

# Advanced Composition Explorer (ACE) Paper Model

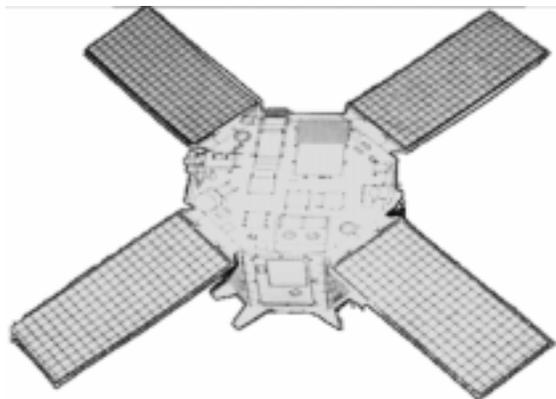
## INSTRUCTIONS for BEGINNERS

### BEFORE YOU BEGIN:

- Read through all the instructions (to avoid surprises).
- Assembly should take less than one hour to complete.

### YOU WILL NEED:

- Two (2) sheets of cardstock ( $\geq 60$  lb. bond) -- may be labeled as "cover weight". (If you don't have any cardstock, just print the model on regular paper and then glue the pieces to an empty, flattened cereal box or some other thin cardboard.)
- A good ruler;
- A comfortable pair of scissors;
- A glue stick, or another form of low-moisture glue (white glue causes parts to buckle and takes a long time to dry);
- An adult's supervision.

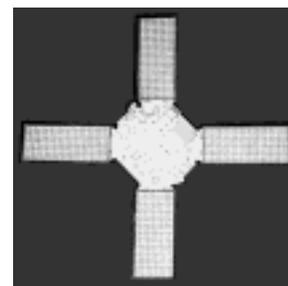


### A NOTE ABOUT THE INSTRUCTIONS:

- You will find references to "+X," "+Y," "-Z" and the like all through the instructions. These letters are the labels that spacecraft scientists and engineers use instead of "top," "bottom," "left," "right," and other terms that are more familiar to us. This is what they will mean to us when we put the model of ACE together:
  - X: As you can see on the parts sheets, the x-axis passes through the side panels labeled "+X" and "-X."
  - Y: The same thing goes for the y-axis: it passes through the side panels labeled "+Y" and "-Y."
  - Z: The z-axis is the most important for us here: it is the "spin axis" of the satellite (meaning the spacecraft spins around with that line in the middle). +Z is the top of the satellite, and -Z is the bottom.
- If we refer to a location that isn't exactly on an axis, like the side panels between +X and +Y, we will use a "coordinate system" that looks like this: +x,+y. This is similar to compass directions -- if you're going in a direction between north and west, you're going northwest.

### THE INSTRUCTIONS:

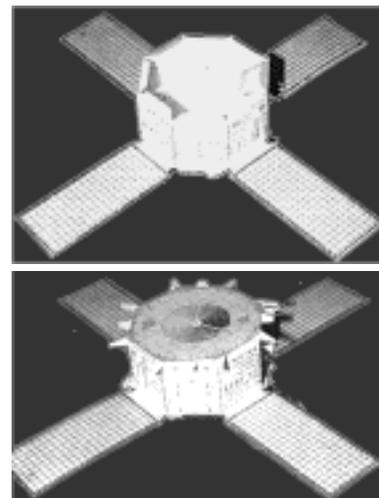
1. Print out the model pieces (found in a separate file) on cardstock. PLEASE NOTE: If you're using regular paper glued to cardboard, follow the instructions below, starting at step 4.
2. Cut out both +Z (top) panel pieces and glue them together with the printed sides out, so that all the edges match up -- there are some weird shapes on the -x,-y side that can serve as a guide. (It's a good idea to have a sheet of scrap paper underneath your work, so that glue doesn't get all over the place.)
3. While the top panel is drying, cut out the two pieces of the -Z (bottom) panel. Glue them together with the printed sides out, so that all their edges match up. The balloon shapes on the inside piece represent large tanks of fuel, which are propped up on a pyramid-shaped base (represented by the big x-shape). The tripod shape on the outside bottom piece represents the antenna that ACE uses to "talk" to scientists back on Earth -- sending back the data that the satellite has collected, and receiving instructions from Earth on what to do next.



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4. For paper glued to cardboard: first glue the top +Z panel to the cardboard, then cut it out. Now you can match up the bottom +Z panel and glue it on. Repeat this with the -Z panels. Let these dry as you go on to step 5.
5. While the bottom panel is drying, score the lines between the gray tabs and the side panels, and also the lines in between each side panel. (It's a little easier to do this before cutting out the pieces.) To "score" a piece, use a ruler and an empty ball-point pen to make an indentation in the paper -- this will make the piece easier to fold and better-looking in the end.
6. Cut out the side panels, fold along your score lines, and then glue the side panel piece together at the end to make an octagonal (eight-sided) ring.
7. Use your glue stick to make a ring of glue where the dotted line-shapes are, on the inside faces of the top panel. These shapes show you where to glue the tabs from the side panels. The tabs all have labels on them corresponding to labels on the shapes, so that the side panels are all lined up the way they are on the real satellite. Glue the panels in place, then repeat the process with the bottom panel.
8. Cut a piece of string about half a meter (18 inches) long, and tie the ends together to make a loop. Then slip an end of the loop under two opposite solar panels, hold the remaining string in your hand, and tie a knot at that point. You can now hang the model up by that point.



The finished model, with lines indicating how string can be tied to hang the model.

Once you've finished this model of ACE, you may want to consider some of the other satellite and spacecraft models available on the Internet. Two great sites to start at are:

The SciKits free model homepage at:  
<http://www.scikits.com/free.html>

and NASA's SpaceLink site at:

<http://spacelink.nasa.gov/Instructional.Materials/Curriculum.Support/Technology/Models/.index.html>

