

GRAVITY PROBE B

1/20th scale space craft model

✦ for ages 12 and up ✦

What you will need

dull knife X-acto knife
sharp scissors scotch tape
glue stick paper hole punch
2 wooden skewers or dowels (9.5" in length)
cutting surface (such as a wooden board)

Helpful Hints

- ✦ Do not cut anything out until instructed to
- ✦ Read all of a section's instructions before beginning
- ✦ Using the dull knife, lightly score all dashed fold lines to make folds as accurate as possible
- ✦ Cut along the light gray lines that border each part
- ✦ Short, thick, black lines mark slots that need to be cut out

— SLIT TO CUT OUT

- ✦ Folding terms



PEAK FOLD



BOOK FOLD

#1 Assembling the Truss Structure

- Cut out the *truss side structure*(pg.2), the *truss side extension*(pg.1) and the *truss bottom*(pg.6).
- Use the dull knife to score along all dotted fold lines.
- Peak fold along all dotted fold lines
- Glue the tab "A" on the *truss side structure* underneath the section marked "A" on the *side structure extension*.
- Glue the tab "B" on the *side structure extension* underneath the section marked "B" on the *truss side structure*.

CHECK: you should now have a ring with 12 triangular sides and 6 narrow triangles protruding from the bottom

- Bring the short sides of the narrow triangles together, matching up the arrows as indicated. Glue the tabs in place.
- Glue the six tabs of the *truss bottom* underneath the long edges of the joined narrow triangles of the *truss side structure*, matching up letters C, D, E, F, G and H.
- Fold down the 6 narrow sections along the top of the completed truss structure. Glue the small triangular tabs (marked with a "+") under the neighboring edges.

#2 Assembling the Dewar

- Cut out the *dewar side pieces*(pg.1) and the *dewar top*(pg.2).
- Punch out the 4 small circles on the *dewar side pieces* with a hole punch. Cut out the eight slits as indicated.
- Glue tab A of the 1st piece behind the edge of the second piece marked A.
- Glue tab B of the 2nd piece behind the edge of the first piece marked B.

CHECK: you should now have a cylinder with 4 holes punched near the top, four vertical slits and four horizontal slits.

- Use the dull knife to score along the top of the triangular tabs of the *dewar top*.
- Glue tab C of the *dewar top* behind the edge marked "C".

CHECK: you should now have a cone with a small opening on top with two tabs and a ring of triangular tabs around the bottom.

- Fold the triangular tabs down and the two tabs at the top of the cone up.
- Slide the cone up through the bottom of the *dewar side* cylinder.
- Adjust the *dewar top* so that the black arrow on its side lines up with the light gray arrow on the dewar side piece.
- Carefully tape the triangular tabs to the inside of the *dewar side*.

#3 Assembling the Equipment Pallets

- Cut out the *equipment pallets*(pg.3)
- Score along the fold lines with a dull knife.
- Fold the sides down as shown.
- Coat the blank side of the tabs with glue.
- Insert the tabs into the vertical slits marked "EP" on the dewar
- Fold the tabs down and tape them to the inside of the dewar.

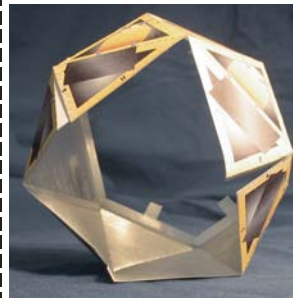
#4 Connecting Dewar to Truss Structure

- Apply glue to the down-ward facing side of the 4 tabs on the *truss structure*.
- Insert the 4 tabs on the *truss structure* (marked i,ii,iii and iv) into their corresponding slots on the dewar.
- Using a pair of long tweezers or the eraser end of a pencil, reach through the *dewar top* opening and fold these tabs down inside the dewar. Hold them in place for at least 30 second to help the glue bond.

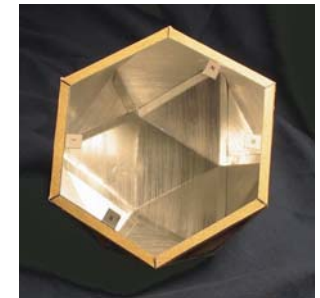
#5 Assembling the FEE Base

- Cut out the *FEE bottom*(pg.2) and *FEE side*(pg.4).
- Score along the bottom of the *FEE bottom*'s triangular surface and cut out the two slits.
- Insert the two top tabs of the *dewar top* (A & B) through the *FEE bottom*'s matching slits. The *FEE bottom* piece should be print-side-down. Fold the *dewar top* tabs down and tape them flat
- Fold the *FEE bottom* triangular tabs up and apply glue to the outer surface.
- Wrap the *FEE side section* around the tabs and glue it to itself.

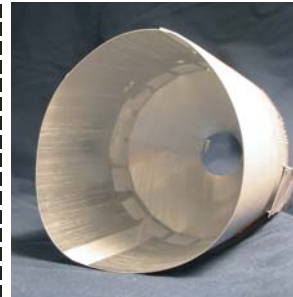
CHECK: The FEE side section should have 4 tabs pointing up. The small white arrow on the bottom of the side section should line up with the matching arrow on the FEE bottom.



STEP 1e- truss walls form a hexagonal ring.



STEP 1h- completed truss structure.



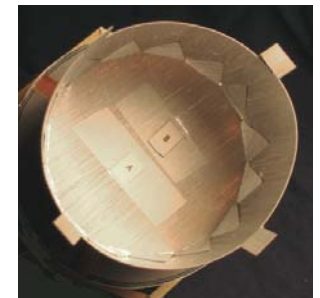
STEP 2i- taping the dewar top to the dewar sides



STEP 3f- adding pallets to the outside of the dewar



STEP 5e- truss, dewar and FEE all assembled.



STEP 5e- looking down inside the assembled FEE.

#6 Assembling the Sun Shield

- Cut out the *sun shield* (pg.3), the *sun shield top frame* (pg.3) and the *frame supports* (pg.3).
- Cut out the two slits on the *sun shield*.
- Roll the *sun shield* into a long narrow cone and glue the long tab underneath it opposing edge.
- Fold the *frame supports* in half.
- Insert the *frame supports'* white tabs into the slits at the large opening of the *sun shield*.
- Fold back the rectangular tabs and tape them flat against the inside of the *sun shield*.
- Fold the *frame support's* gray triangular flaps out horizontally.
- Fold the small triangular flaps on the *sun shield* mouth outward.
- These 6 flaps form the contact base for the *sun shield top frame*. Coat each flap with glue then press the *sun shield top frame* on top. The small blue squares go over the two sunshade opening flaps.

#7 Assembling the top Vehicle Assembly

- Cut out the *FEE top cover* (pg.3) and *FEE V Struts* (pg.6).
- Cut out all the slits on the *FEE top cover*.
- Insert the 2 tabs on the assembled *sun shield's* narrow end into the two slits on the top half of the *FEE top cover* (match up A to A and B to B).
- Fold down the tabs and tape them flat against the blank side of the *FEE top cover*.
- Insert the 4 tabs on top of the *FEE Base* into the 4 slits on the bottom half of the *FEE top cover*.
- Fold down the tabs and tape them flat against the blank side of the *FEE top cover*.

CHECK: The TEE base should be positioned over the dashed circle on the bottom half of the TEE top cover. The small white arrow near the top edge of the TEE base should line up with the arrow on the dashed circle.

- Insert the top tabs of the *FEE V Struts* into the small slits in the bottom half of the *FEE top cover*. The slits are marked V1 through V4.
- Fold these tabs down against the blank side of the *FEE top cover* and tape them flat.
- Carefully apply glue to the entire blank surface of the *FEE top cover*. Fold along the joined edge between the top and bottom halves of the *FEE top cover* and align the matching edges before pressing the pieces together.
- Fold back the bottom tabs of the V-struts. Apply glue to the surfaces marked with a "*". Press these tabs against the conical section of the dewar top.

CHECK: The V-struts should be stretched vertically between the dewar and the FEE Top.

#8 Assembling the Forward Thrusters

- Cut out the *forward thrusters* (pg.6).
- Score along the fold line with a dull knife.
- Coat the entire blank surface of the part with glue.
- Fold the *forward thrusters* in half along the folding line. Press the part flat.
- Cut out the slits as indicated.
- Slide each thruster, folded edge down, into the slots marked "T" on the *FEE top cover*.

#9 Assembling the Solar Panels

- Cut out the 8 *solar panels* (pg.4 & 5).
- Cut the 2 pieces of doweling or skewers sticks down to 9.5 inches in length. These are the *solar panel support rods*.
- Make a small mark 3 inches from each end of the 2 *support rods*.
- Coat the blank surface of one *solar panel* with glue.
- Place one end of a *support rod* in the middle of the *solar panel*, with the three inch mark on the *support rod* lined up with the edge of the part.
- Carefully place another solar panel over the rod, matching up with the edges of the panel below, then press flat.

CHECK: The solar panel should have approximately 6.5 inches of rod protruding from the edge indicated.

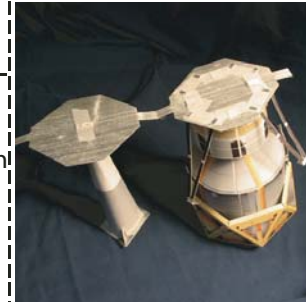
- Insert the bare end of the *support rod* into one of the punched holes in the side of the dewar and out through the opposing punched hole.
- Follow steps "d" through "f" and glue a second set of *solar panels* over the protruding end of the *support rod*.
- Follow steps "d" through "h" to create and insert the second set of solar panels.

CHECK: There should be two sets of solar panels, perpendicular to each other. These should swivel freely on their support rods.

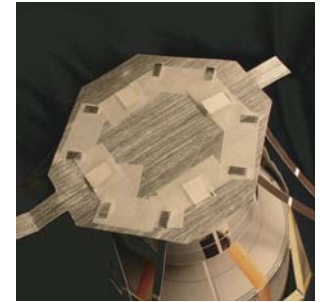
#10 Assembling the Model Base

- Cut out the *model base* (pg.6).
- Lightly score along the center fold line.
- Coat the blank side of the piece with glue. Fold the base in half along the fold line, lining up the tab edges.
- With the text side facing out, roll the strip into a short cylinder. Glue the blank white tab underneath the opposite edge.
- Fold the tabs in towards the center of the cylinder.
- With the tabbed edge facing up, place the model on top of the cylinder.
- Turn the model over.

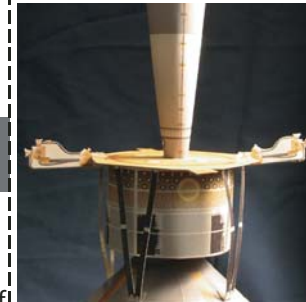
- Position the three tabs over the three corners of the truss structures's bottom triangle.
- Tape the tabs in place.
- Turn the model right-side up and place on desk.



STEP 7h- vehicle top ready to fold and glue



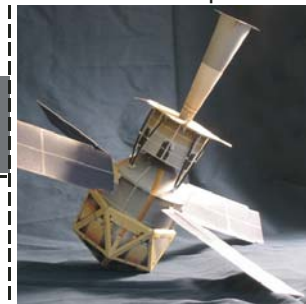
STEP 7h- close-up of tabs on the FEE bottom half.



STEP 8f- completed FEE with thrusters in place



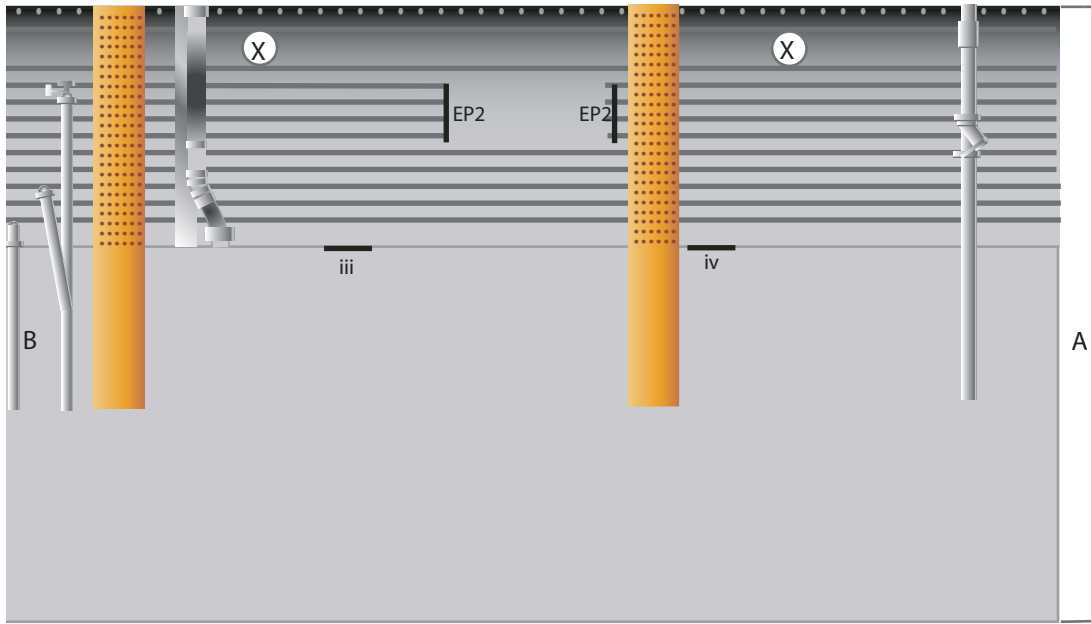
STEP 9h- first solar panel in place.



STEP 9i- completed model

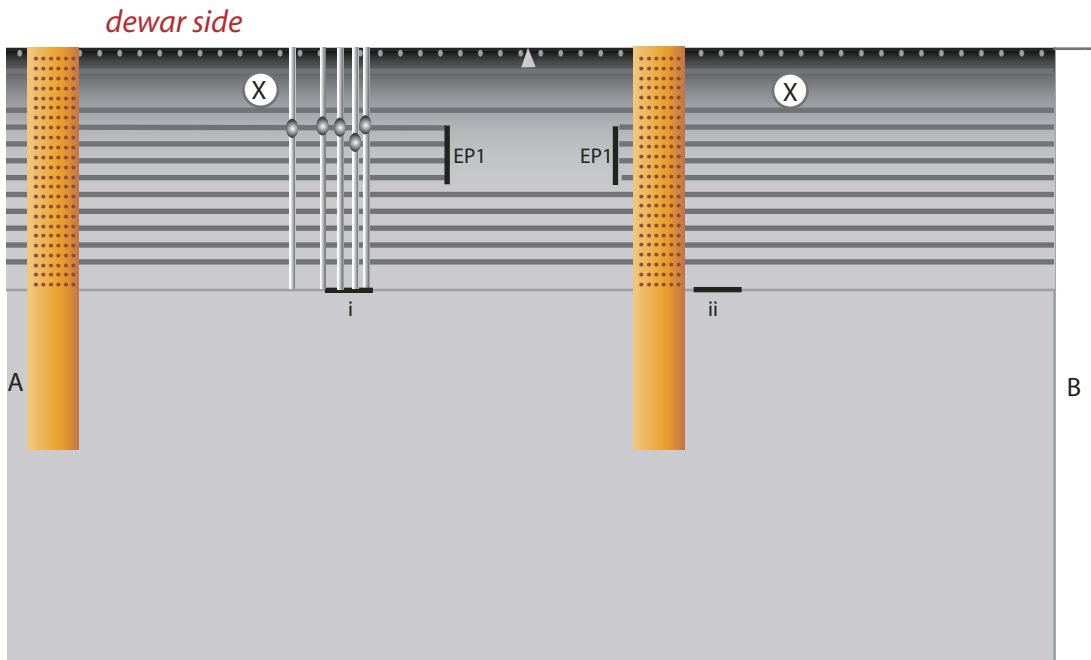


STEP 10i- model base mounted to the model

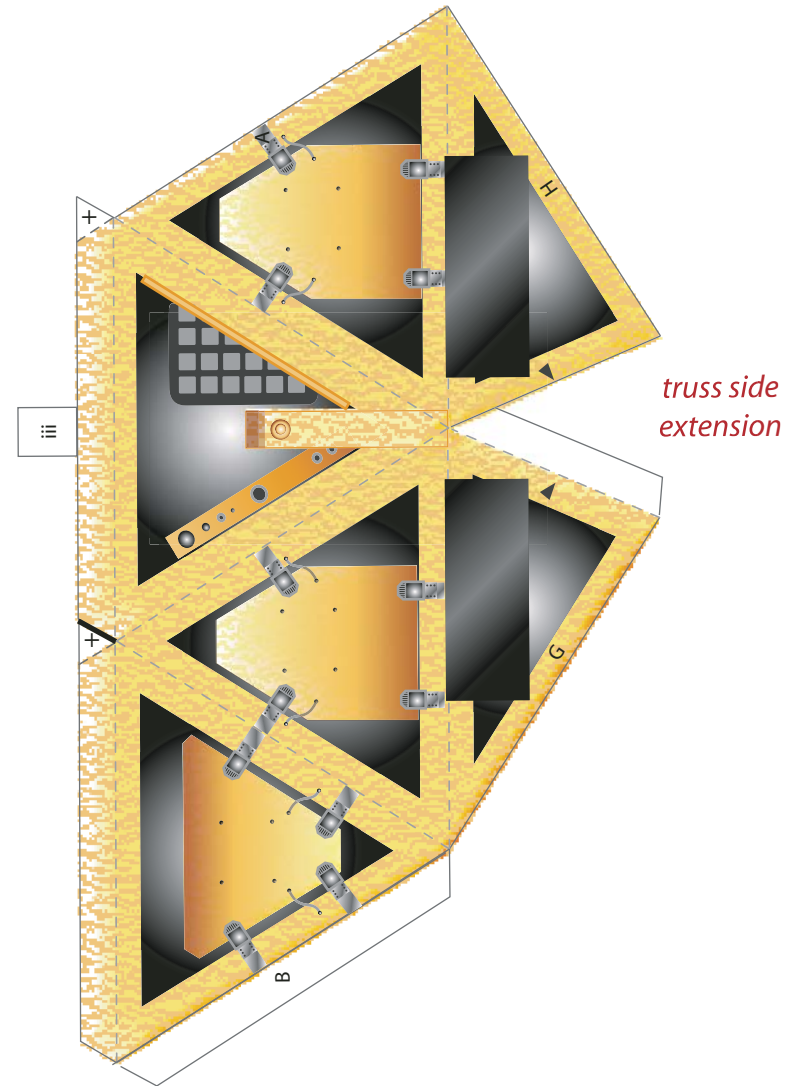


dewar side

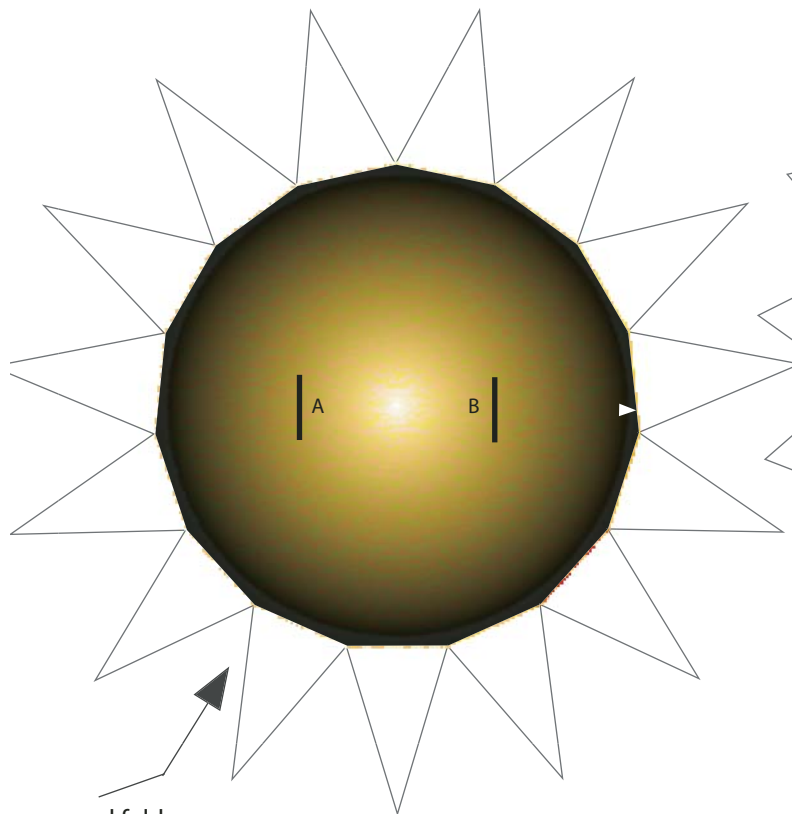
PUNCH OUT HOLES (X)



dewar side

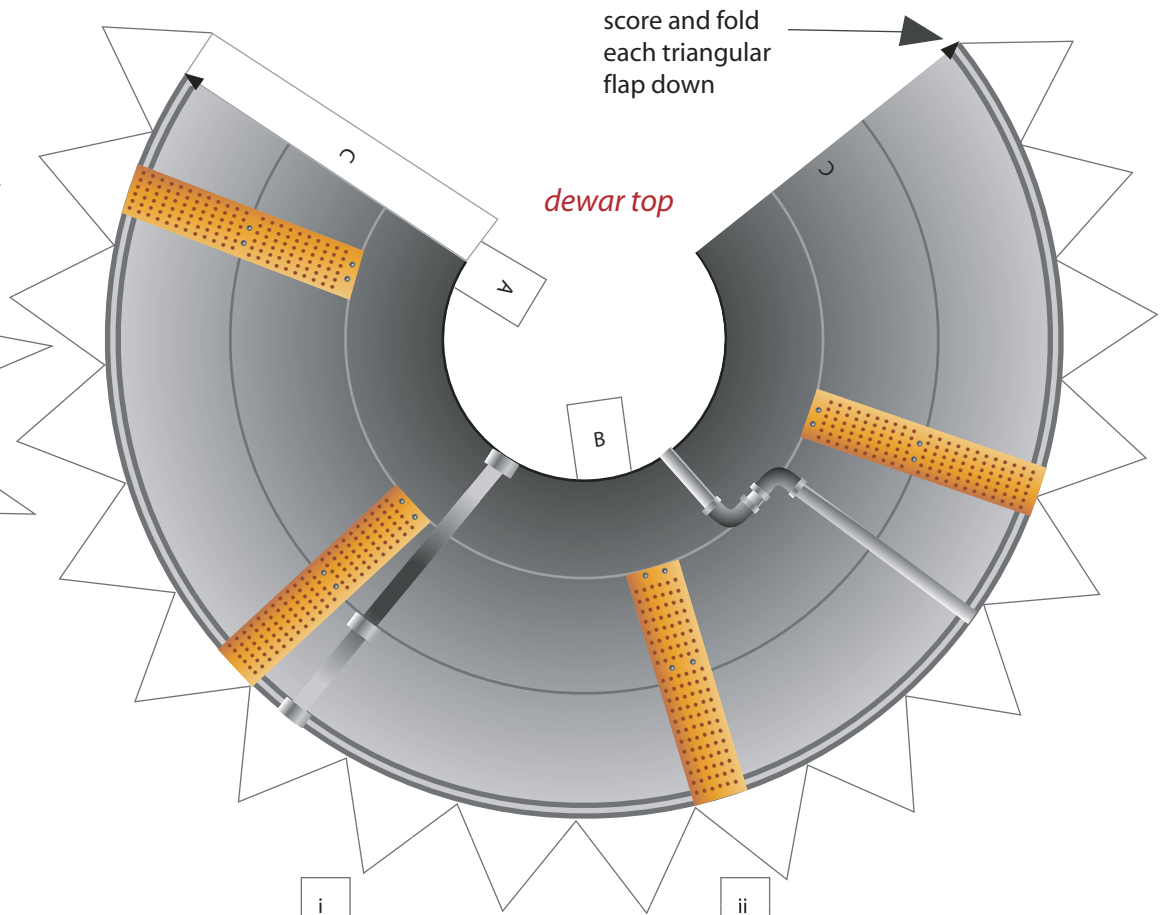


truss side extension



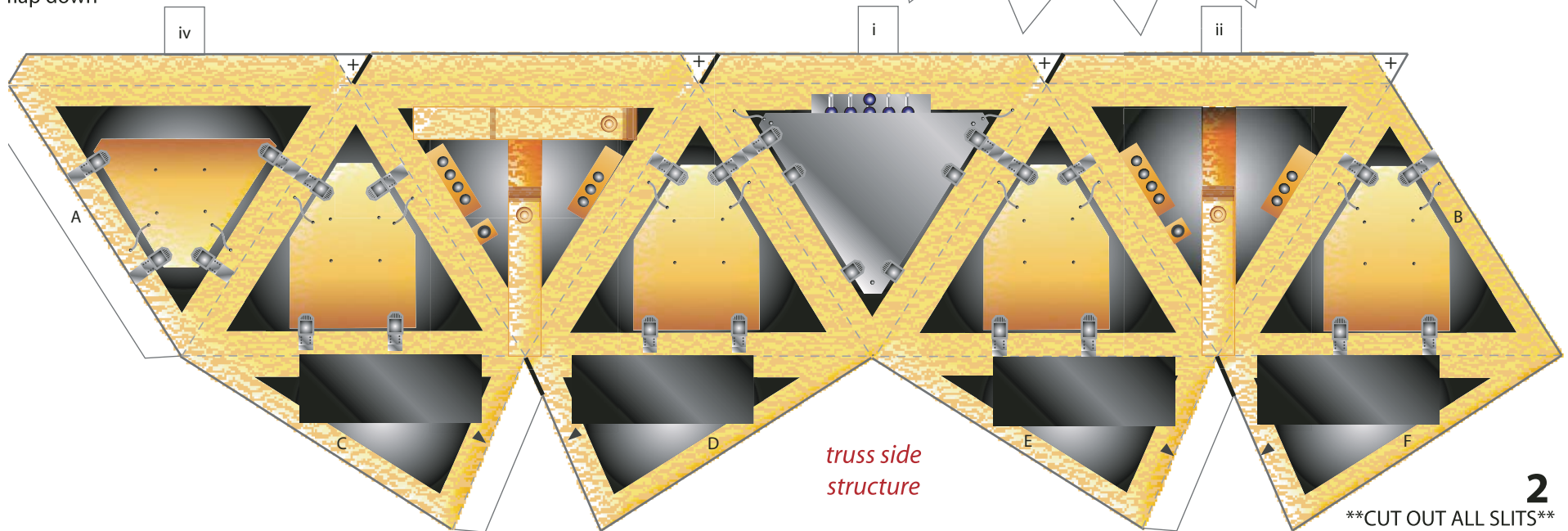
score and fold
each triangular
flap down

FEE bottom



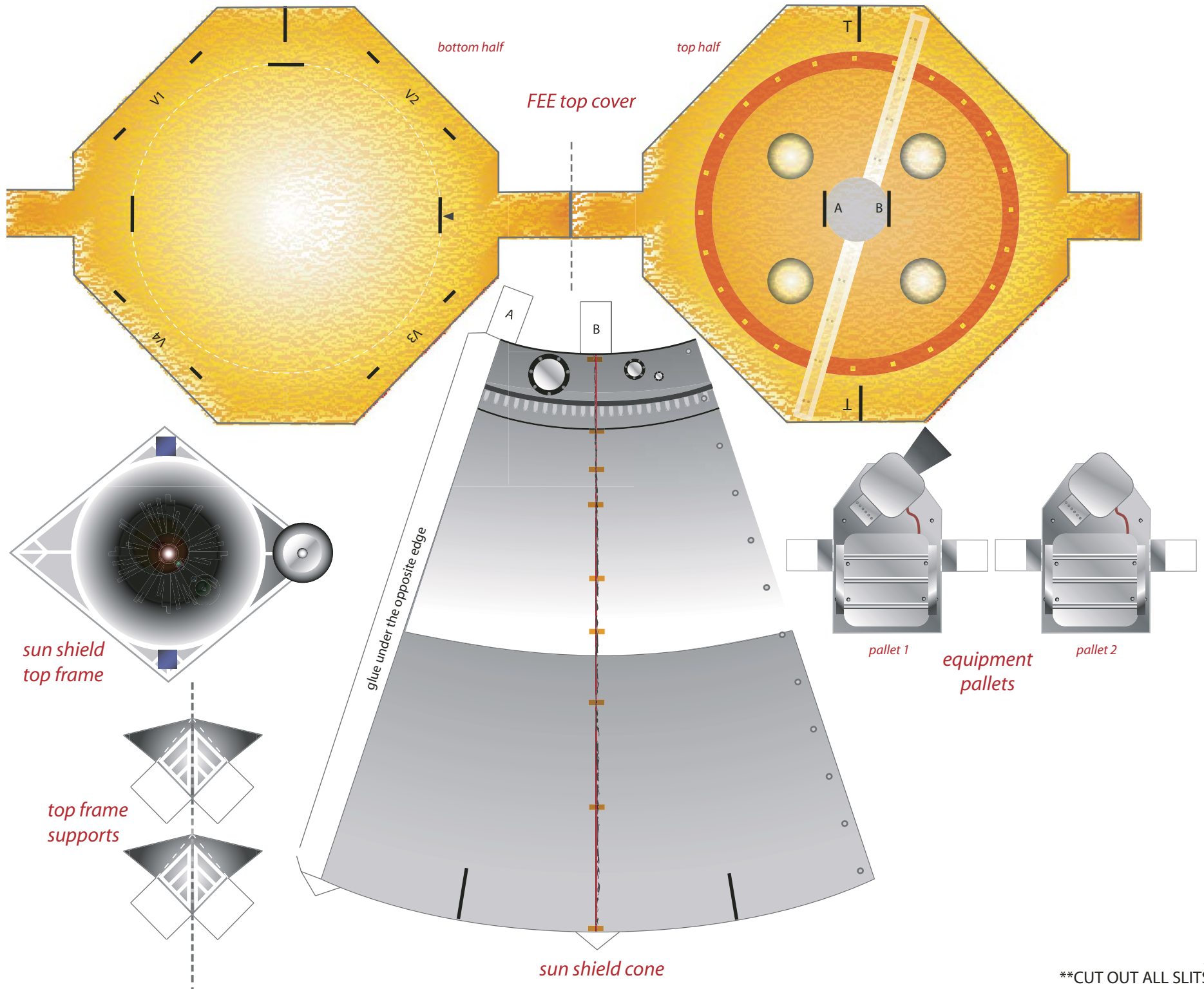
score and fold
each triangular
flap down

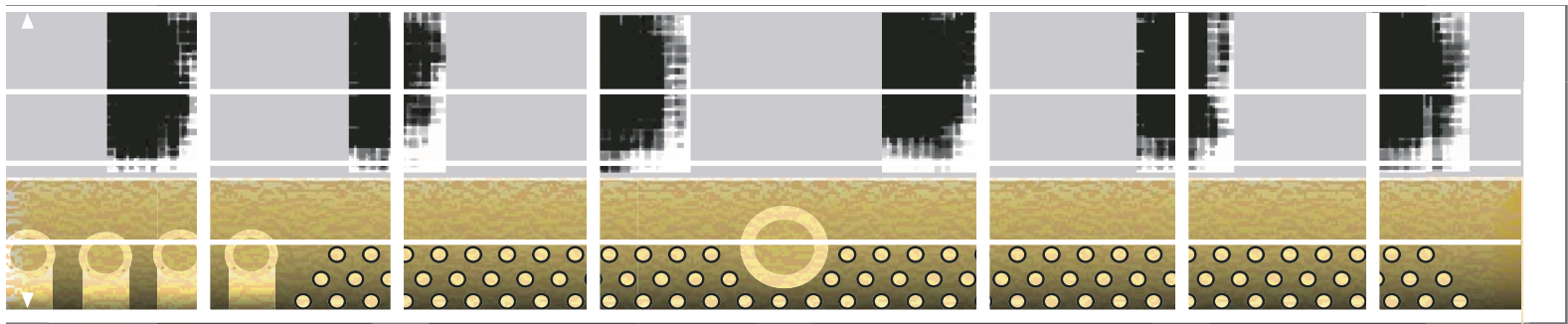
dewar top



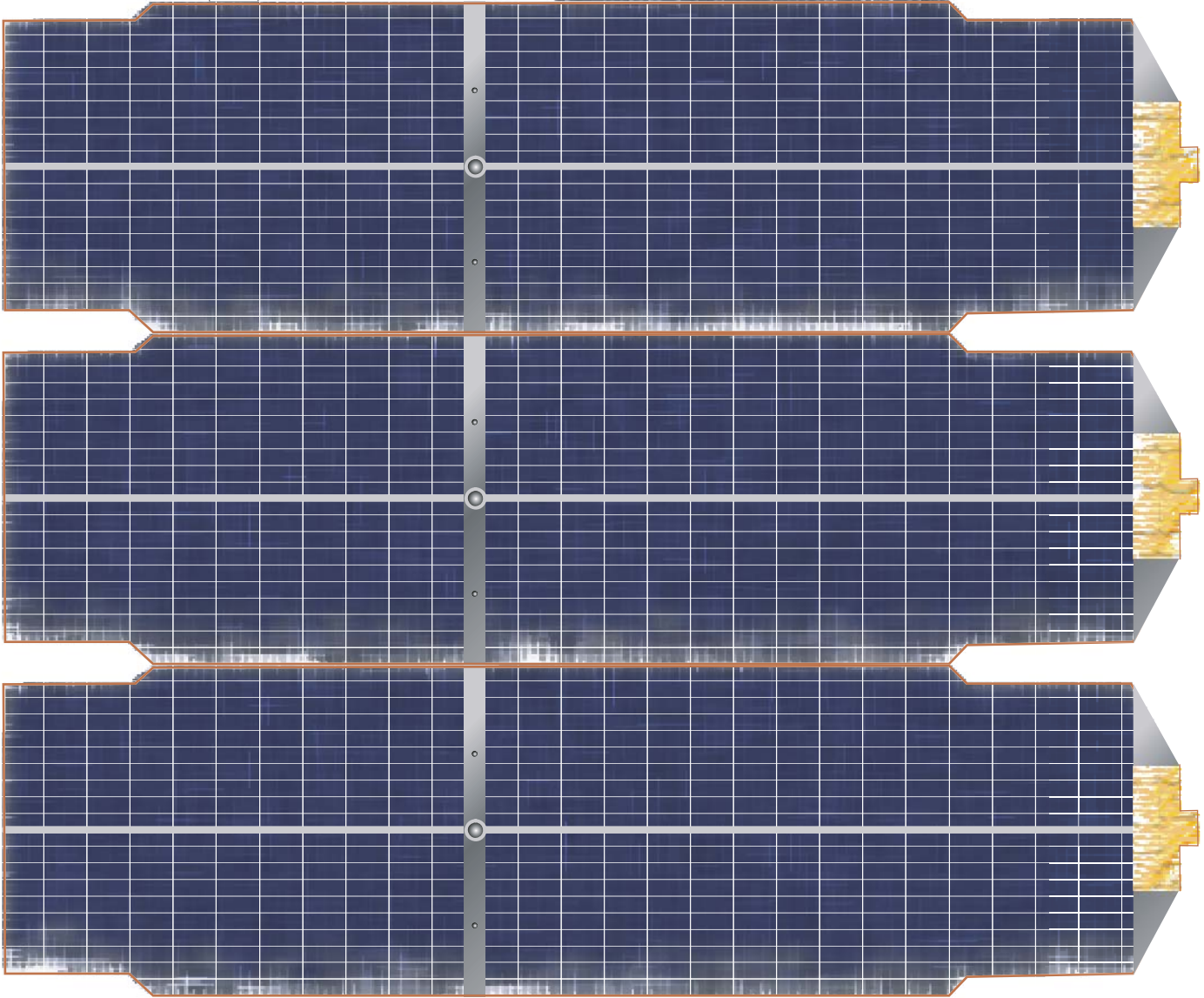
*truss side
structure*

2
CUT OUT ALL SLITS

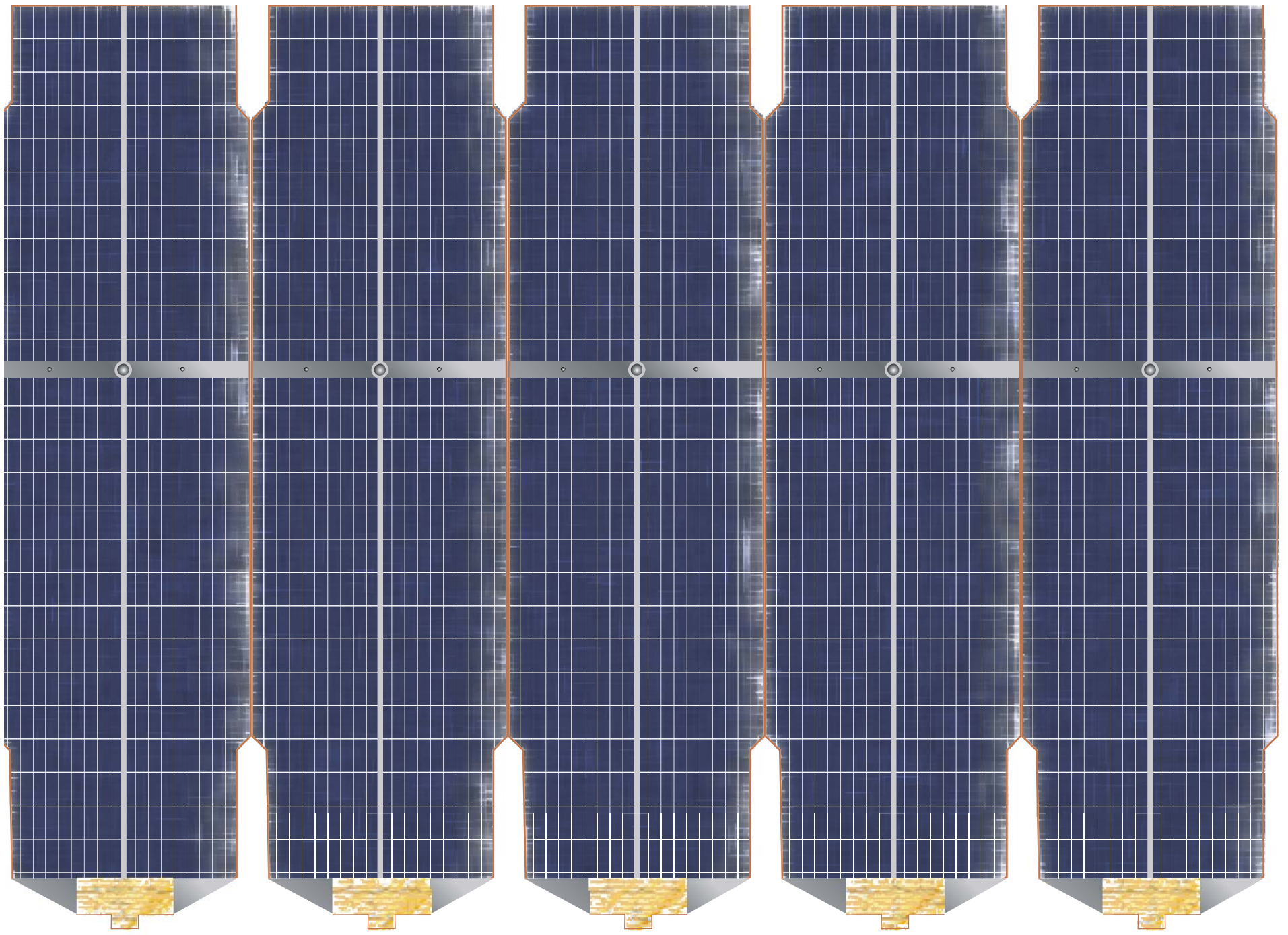




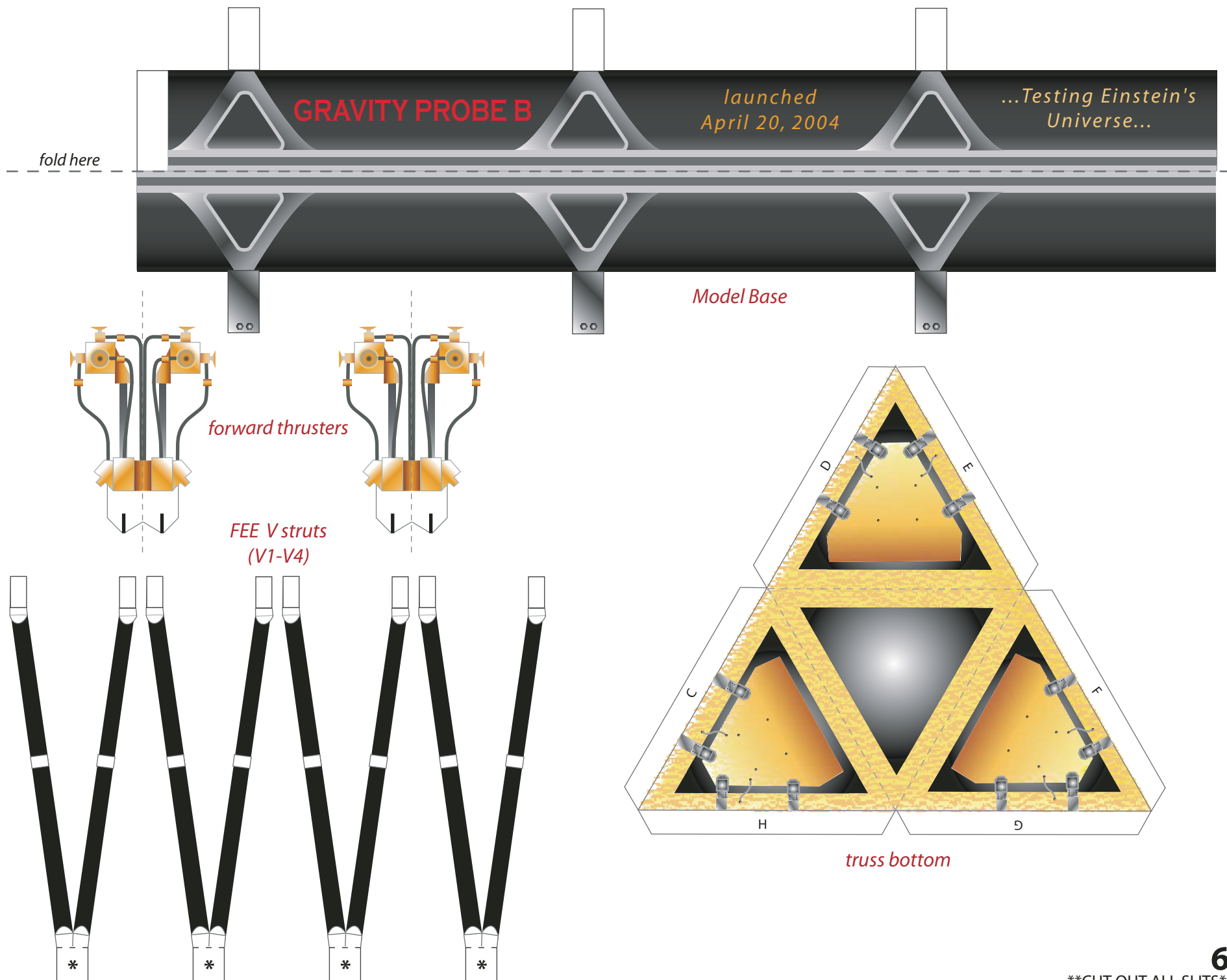
TEE side surface



Solar Panels



Solar Panels



GRAVITY PROBE B

launched
April 20, 2004

...Testing Einstein's
Universe...

fold here

Model Base

forward thrusters

FEE V struts
(V1-V4)

truss bottom