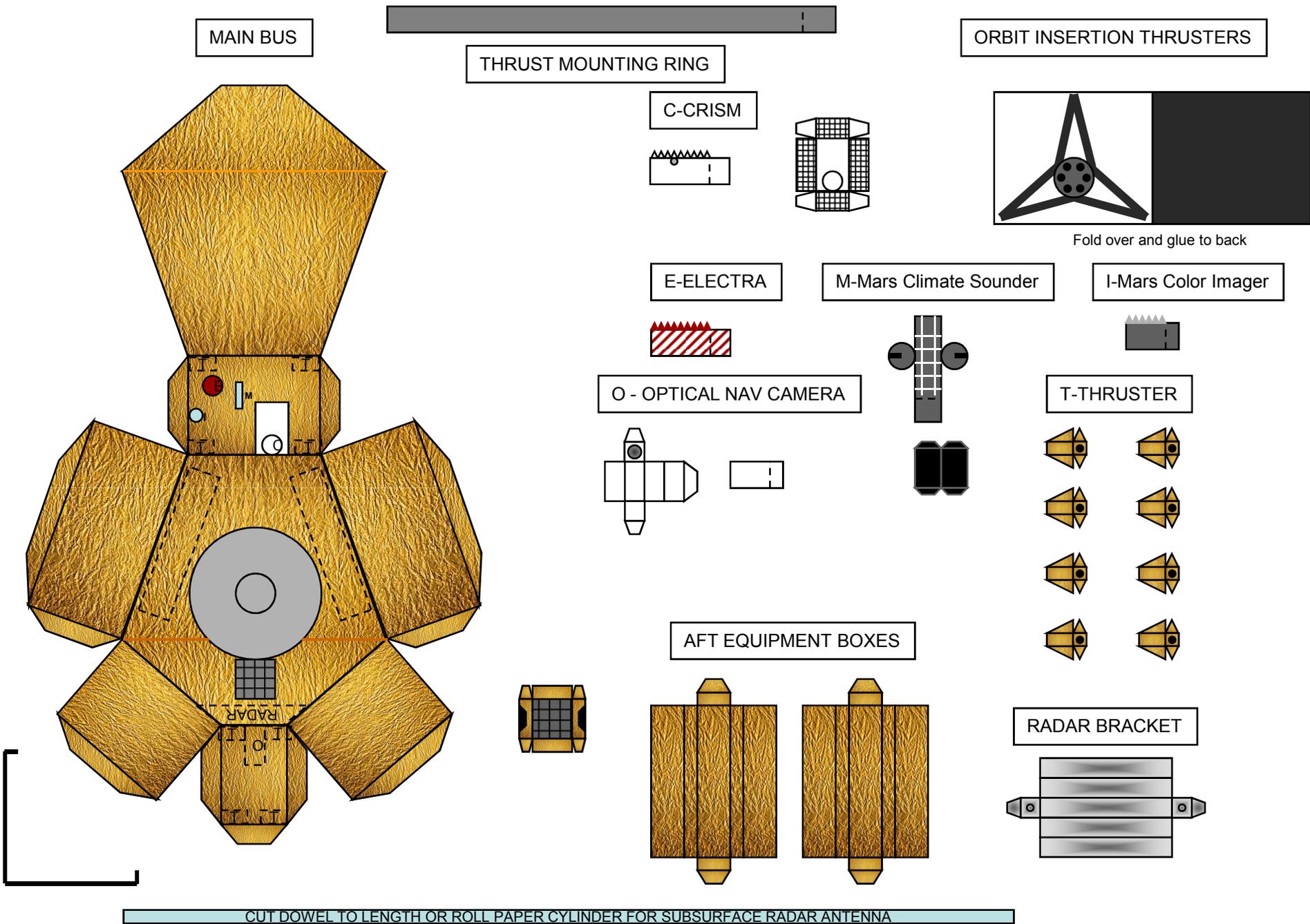
FRONT TRUSS

Solar Array mounting hole



HGA Mast Mount

Solar Array mounting hole



X-CONTEXT CAMERA

S-STAR TRACKER

H-HIRISE

Optics-insert in baffle, trim if needed

cut

Light baffle-roll color inward insert in barrel

Barrel

CONNECTOR TRUSS

All folds mountain folds except as noted

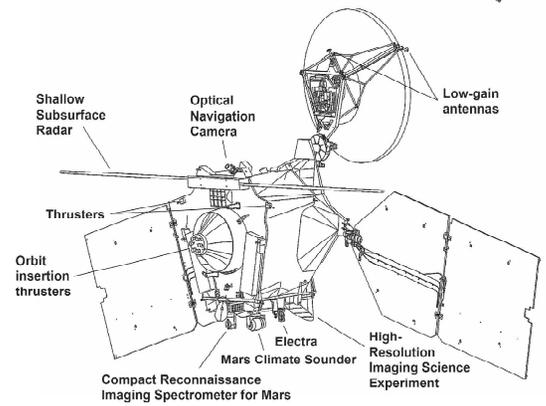
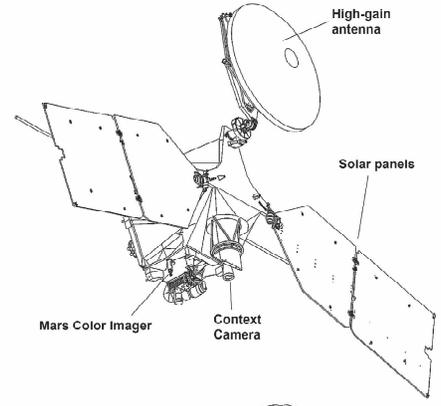
Optional Fold to adjust fit

Valley Fold

Valley Fold

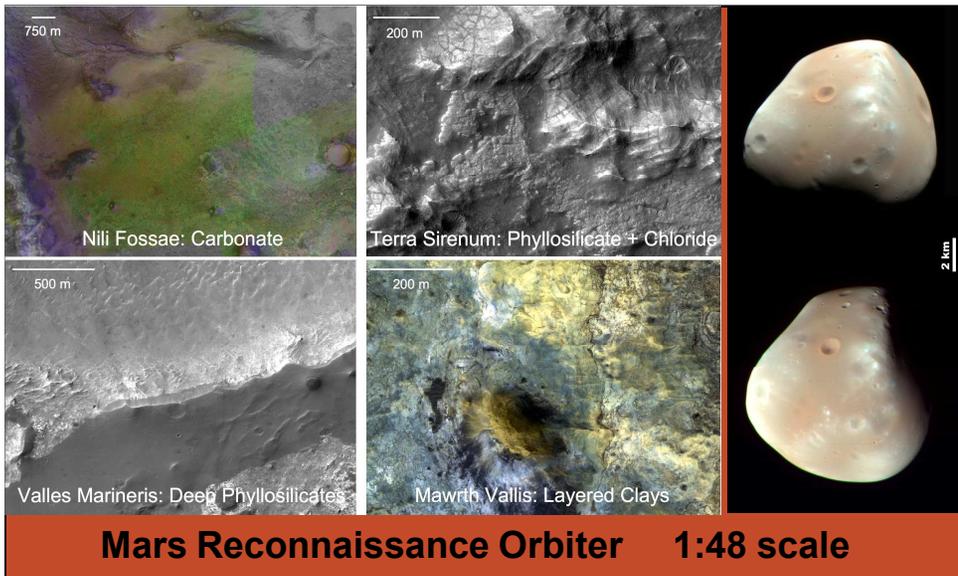
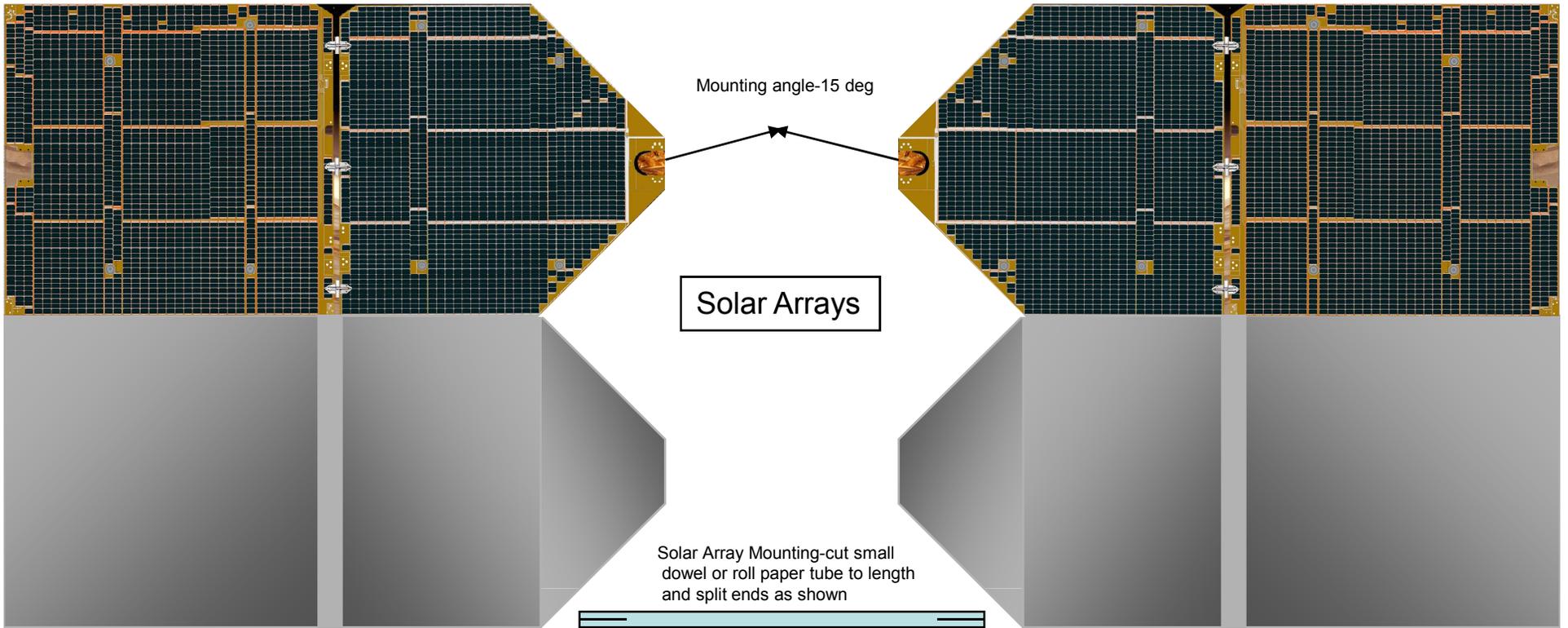
This side to main bus

This side to front truss

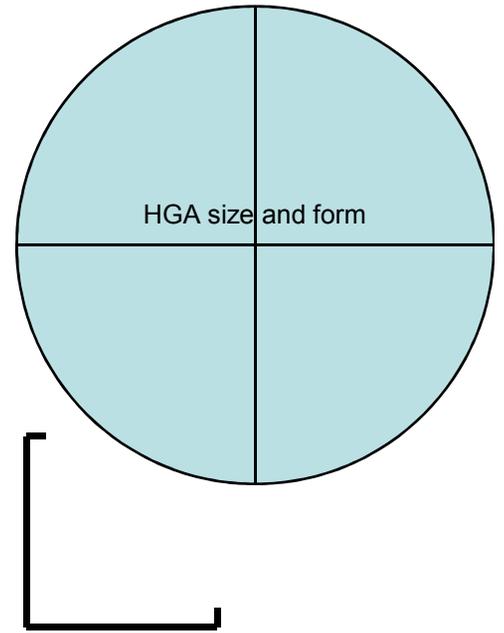
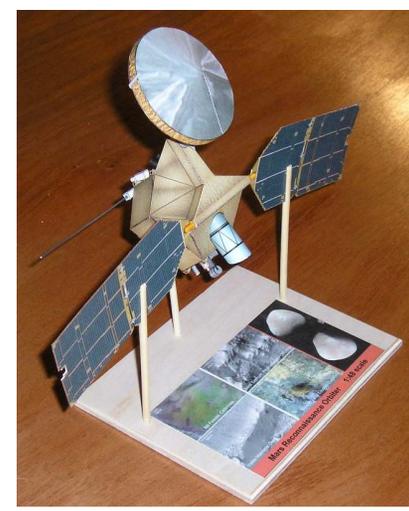


Spacecraft

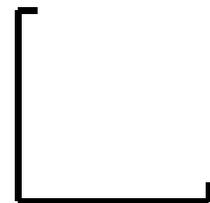
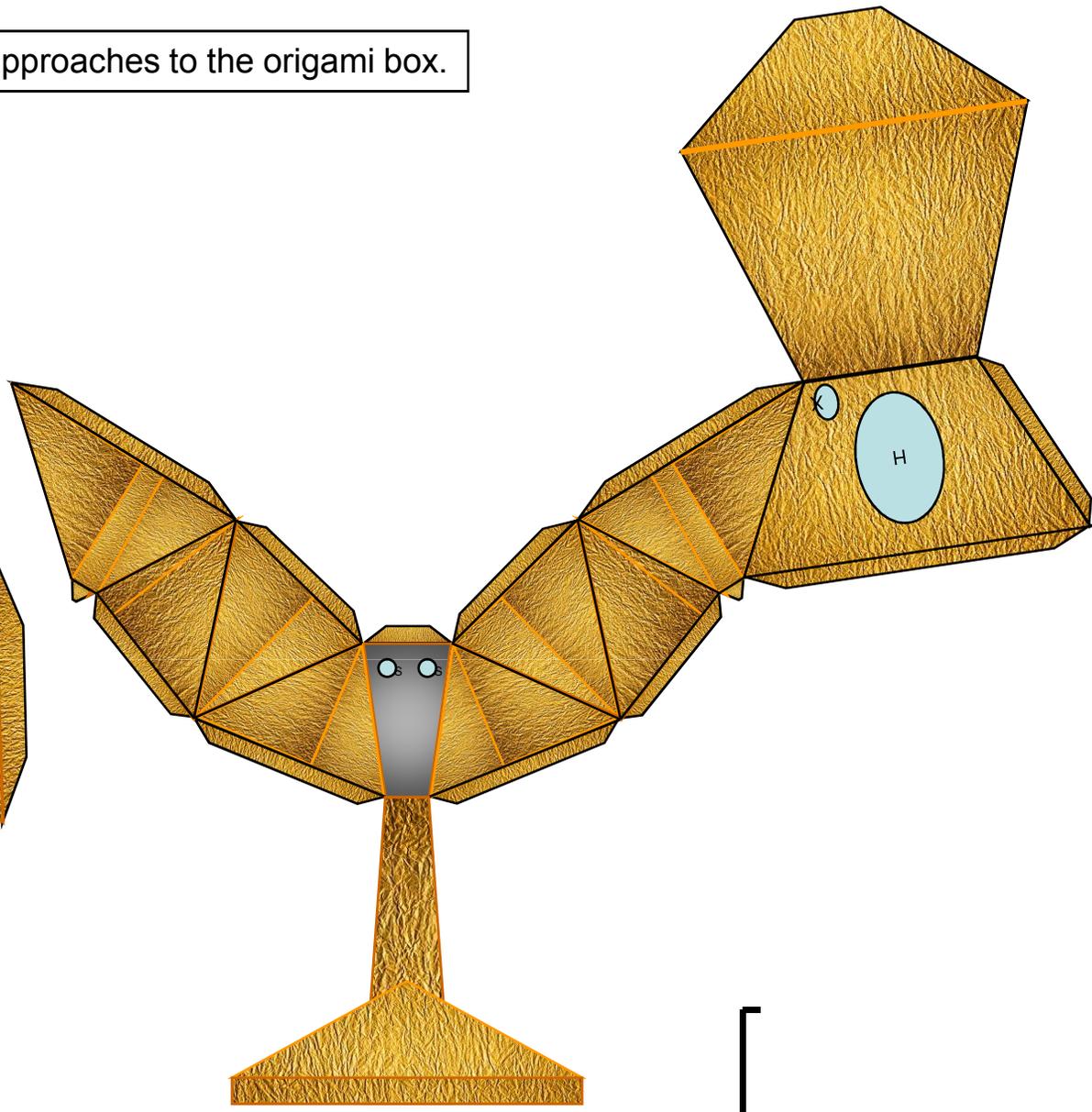
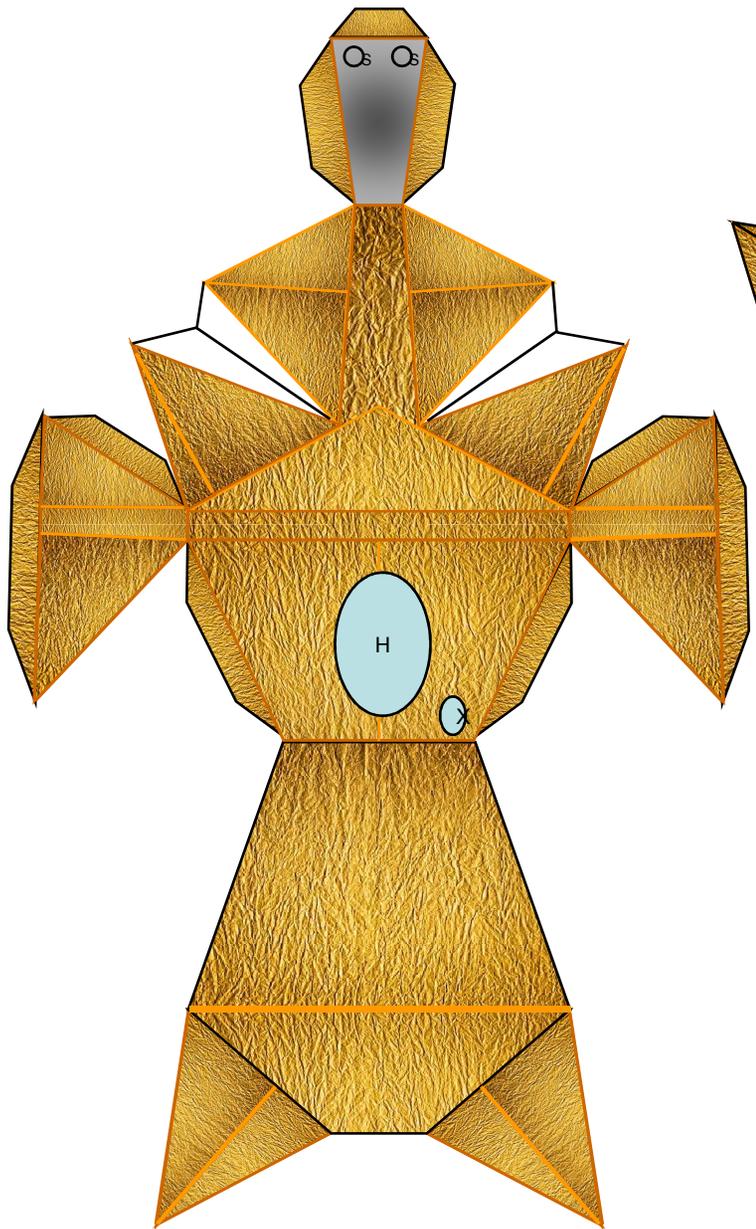
Diagram courtesy NASA – zoom in for more detail



**BASE GRAPHIC**



Alternate connector truss parts – two approaches to the origami box.



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