MINI SHUTTLE

SKILL LEVEL 2 - RECOMMENDED FOR THE INTERMEDIATE ROCKETER

RECOMMENDED ENGINES:
A8-3, B4-4, B4-6, B6-4, B6-6, B8-5,
C6-5, C6-7, First Flight A8-3

BEFORE YOU START

Read each step and study the accompanying drawings before doing any of the work called for in that step. Make sure you have all parts and materials. Check off each step as you complete it. Always test-fit parts together before applying glue. It will sometimes be necessary to sand edges of rings, tubes, etc. to obtain proper fit. If you are in doubt about the relative size or location of some parts, refer back to this exploded view drawing for clarification. Adequate glue joints are very important for a flying model rocket. Follow the instructions carefully in this respect.

PARTS LIST

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<th>QUANTITY</th>
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<td>1</td>
<td>Engine Mount Tube (type BT-20)</td>
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<td>B</td>
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<td>Engine Hook (type EH-2)</td>
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<td>C</td>
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<td>Die-Cut Rings (type RA-2060)</td>
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<td>D</td>
<td>1</td>
<td>Die-Cut Balsa (type BF-1391)</td>
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<td>E</td>
<td>1</td>
<td>Body Tube (type BT-60)</td>
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<td>F</td>
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<td>Pattern Sheet (type SP-1391)</td>
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<td>G</td>
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<td>Clay Weight (type 1/2&quot; square)</td>
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<td>Nose Cone (type PNC-60 MS)</td>
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<td>I</td>
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<td>Launch Lug (type LL-2A)</td>
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<td>J</td>
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<td>Decal (type KD-1391)</td>
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<td>K</td>
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<td>Shock Cord (type SC-1B)</td>
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<td>L</td>
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<td>Streamer (type RS-20)</td>
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KIT NO. 1391

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TOOLS AND MATERIALS

In addition to the parts included in this kit you will need: Scissors, pencil, ruler, masking tape, fine or extra-fine grit sandpaper, sanding sealer, a medium-size modeling paint brush, modeling knife with sharp blade, gloss white and gloss black enamel spray paint. a bottle of gloss black enamel paint, and household white glue or resin glue (Elmer's, Titebond or similar). Other types of glue are not recommended. For easy and positive alignment of the fins on your model, we recommend the use of Estes' Fin Alignment Guide, Part No. 2231.
**ASSEMBLY INSTRUCTIONS**

1. **Mark the engine mount tube (part A)** 1", 2-1/4", and 2-1/2" from one end. Cut a 1/8" long slit at the 2-1/2" mark. Gently bend the engine hook (part B) so it bows upward very slightly in the middle. (Don’t bend the wrong way.) Insert one end of the engine hook into the slit in the tube. Hold hook in place with a wrap of masking tape.

2. **Slide each disc onto tube and against mark**

   - **Front**
   - **Rear**

   Remove the centering rings from die-cut ring set (part C). Slide one ring onto the engine mount tube from the front until it is even with the 2-1/4" mark. Slide the remaining centering ring onto the rear of engine mount tube until it is even with the 1" mark. Apply a line of glue at the ring/tube joints on both sides of each ring. Set aside until glue is completely dry.

3. **White glue**

   - **Apply glue to mating edges, let dry**

   Fine-sand both sides of balsa sheet (part D), then carefully remove the tail and wing parts using a sharp knife to free the edges. Sand the edges of the parts slightly to remove any rough edges—but be careful to leave the edges square and sharp-cornered. Rub a line of glue into the mating edges of all the fin parts as shown and allow the glue to dry. Lay a piece of waxed paper on top of the pattern sheet (on back of panel) on a flat surface and apply another bead of glue to the mating parts and glue wing sections together as shown using white glue. Cover with waxed paper, weigh entire assembly down (with paint bottles or a book), and allow to dry.

4. **Apply glue to the inside of the tube**

   - **3/4"**

   Test-fit engine mount into the body tube (part E) as shown. Sand if necessary to assure a smooth fit. Remove and apply a ring of glue around the inside of the rear of the body tube. Replace engine mount quickly, before glue sets, so that the rear of the engine mount tube is even with the end of the body tube. Apply a glue reinforcement to tube/ring joint.

5. **Apply 2 coats of sanding sealer**

   - **Root edge**
   - **Lightly sand all fins after sealer has dried**

   Lightly sand the top and bottom surfaces of the wing assemblies so the glue joints are smooth. Make sure the root edges of the wings are straight and square. If not, sand them lightly so they are straight and square. Apply a coat of sanding sealer to each wing and tail. Apply sealer to all edges except the root edge. When sealer is dry, lightly sand all the sealed surfaces. Repeat sealing and sanding process until balsa grain is filled and smooth. Resand root edge, lightly, to remove any trace of sealer.

6. **Mark tube at arrows**

   - **Draw lines full length of tube**
   - **Extend lines over edge**

   Cut out the tube marking guide from the pattern sheet (part F) and wrap it around the body tube. Line up the engine hook with the launch lug alignment line on the marking guide. Mark the body tube at each of the arrow points. Draw straight lines connecting each pair of marks. A door frame inside edge can be used as a guide as shown. Extend the lines down full length of tube. Extend the lines over the edge of the tube as shown.
Rub glue into the root edge of each wing and the tail and allow to dry. Apply glue to the wings and tail again and position wings and tail on the alignment lines in positions shown. Adjust the wings and tail so they project straight away from the body tube. DO NOT set the rocket on its wings and tail while the glue is wet.

Roll the clay balance weight (part G) between your hands to make a "snake" about 1/8" diameter. Poke the clay through the hole in the rear of the nose cone (part H). Use a pencil or dowel to push the clay forward into the cone until it is packed tightly in the front of the cone. Wash the nose cone with lukewarm soapy water, rinse well, and dry.

Glue launch lug (part I) to rocket body tube on the launch lug line. The rear of the launch lug should be 1" from the rear of the rocket body tube. Align the launch lug straight along the body.

When all paint is dry, apply the decals (part J) in the positions shown. (A) Cut only one decal at a time from sheet. (B) Submerge decal in lukewarm water until decal slides on backing paper (usually 15 to 30 seconds). (C) Gently slide decal from backing paper onto model. (D) Move decal into exact position and carefully blot away excess water with a soft cloth. (E) If the decal "sticks" before you have it in position, apply water over the decal with a brush. This will permit the decal to be moved. (F) Smooth out all wrinkles and air bubbles before the decal dries. We recommend that the completed model be sprayed with Testor's "Dull-Cote" or "Gloss Cote". This is a clear paint that protects the model's finish.
Cut out the shock cord mount from the parts illustration on front of instructions. Fold on dotted lines, then unfold and apply glue to Section 1. Lay the end of the shock cord (part K) into the glue. Fold over and apply glue to the back of Section 1 and the exposed portion of Section 2. Fold again to complete mount. Curl the edges of the mount up so it will match the contour of the body tube and hold with your fingers until the glue sets.

Apply glue to the side of the shock cord mount and press the mount firmly into position as far as possible down inside the body tube. This will allow clearance for the nose cone to fit into place. To insure a good bond use a stick or your finger to smear a film of glue over the shock cord mount and surrounding area in the body tube.

Using a double knot, tie the shock cord around the middle of the plastic streamer (part L) about 2" from the end of the shock cord. Attach the free end of the shock cord to the nose cone with a firm knot.

LAUNCHING COMPONENTS

To launch your rocket you will need the following items:
- An Estes model rocket launching system
- Flame Resistant recovery wadding (Estes Cat. No. 2274)
- Estes A8-3, B4-4, B4-6, B6-4, B6-6, B8-5, C6-5, or C6-7 model rocket engines. Use an A8-3 engine for your first flight.

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

COUNTDOWN CHECKLIST

T-13
Pack 3 or 4 squares of loosely crumpled recovery wadding into the body tube. Usually this will fill the body tube for a distance equal to about 1-1/2 times its diameter.

T-12
Fold streamer in half twice. Roll.
Slide shock cord and streamer into tube.
Fold the streamer in half lengthwise. Fold again, then roll streamer tightly until the streamer fits loosely into the rocket body. Pack the shock cord neatly into the rocket body. Slide nose cone into place.

T-11
Select an engine and install an igniter as directed in the engine instructions. The first flight engine recommended for this rocket is an A8-3 made by Estes.

T-10
Engine hook must latch securely.
Insert engine into rocket engine mount. Engine hook must latch securely over end of the engine.

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

T-8
Launch rod
Launch lug
Micro-clips
Stand-off
Blast deflector
Slide launch rod through rocket launch lug and place rocket on launch pad. Make sure the rocket slides freely on the launch rod. Clean the micro-clips and attach them to the igniter wires. Arrange the clips so they do not touch each other or the metal blast deflector. Attach clips as close to protective tape on igniter as possible.

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!!
Repeat Countdown Checklist for each flight.

MISFIRE PROCEDURE

Disarm the launch panel. Wait one minute before approaching the rocket on the launch pad. Remove the rocket, clean the igniter residue from the nozzle of the engine, and carefully install a new igniter. Repeat the Countdown Checklist.

Failure of the rocket engine to function properly is nearly always caused by a failure to install the igniter correctly. This failure permits the igniter to heat and burn into two pieces without igniting the engine.
MINI SHUTTLE

OVERLAP FLAP

WING

BODY TUBE MARKING GUIDE

FIN

WING

LAUNCH LUG

ALIGN GUIDE MARKS
MINI SHUTTLE

FLYING MODEL ROCKET

SKILL LEVEL 2
For the experienced modeler

- Simplified Space Shuttle Design
- 3D Stabilizer Recovery

Length: 12.5" Diameter: 2.165"
Wingspan: 11.75" Weight: 1.09 lbs
Required Engines: #64-4
RFP: 0.8-0.9" FL: 6-7" 

FLIGHTS OVER 1000 FEET

ESTES

#1391