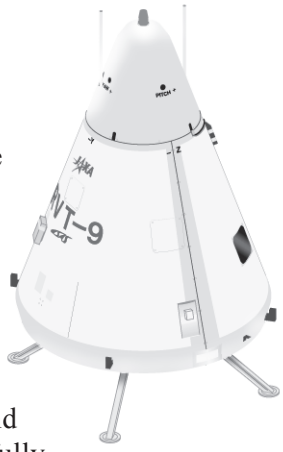
CURRELL GRAPHICS

Assembly instructions for the RVT



History

The RVT is a rocket-powered reusable test vehicle developed by JAXA, the Japan Aerospace Exploration Agency (formerly the Institute of Space and Aeronautical Science). While not itself designed for space flight, it is being used as a low-cost testbed for technologies that could be used on future SSTO (Single Stage to Orbit) spacecraft. It is similar in concept to, though smaller than, the cancelled Delta Clipper demonstrator flown by the USA.

The RVT was developed in the late 1990s, and first flew in March 1999 at the Noshiro Testing Centre in Honshu. It stands 3.6 metres high and has a dry (excluding fuel) weight of 500 kilograms. Lifting power is provided by a liquid oxygen/liquid hydrogen rocket motor, and nitrogen thrusters allow attitude control. It takes off and lands vertically, and is capable of fully automated flight. The vehicle is renumbered incrementally (RVT-1, RVT-2, etc.) as improvements are made.

As a demonstrator, endurance and altitude are modest (the flight on October 31, 2003 lasted 17 seconds and reached an altitude of 42 m), but are sufficient to gain experience with the handling and reuse of a hydrogen-fuelled rocket, and the vertical landing of a rocket-powered vehicle. The lessons learned from the RVT program are an important step toward the design of a true reusable spacecraft.

The Model

This model is a 1:32 scale replica of the RVT-9 as it appeared during flight tests in October 2003. A word of caution: this model is not suitable for assembly by young children, due to the use of sharp tools and the complexity of some assembly steps. Previous experience with card modeling would be helpful. If you have any comments or suggestions regarding this kit, I can be reached by e-mail at models@currell.net

Model parts are contained in the document **rvt_parts.pdf**. Print out the parts document on 8.5"x11" or A4 size white paper card stock suitable to your printer. 67 lb. cover stock (approx. 8.5 thousandths of an inch or 0,2 mm thick) is recommended.

Tools

Before beginning, you will need the following tools and materials:

a) a sharp knife for cutting
b) a flat cutting surface
c) a ruler or straight edge
d) white glue
e) a scoring tool or blunt knife for creasing the fold lines
f) a glue applicator such as wooden toothpicks or a small paintbrush
g) (optional) 0.025 inch (0,7 mm) wire or tubing

Hints

a) Select a well-lit, comfortable work area that will remain undisturbed when you are not there.
b) Keep your hands and tools clean when working, to avoid getting glue on visible parts of the model.
c) It's easier to stay organized if you only cut out those parts you need for each step.
d) Make sure your knife is sharp. When cutting straight lines, use a straight-edge.
e) Study the diagrams carefully, and always test-fit the parts before applying glue

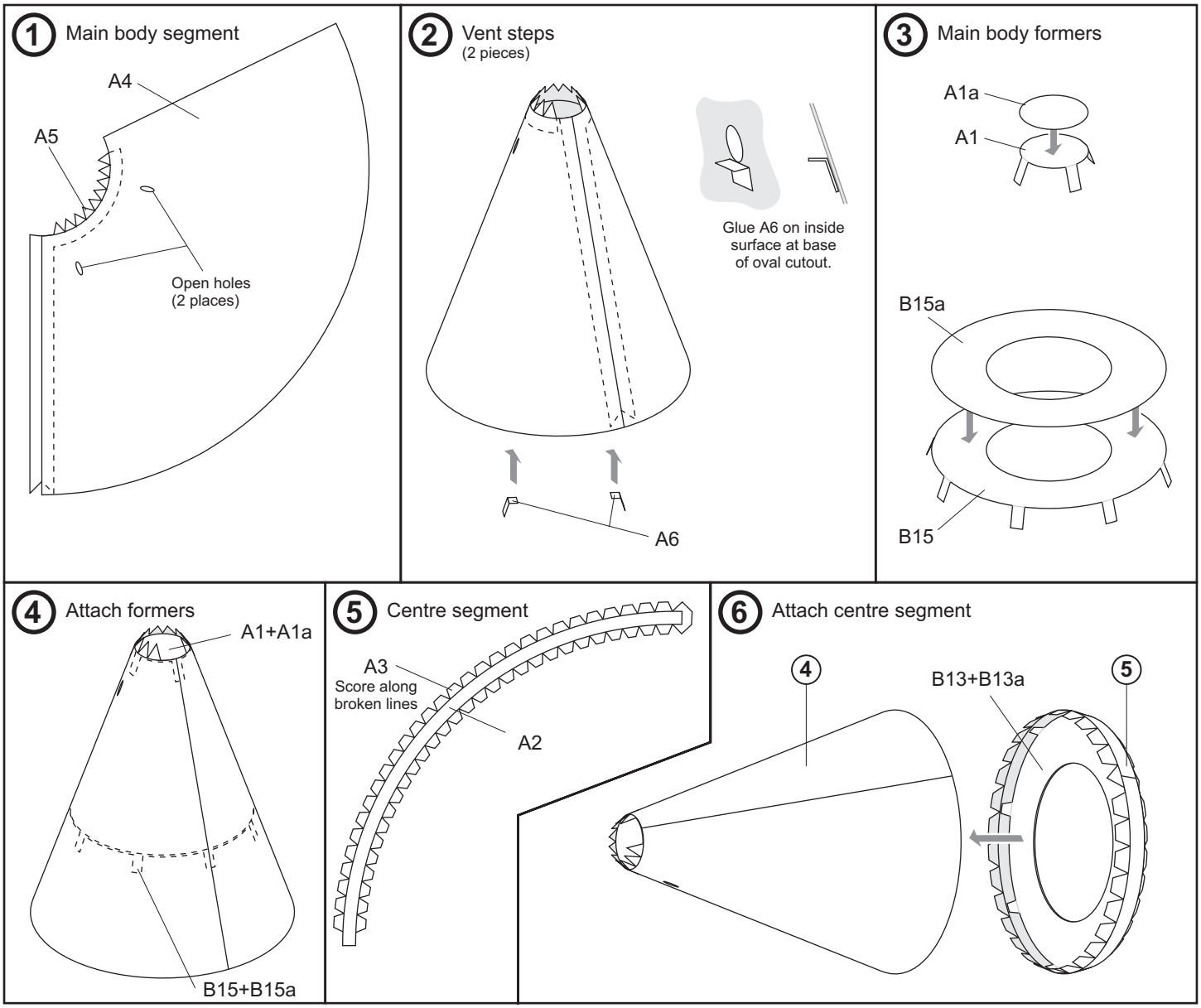
Assembly

In these instructions, the directional terms "top" and "bottom" refer to the rocket standing vertically. Scoring of parts is indicated by thin black lines outside the part's outline, and by dashed or shaded lines on the part's surface. Score parts *before* cutting them out. In the diagrams, subassemblies are identified by a number within a circle (e.g. ②), corresponding to the step in which it was assembled.

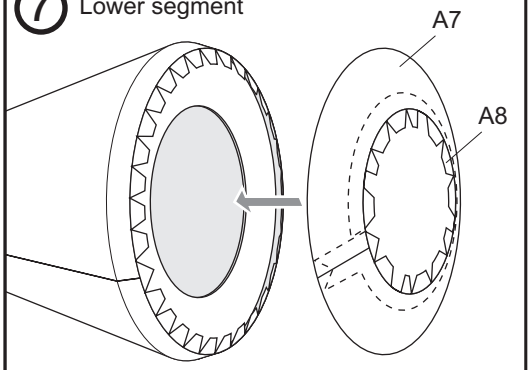
Assemble the main body segment. Cut out the body surface A4, ensuring the two small oval holes are opened, then glue the connecting strip A5 to the inside of the surface (**step 1**). Roll the segment and glue together so that the edges butt together and are held by the connecting strip (**step 2**). Add the vent steps A6 to the *inside* of the body, at the base

of the two oval holes. Assemble the former rings, and glue inside the body assembly, as close to the narrow end as necessary to fit snugly (**steps 3,4**).

Assemble the centre surface segment and connecting strip (**step 5**) ensuring the connecting strip is first scored along the printed broken lines. Attach the wider end of the centre segment to the base of the main body segment (**step 6**). It will be necessary to fold the connecting strip tabs inward to fit properly. Similarly, assemble and attach the lower body segment (**step 7**). Assemble the base segment (**step 8**), then fold and attach the landing gear legs to the inside (non-inked) surface (**step 9**). Ensure the legs protrude through the slots in the base, and are at right angles to each other when viewed from the top. It may be necessary to bend the legs slightly to ensure they rest on a flat surface without any wobble. Attach the base assembly to the main body (**step 10**), then add the nose and antenna segments (**step 11**). Fold the various surface details B2–B7 as shown (**step 12**) and attach as indicated by the blue shapes printed on the body surface. Fold and cut out the landing gear feet B8 and attach to the base of the legs. Fold vent pipes B9 as shown and attach protruding vertically from the two oval holes in the upper body (the vent pipe base should rest on the internal step added in step 2). Alternately, thin wire or tubing may be substituted for the vent pipes. The stand B14 may be used to display the finished model (**step 13**).

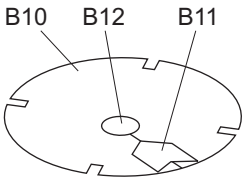


7 Lower segment



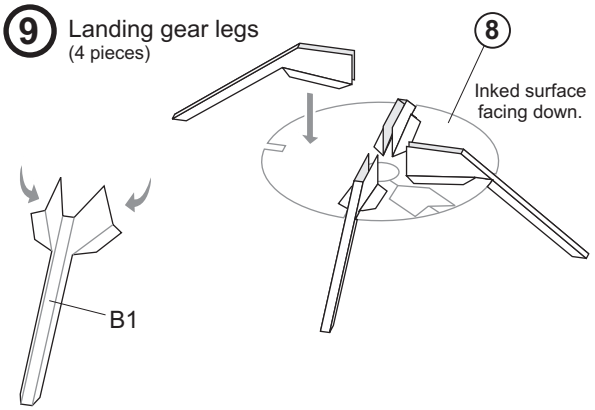
8 Base segment

Inked surfaces shown facing down.

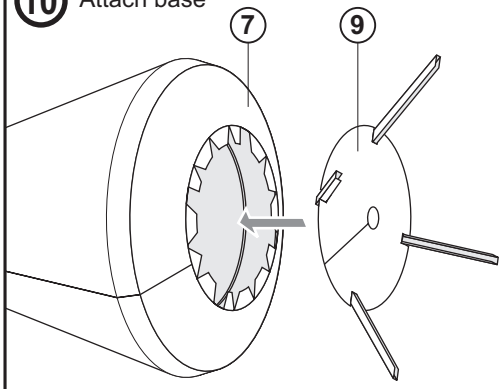


9 Landing gear legs

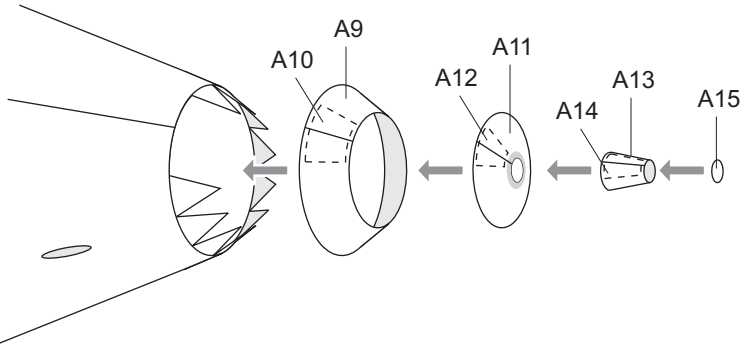
(4 pieces)



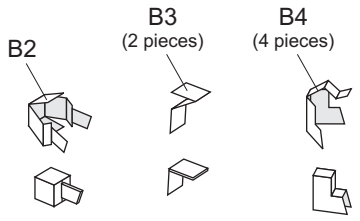
10 Attach base

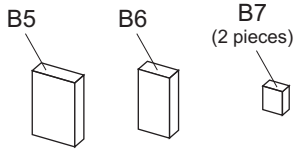


11 Upper segments

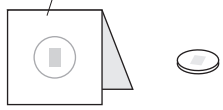


12 Surface details

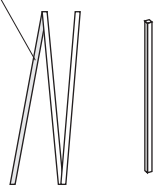


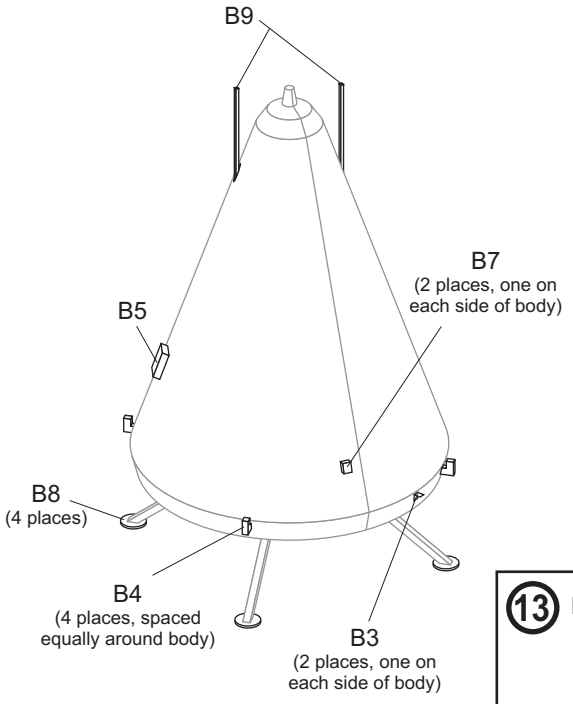


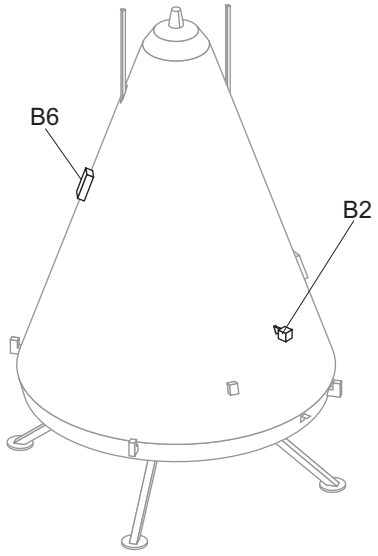
B8
Fold to double thickness, then cut out shape (4 pieces)



B9
Fold to triple thickness (2 pieces). Alternately, use 0.025 inch (0,7mm) wire or tubing, painted white.







13 Display stand