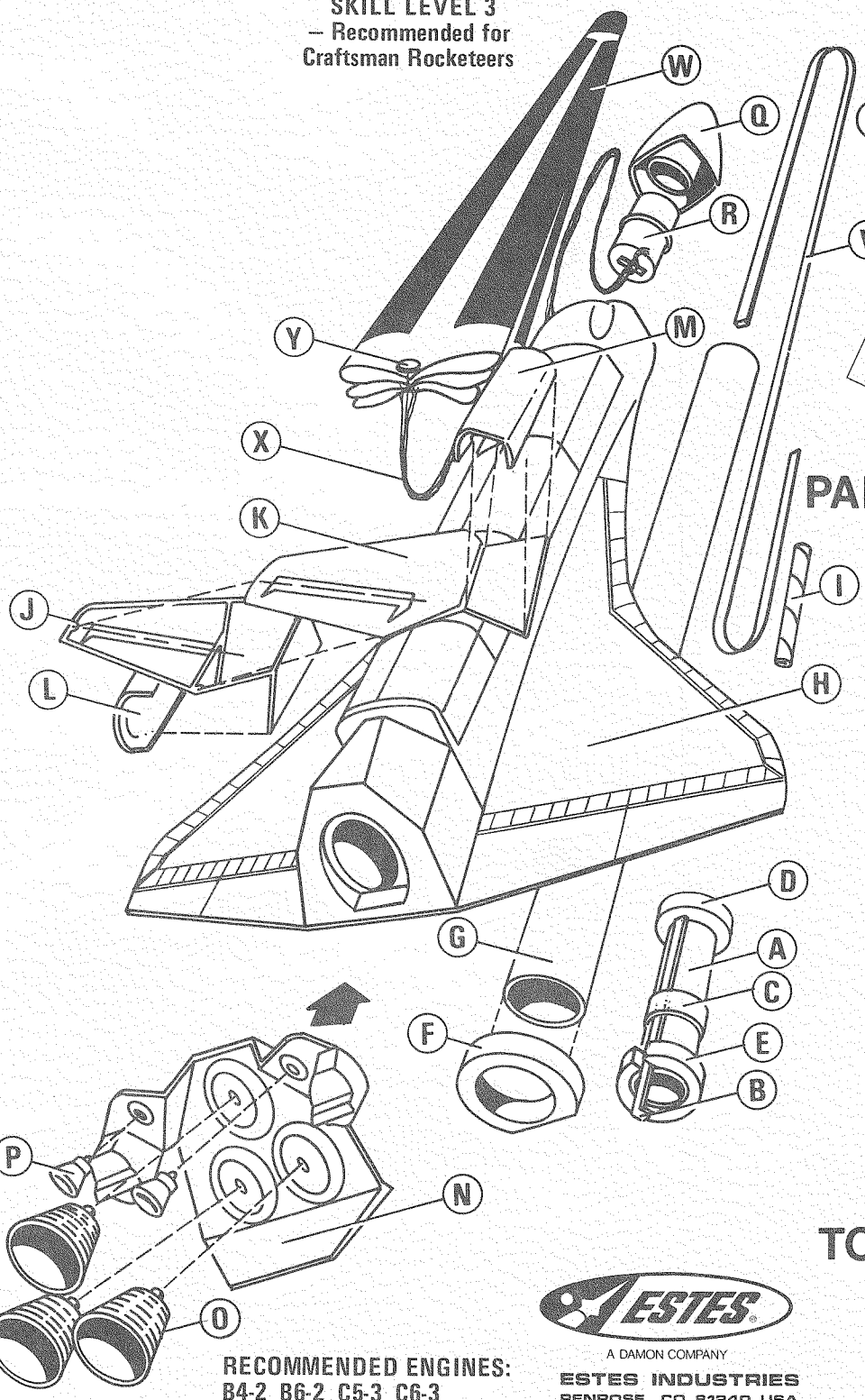
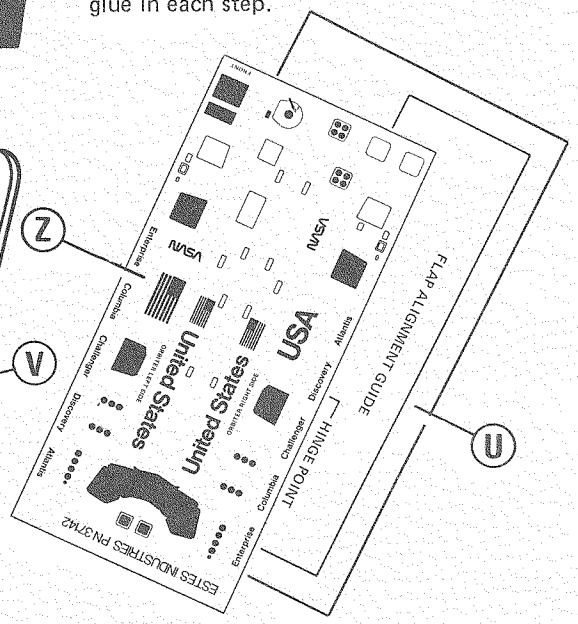
NASA SPACE SHUTTLE ORBITER

SKILL LEVEL 3
– Recommended for Craftsman Rocketeers





IMPORTANT:

A. Read each step COMPLETELY and study illustrations before beginning work on that step.

B. Always test-fit parts together before applying any glue. Sand or carve as necessary to obtain a good fit, then glue parts together.

C. This kit uses three types of glue (One type is furnished.). Make sure you use the correct glue in each step.

PARTS LIST KIT NO. 1337

A	1	Engine Mount Tube (type BT-20J)	30326
B	1	Engine Hook (type EH-2)	35025
C	1	Retaining Ring (type HR-20)	30168
D	1	Centering Ring (type AR-2050)	30164
E	1	Split Centering Ring (type AR-2050S)	80425
F	1	Large Centering Ring (type AR-5055)	30166
G	1	Body Tube (type BT-50P)	30365
H	1	Shuttle Body	87029
I	1	Launch Lug (type LL-2B)	38178
J	1	Fin-Left Half	33231
K	1	Fin-Right Half	33232
L	1	Engine Pod-Left	33233
M	1	Engine Pod-Right	33234
N	1	Rear Bulkhead	33230
O	3	Engine Nozzles	33236
P	2	Auxiliary Nozzles	33235
Q	1	Nose Cone	33229
R	1	Nose Cone Base	33242
S	1*	Clay Weight	85264
T	1*	Capsule of Contact Cement	37828
U	1	Pattern Sheet	84082
V	1	Shock Cord (type SC-2)	85736
W	1	Parachute (type PK-18A)	85566
X	1	Shroud Line (type SLT-108)	38239
Y	1	Tape Discs (type TD-3F)	38406
Z	1	Decal Sheet	37142

*Included in kit, but not illustrated.

TOOLS AND MATERIALS

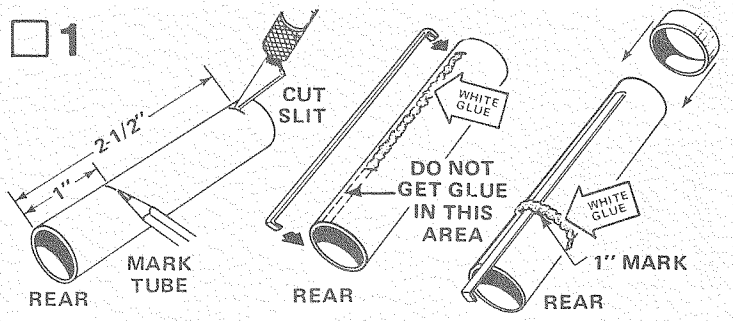
In addition to the parts included in this kit you will need: A sharp model knife, 150 or 220 grit sandpaper, ruler, pencil, scissors, white glue (Elmer's, Titebond, Wilhold, etc), plastic model cement (either liquid or tube-type), and painting materials as listed in Step 18.

RECOMMENDED ENGINES:
B4-2 B6-2 C5-3 C6-3

ESTES®
A DAMON COMPANY
ESTES INDUSTRIES
PENROSE, CO 81240 USA

ASSEMBLY INSTRUCTIONS

☐1



Mark engine mount tube (part A) at 1" and 2-1/2" from one end. Cut a 1/8" long slit at the 2-1/2" mark. Apply a line of white glue between the slit and the 1" mark. Push end of the engine hook (part B) into slit and press hook into glue. Align hook so it runs straight along tube. Apply a line of glue around tube just forward of the 1" mark. Slip the retaining ring (part C) over front of tube and slide rearward to the 1" mark. Wipe away excess glue.

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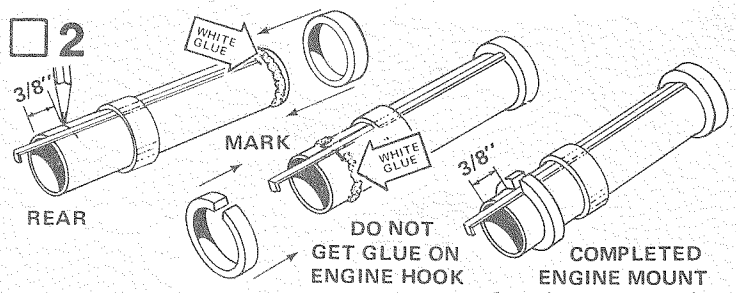
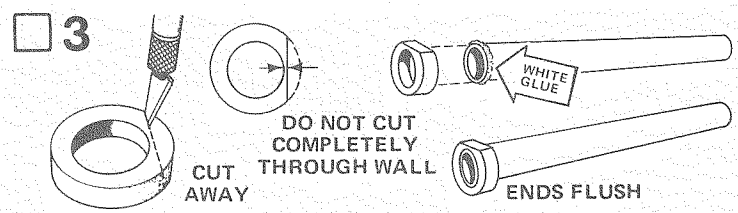


Apply a line of glue around forward end of engine mount tube. Slide centering ring (part D) over forward end of tube. End of ring should be flush with forward end of tube. Place a mark on the engine tube 3/8" from the rear of the tube. Apply a line of glue around tube forward of this mark. Do not get glue on the engine hook. Slip the split centering ring (part E) onto the rear of the tube and push forward until the rear of the ring is even with the mark. The engine hook should be centered in the split opening in the ring. NOTE: It is important that the rear edge of the ring be a full 3/8" forward of the rear of the engine tube. This is necessary to allow mounting of the removable plastic bulkhead.

☐3



Cut away a portion of one side of the large centering ring (part F). Do not cut completely through the side of the ring. Do not worry if the cut off area is not perfect, it will be finish sanded later. Run a line of glue around one end of the body tube (part G). Glue the ring onto the tube flush with the end. Wipe away excess glue. Set aside to dry.

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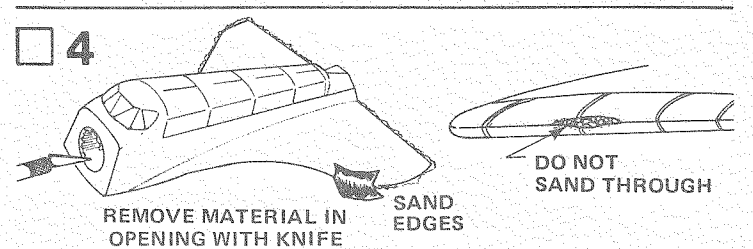

The shuttle body (part H) is made of foam and has a vinyl covering called a "skin". Around the sides of the body you will see a ragged edge left from the molding process. Lightly sand the edges with fine sandpaper to remove the excess material. It is important that you do not sand hard enough to sand completely through the layer of skin along the edges.

There may be some excess skin material extending into the body tube opening at the front and rear of the shuttle body. Carefully remove this with a knife.

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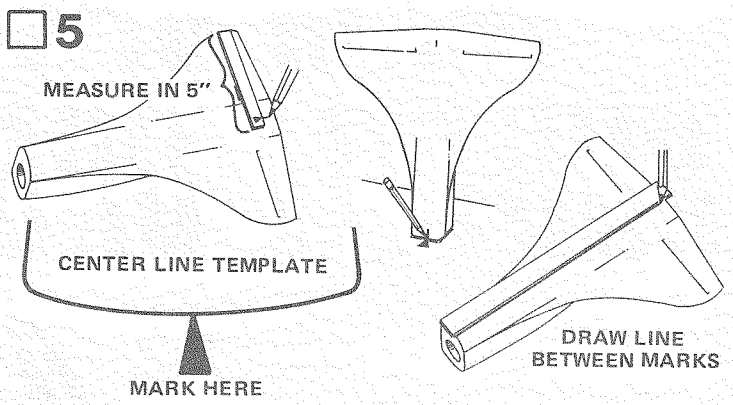
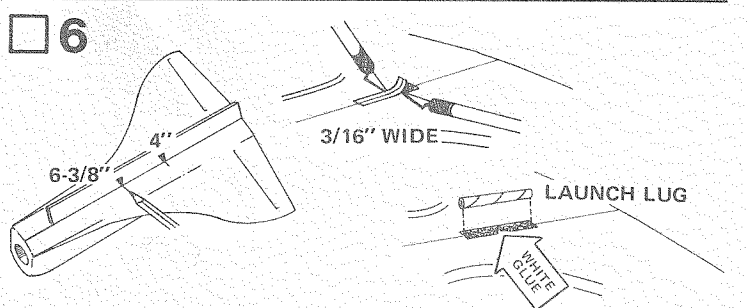


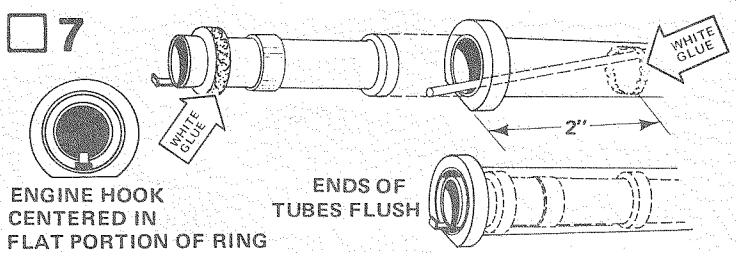
Turn the shuttle body upside down. Measure in 5" from the widest part of the wing and place a mark. This establishes the rear center line of the body. Now place the front of the body on the template above and mark the front center line. Use a ruler to draw a line between the marks.

☐6



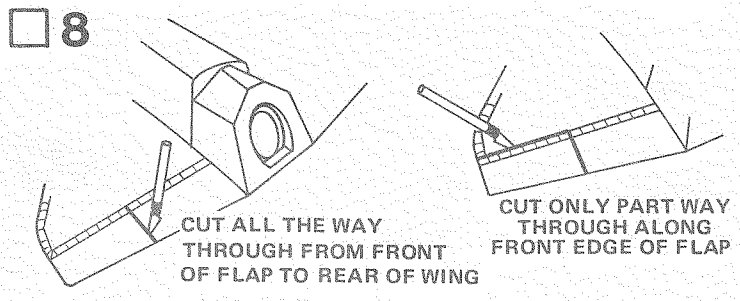
Place a mark on the center line at 4" and 6-3/8" from the rear of the body. Carefully cut a 3/16" wide strip between the marks. The cut should be very light, only enough to cut through the skin. Using the edge of the knife blade, peel away this strip of skin. Apply a line of glue to the area where the skin was removed and attach the launch lug (part I). Make sure the launch lug is lined up straight with the center line. After the glue has dried, apply a light bead of glue to both sides of the launch lug/body joint for added strength.

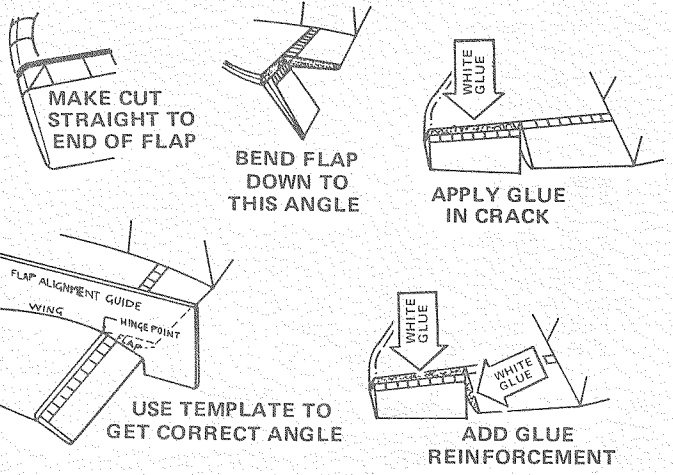
☐7



Using a small stick, apply a generous bead of glue around the inside of the body tube about 2" from the end (to which large centering ring was attached). Apply a light film of glue to the rear centering ring only on the engine mount. Slide the engine mount into the body tube until the tube ends are exactly flush. Make sure you have turned the engine mount so the hook is centered over the flat portion of the large centering ring. Set aside to dry.

☐8



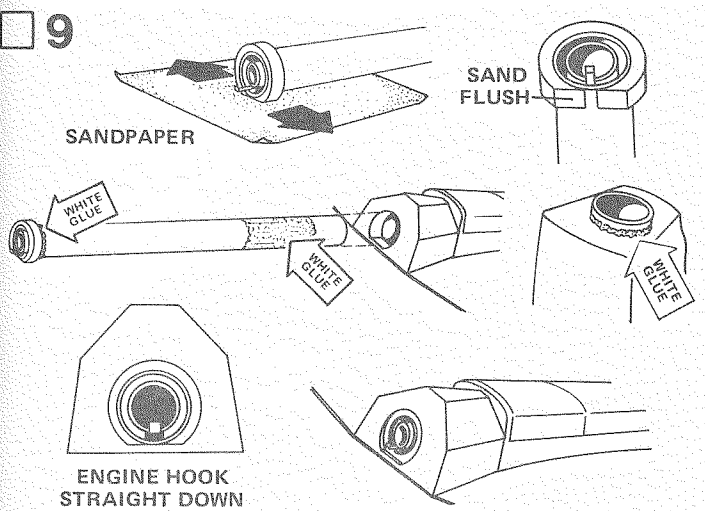


Because the Shuttle has a large rudder on top and no bottom fin, it must be "spin stabilized" to fly properly. FOLLOW THE INSTRUCTIONS IN THIS STEP EXACTLY.

Using the embossed flap lines on the wing as a guide, cut through the line between the outer and inner flaps. This cut must go all the way through the wing. The next cut is made along the front edge of the outer flap. This cut must go only part way through the foam. Bend the outer flap down as shown. Very carefully cut the flap alignment guide from the pattern sheet (part U). Squirt white glue into the crack along the front of the flap. Make sure you get glue all the way down into the crack. Now place the guide on top of the wing in the location shown. Bend the flap up until it matches the contour on the guide. Wipe away excess glue then re-check the angle of the flap with the guide. Set the model aside to dry. Place a pencil or something under the model so the flap does not touch the table. Allow the glue to dry for an hour before proceeding.

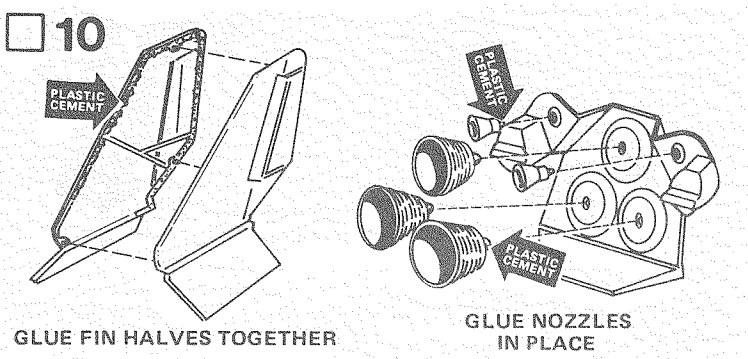
After the glue has dried, run more glue along the crack to fill it in completely. Also apply a bead of glue to the top and bottom of the joint between the outer and inner flaps. **NOTE: THIS STEP IS PERFORMED ON ONE WING ONLY. DO NOT REPEAT THIS PROCESS ON THE OTHER WING.**

☐ 9



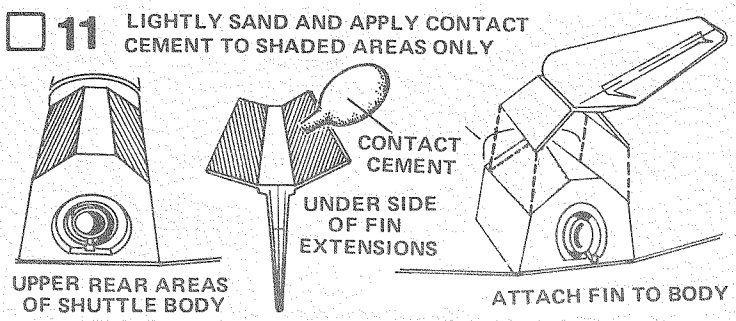
Proceed with this step only if the glue on the ring/body tube joint is completely dry. (The glue will turn almost clear when dry.) Lay a piece of fine sandpaper, face up, on a flat surface. Move the ring end of the assembly back and forth over the sandpaper until the flat section of the ring is sanded even with the body tube. Check the fit by inserting the tube into the shuttle body. The ring should socket into the rear of the body with nothing but the engine hook extending beyond the rear of the body. The front of the tube should extend out the front of the body for a short distance. When satisfied with the fit, remove body tube and apply white glue to the forward portion of the tube and smear into an even film with your finger. Apply a line of glue around the forward edge of the centering ring. Slide the tube into the body until the ring sockets in place. Make sure the engine hook is pointing straight down. Apply a line of glue around the front of the tube where it extends from the front of the body. (DO NOT get any glue inside the body tube.) If there is any foam exposed at the front of the body, cover it with a film of glue to protect against hot ejection gases.

☐ 10



Open the bag of plastic parts and identify each. Use plastic model cement only for gluing these parts together. Apply cement to the inside edge of one fin half (part J) and glue to other fin half (part K). Apply cement to the back of the 3 nozzles (parts O) and attach to rear bulkhead (part N) as shown. Glue the 2 auxiliary nozzles (parts P) to the upper portion of the bulkhead and set aside to dry.

☐ 11 LIGHTLY SAND AND APPLY CONTACT CEMENT TO SHADED AREAS ONLY



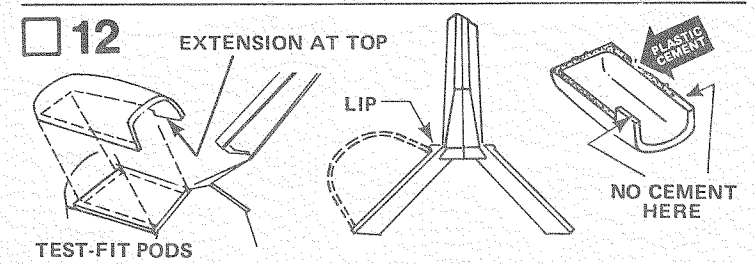
A capsule of contact cement (part T) is included in the kit for use in this step only. This cement works differently from most types of glue, so follow the instructions:

1. Cement must be applied, in even layers, to both parts to be joined.
2. Cement must be dry to the touch before parts are joined.
3. The cement adheres instantly, so parts must be positioned accurately before they are allowed to touch each other.

Very lightly sand the shaded areas indicated on the shuttle body and underside of the plastic fin. This provides a better bonding surface for the cement. Cut off the tip of the capsule and apply cement to the shaded areas. Use the tip of the capsule to spread the cement evenly over the surfaces. DO NOT get cement on any surfaces other than those indicated.

Let the parts set until cement is dry to the touch, then position the fin above the body as shown. The rear edges of the fin extensions should be even with the rear of the body. Carefully lower the fin onto the body. Press down firmly on the bottom fin extensions to seal the bond.

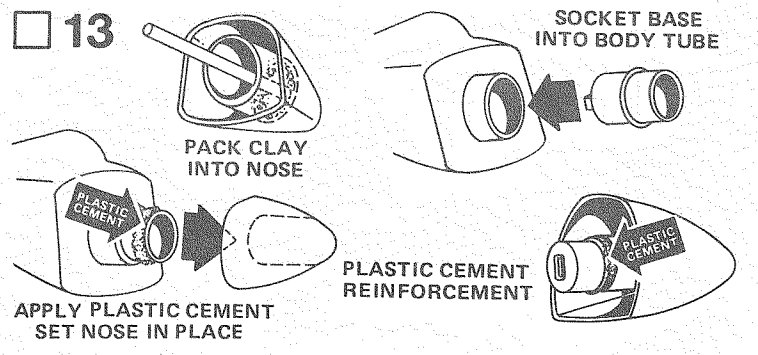
☐ 12



Test-fit the left and right engine pods (parts L & M) onto the model as shown. There is a small offset extension on one side of each pod. This extension is positioned at the top (next to the fin). The pods fit on top of the fin extensions with the front of the pods

even with the front of the fin extensions and the top edges against the small lips at the base of the fin. Apply plastic cement to the bottom edge of each pod, as shown, and glue in place. Set aside to dry.

☐ 13

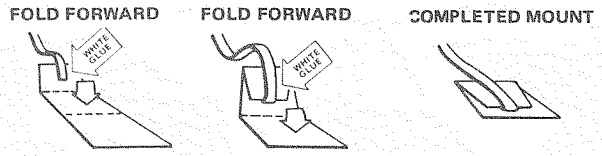


Form the clay weight (part S) into a rope and push it into the circular opening in the nose (part Q). Pack the clay tightly into the front of the nose with a stick or pencil.

The body tube hole in the shuttle body may vary slightly (up or down). For this reason, the socket in the nose is slightly oval. It may be moved up or down on the nose cone base (part R) to provide a perfect match to the shuttle body.

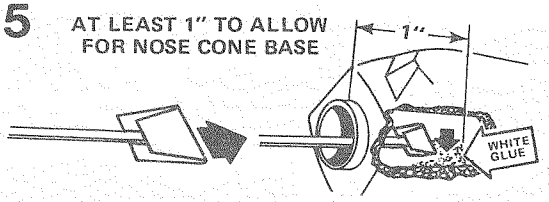
Socket the nose cone base into the front of the body tube. Apply plastic cement to the portion of the base that extends beyond the end of the body tube. Set the nose in place and adjust it so it matches the body. After the glue has dried, remove the nose (with base). Apply more plastic glue to the joint where the base sockets into the nose and set aside to dry.

☐ 14



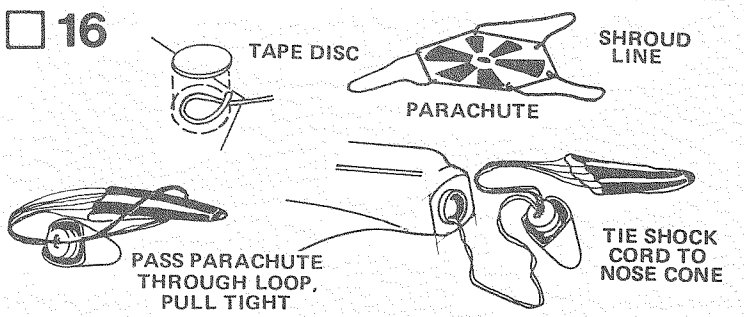
Cut out the shock cord mount from the pattern sheet. Crease it on the dotted lines by folding. Spread glue on the first section (1) and lay the end of the shock cord (part V) into the glue. Fold over and apply glue to the back of the first section and the exposed part of section 2. Fold forward and clamp the unit together with your fingers until the glue sets.

☐ 15



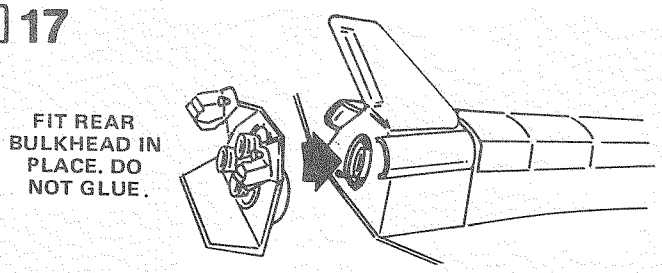
Apply white glue to the inside of the body tube, at least 1" in from the end of the tube. The glue area should be slightly larger than the shock cord mount. Press the mount into the glue and hold until glue sets. After the glue has dried, smear a thin film of glue over the edges of the mount with your finger.

☐ 16



Cut out the parachute (part W) on its edge lines. Cut three 36" lengths of shroud line (part X). Attach line ends to the top of the parachute with tape discs (part Y) as shown. Rub the discs down firmly over the shroud lines. Pass the shroud line loops through the ring on the nose cone. Pass the parachute through the loop ends and draw the lines tight against the ring. Set the knot with a drop of glue. Tie the free end of the shock cord to the nose cone. Fold up 'chute and insert into body. Fold shock cord into body and socket nose cone into place.

☐ 17



Fit the rear bulkhead in place at the back of the shuttle. This part is not glued in place because it must be removed when the shuttle is actually flown. The opening in the rear of the shuttle may vary up and down or side to side. For this reason, the cylinder on the back of the bulkhead is a loose fit into the body tube. Use tape to shim the cylinder for a proper fit.

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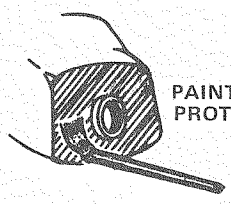
PAINTING AND DETAILING

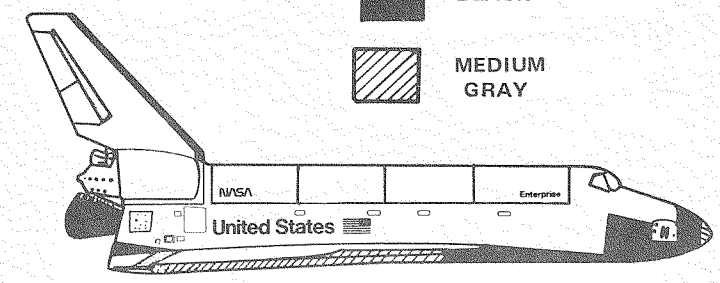
☐ 18 *Illustrations are for both painting and decaling steps.*



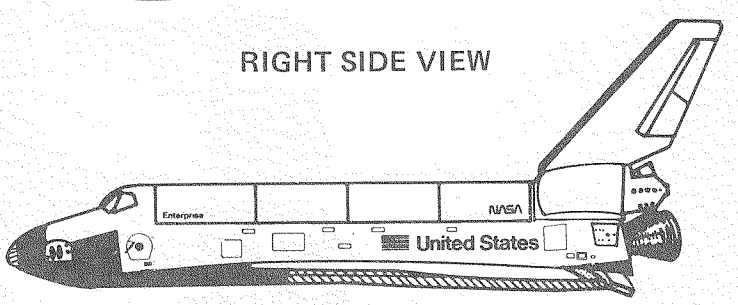
PAINT THE FRONT OF THE BODY FOR PROTECTION FROM HOT EJECTION GASES.

BLACK

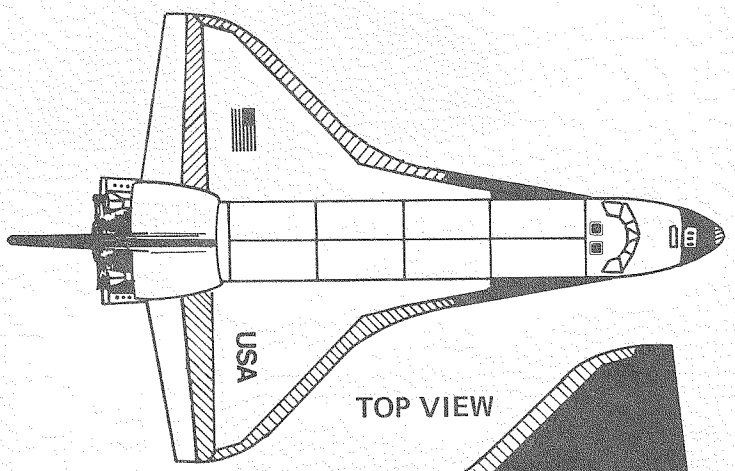
MEDIUM GRAY



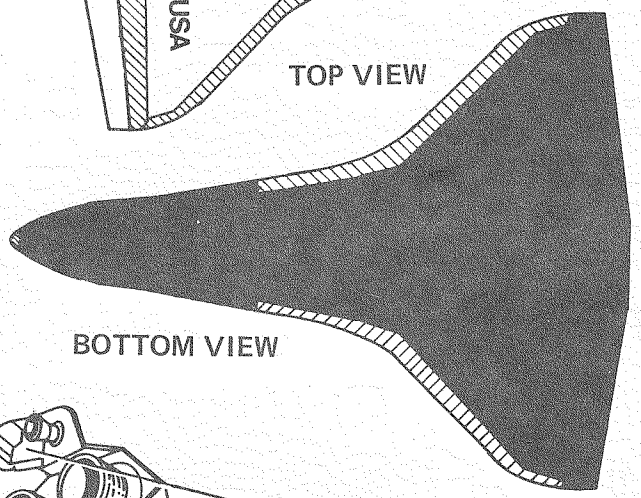
RIGHT SIDE VIEW



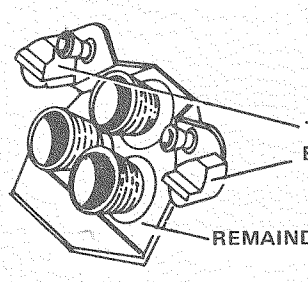
LEFT SIDE VIEW



TOP VIEW



BOTTOM VIEW



THESE TWO EXTENSIONS REMAIN WHITE.

REMAINDER OF BULKHEAD PAINTED BLACK.

(NOTE: All paint MUST be enamel type. Lacquer paint will mar the finish of the plastic.)

MATERIALS NEEDED:

- 3 oz. spray can white enamel
- 3 oz. spray can black enamel
- Small bottle medium gray enamel
- Masking tape*
- Small paint brush
- Testor's "Dull-Cote" (Optional)

**If you do not wish to mask the model, you may substitute a small bottle of black paint for the black spray paint and the masking tape will not be required.*

Before painting, wipe the model thoroughly with a damp cloth to remove oily fingerprints. Remove the rear bulkhead. It will be painted separately. Remove the nose and brush paint the front of the body gray. DO NOT get paint inside the body tube. The paint will protect this area from hot ejection gases. Let the paint dry and replace the nose. Spray the model white. You need not paint the bottom, but make sure you have a solid covering of white down to where the black color begins. Spray in several light coats rather then one heavy coat. The only portions of the rear bulkhead assembly that will remain white are the two irregular shaped extensions next to the auxiliary nozzles. Spray this area white. If you wish to spray the black areas, you must allow the white to dry for at least four hours. If you are going to brush on the black, let the white dry for one hour. After the paint on the Shuttle is dry, apply masking tape along the color break lines between black (or gray) and white portions. (See illustrations.) Cover the white upper portion with paper held in place with tape. Make sure there are no openings where over-spray could sift through onto the white. Mask off the two extensions on the rear bulkhead. Paint the lower portion of the body and the rear bulkhead black. After the paint is dry, carefully remove the masking material. NOTE: If you brush paint the black, disregard masking instructions. Carefully brush paint the indicated gray areas on the body. The outside of the two auxiliary nozzles on the bulkhead are painted gray. The large nozzles remain black.

DECAL PLACEMENT

☐ 19

After the paint has dried, apply the decals (part Z). Refer to the illustrations for decal position. Cut a decal from the sheet and dip in water for 20-30 seconds (or until decal slides on the backing paper). Carefully slide decal off backing paper and onto the model. Position decal and gently blot with a soft cloth. Smooth out the decal to eliminate any air bubbles. NOTE: If you need to move a decal and it tends to stick, brush a little water over the decal. It will then slide easily on the surface. When cutting out decals, always cut around the outside of the clear film since some decals contain more then one component. (If you hold the decal sheet angled to the light, you can see the clear film more easily.)

After the decals have all been applied, we recommend the model be sprayed with a protective clear coating. The model should set for several hours to allow moisture to evaporate from beneath decal film. Spray the entire model (including rear bulkhead) with Testor's "Dull-Cote". This clear spray is easy to use and dries quickly. It not only protects the decals and paint, but provides a uniform flat finish that looks professional.

LAUNCHING COMPONENTS

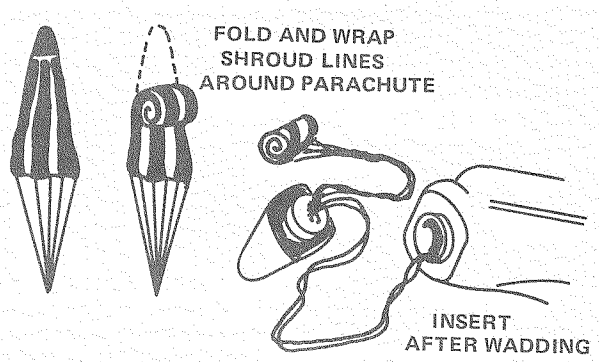
To launch your rocket you will need the following items:
An Estes model rocket launch system
Parachute recovery wadding (Estes Cat. No. 2274)
Estes B4-2, B6-2, C5-3, or C6-3 model rocket engines.
Use a B4-2 engine for your first flight.

Be sure to follow the HIAA-NAR* Model Rocketry Safety Code when carrying out your model rocket activities.
*HIAA -- Hobby Industry Association of America
NAR -- National Association of Rocketry

COUNTDOWN CHECKLIST

T-14 Remove rear bulkhead and store in a safe place. Pack four squares of loosely crumpled recovery wadding into body tube.

T-13

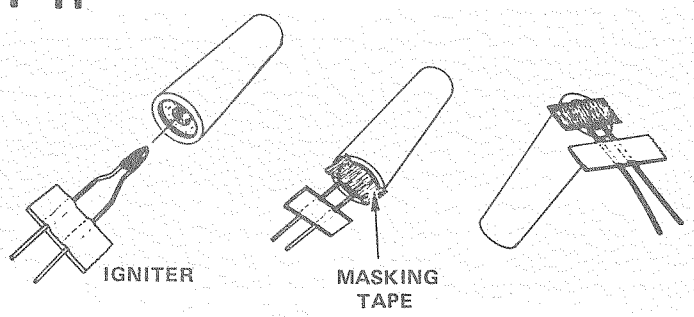


Fold the parachute into a triangular shape. Roll 'chute tightly as shown and wrap shroud lines around it. If 'chute is too large, unroll it and repack until it slides easily into rocket. A fit that is too tight may prevent parachute from ejecting properly.

NOTE: DO NOT pack parachute until you are actually ready to launch. For maximum parachute reliability, lightly dust the 'chute with ordinary talcum powder before each flight, especially in cold weather.

T-12 Pack shock cord neatly into rocket, then slide nose cone into place. Nose cone should separate easily from rocket body tube, but should not be extremely loose. If it is too tight, sand inside of body tube end and shoulder of nose cone with extra fine sandpaper. If nose cone is too loose, add a wrapping of transparent tape or masking tape to the shoulder of the nose cone.

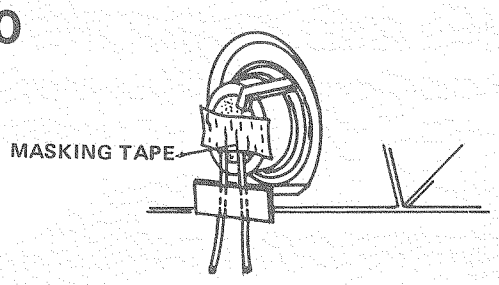
T-11



Select an engine and install an igniter as directed in the engine instructions. Engines recommended for use with this rocket are the B4-2, B6-2, C5-3, and C6-3 made by Estes.

Use a B4-2 engine for your first flight.

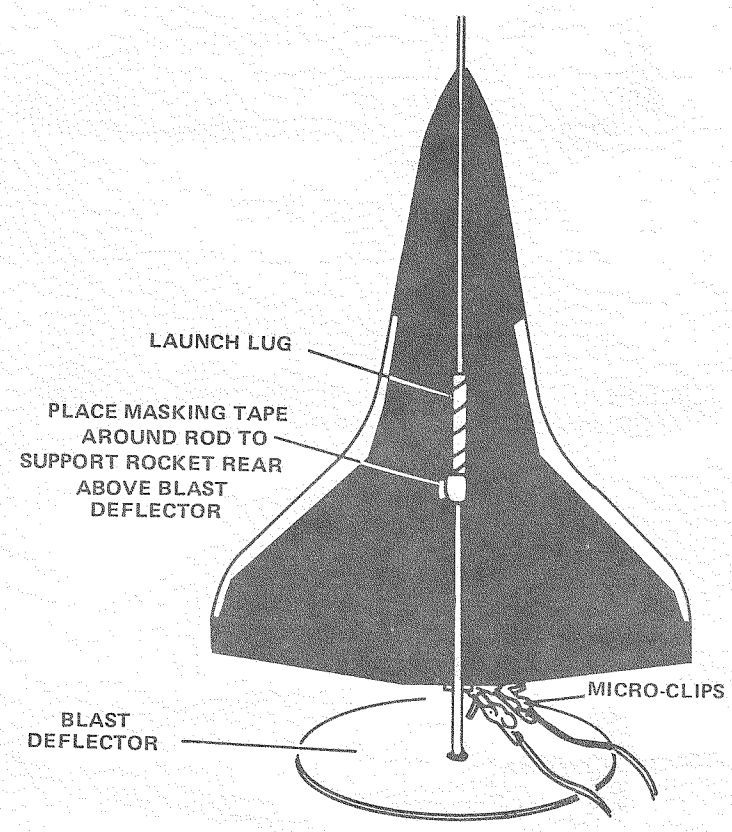
T-10



Insert engine into rocket. Engine hook must latch securely over end of engine.

T-9 Disarm the launch panel -- REMOVE SAFETY KEY!

T-8



Place rocket on launch pad, making sure rocket slides freely on launch rod. Clean the micro-clips and attach them to the igniter.

T-7 Clear the launch area, alert recovery crew and trackers. Check for low flying aircraft and unauthorized persons in the recovery area.

T-6 Arm the launch panel -- INSERT SAFETY KEY!

-5-4-3-2-1-LAUNCH!!

MISFIRE PROCEDURE

Occasionally the igniter will heat and burn into two parts without igniting the engine. This is almost always caused by a failure to install it correctly. Disarm the launch panel, remove the model, clean the igniter residue from the nozzle, and install a new igniter. Follow the launching procedure again.

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