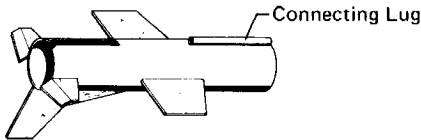


Centuri Space Shuttle KC-6/5066

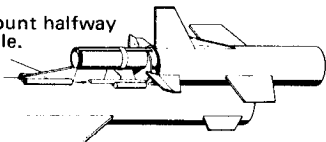
Q	Desc	Stk Num	Size	Other
1	Plastic Nose Cone	PNC-160	2.5"L	2 part
1	Plastic Nose Cone	PNC-132	2.7"L	2 part
1	Body Tube (Main)	ST-16	12"L	Estes BT-60
1	Body Tube (Glider)	ST-13	6 7/32"L	Estes BT-56
1	Body Tube (Engine)	ST-7	5.75"L	Estes BT-20
1	Body Tube (Spacer)	ST-7	3"L	Estes BT-20
1	Balsa Sheet		3" x 9" x 3/32"	
2	Balsa Sheet		3" x 12" x 3/32"	
1	Wood Dowel		1/8"D 9"L	
1	Thrust Ring	TR-7	3/8"L	Used Casing
1	Engine Lock	EL-1		With Retainer
7	Launch Lug	LL-2	1/8"D 2.25"L	Mylar
1	Die Cut Disk Sheet		.022"Thick	
1	Vac-u-Form cockpits			Make from cardstock
1	Fin Spacer Guide		Paper	
2	Trim Tab Sheet		2.25" x 6.5"	"Fasson" Crack 'N Peel
1	Streamer		1.25" x 18"	Vinyl
5	Tape Tabs		.25" x 1.25"	
1	Shroud Line		6"L	
1	Decal		3.25" x 8.5"	Red,Blu,Blk

- 31** Glue the connecting lug to the bottom center of the shuttle craft with the forward end flush with the tube. Be sure the lug is in line properly. Sand all wood edges round and strengthen joints with glue fillets.

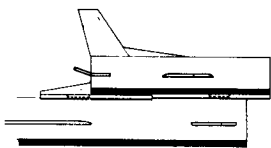


- 32** As the glue on the connecting lug sets up, slide the power-pod halfway into the orbiter. Then slide the power-pod forward along the body tube top engaging the lugs on the standoff with the pins on the mother ship. The mount should slide freely on and off the pins. Sand parts carefully until the mount slides freely.

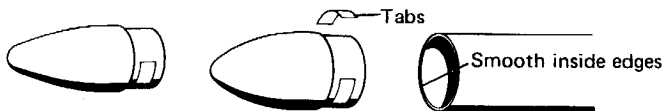
Engine mount halfway into Shuttle.



- 33** When the standoff is fully engaged by both pins, slide the orbiter back over the power-pod, engaging the lug under the shuttle body tube with the forward pointing single pin. The completed assembly should hold the orbiter in place with no shifting of the system back and forth. If necessary, relocate the bottom lug on the orbiter for a firm grip. The two ships should exactly parallel each other, and should not wobble much.



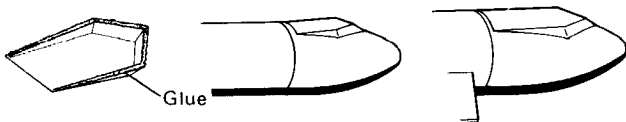
- 34** Apply two pressure-sensitive tabs firmly on the base of each nose cone. Run your thumbnail around the inside forward end of each body tube. Test fit each cone into its tube.



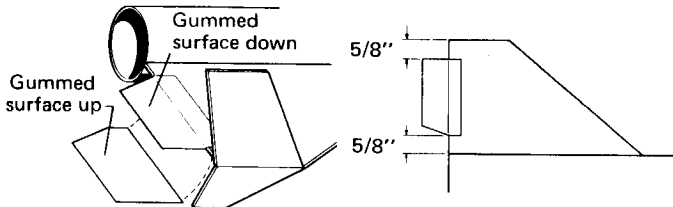
- 35** Apply a generous bead of glue 1/2" inside one body tube. Insert its cone with a firm, even twisting motion. Repeat with other cone.



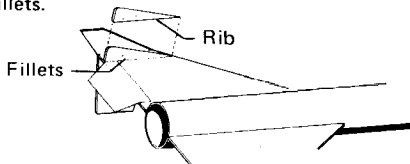
- 36** Trim flashing, if any, from the plastic cockpits. Apply plastic glue (tube type only) on the cockpit rims and carefully position on the respective cones. Hold until glue sets.



- 37** Cut the trim tabs for the booster ship from the pressure-sensitive sheet and press into place as shown. There should be 1-1/4" of flap extending from the wing.



- 38** Turn the booster ship on its back (airfoil down). Bend flaps down and crease to hold in place at about a 45° angle. Glue the balsa reinforcing ribs in place as shown and apply glue fillets.



- 39** The die-cut nozzle plate for the booster ship is very effective painted cherry red. Spray it separately and, when all paint is dry, glue it in place at the after end of the booster ship.

REFER TO THE BACK OF THE EXPLODED VIEW SHEET FOR FINISHING, TRIMMING, AND LAUNCHING INSTRUCTIONS.

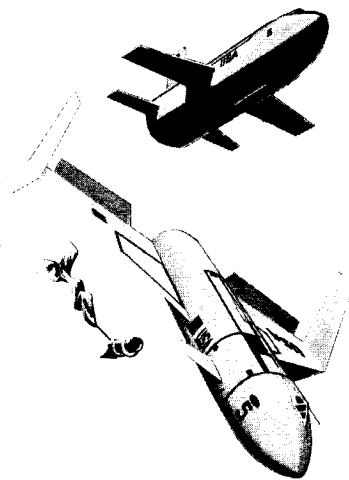
Space Shuttle

Catalog No. KC-6

The Space Shuttle is Centuri's simulation of current proposals now under study by NASA as an orbiting payload craft for future space flights. The Centuri Space Shuttle three-way performance is fascinating for every rocketeer. After the Space Shuttle reaches apogee, the booster separates and begins to glide slowly back to earth; the "power-pod" containing the expended engine returns via streamer, and the orbiter glides earthward for landing.

This rocket is designed to be launched only from standard remote controlled electrical launch systems. Always use the recommended engines and recovery wadding. Check with local authorities for possible restrictions before launching model rockets in your community.

Model rocketry, like any outdoor activity such as football or swimming, has its safety precautions. Following the Model Rocketeers Safety Code, common to all manufacturers, will let you get the most out of model rocketry!



MODEL ROCKETEER'S SAFETY CODE

CONSTRUCTION

My model rockets will be made of only lightweight materials such as paper, wood, plastic, and thin metallic foils, with the exception of payloads and engine holders made of wirelike material.

ENGINES

I will use only pre-loaded factory made model rocket engines in the manner recommended by the manufacturer. I will not change in any way nor attempt to reload these engines.

RECOVERY

I will always use a recovery system in my model rocket that will return them safely to the ground so that they may be flown again.

WEIGHT LIMITS

My model rocket will weigh no more than 453 grams (16 oz.) at liftoff, and the engines will contain no more than 113 (4 oz.) of propellant, as prescribed by Federal Regulations.

STABILITY

I will check the stability of my model rockets before their first flight except when launching models of already proven stability.

LAUNCHING SYSTEM

The system I use to launch my rockets will be remotely controlled and electrically operated, and will contain a switch that will return to "off" when released. I will remain at least 10 feet away from any rocket that is being launched.

LAUNCH SAFETY

I will not let anyone approach a model rocket on a launcher until I have made sure that either the safety interlock key has been removed or the battery has been disconnected from my launcher.

LAUNCH AREA

My model rockets will always be launched from a cleared area, free of any easy-to-burn materials, and I will only use non-flammable recovery wadding in my rockets.

BLAST DEFLECTOR

My launcher will have a blast deflector device to prevent the engine exhaust from hitting the ground directly.

LAUNCH ROD

To prevent accidental eye injury I will always place the launcher so the end of the rod is above eye level or cap the end of the rod with my hand when approaching it. I will never place my head or body over the launching rod. When my launcher is not in use I will always store it so that the launch rod is not in an upright position.

POWER LINES

I will never attempt to recover my rocket from a power line or other dangerous places.

LAUNCH TARGETS AND ANGLE

I will not launch rockets so their flight path will carry them against targets on the ground, and will never use an explosive warhead nor a payload that is intended to be flammable. My launching device will always be pointed within 30 degrees of vertical.

PRE-LAUNCH TEST

When conducting research activities with unproven designs or methods, I will, when possible, determine their reliability through pre-launch tests. I will conduct launchings of unproven designs in complete isolation from persons not participating in the actual launching.

FLYING CONDITIONS

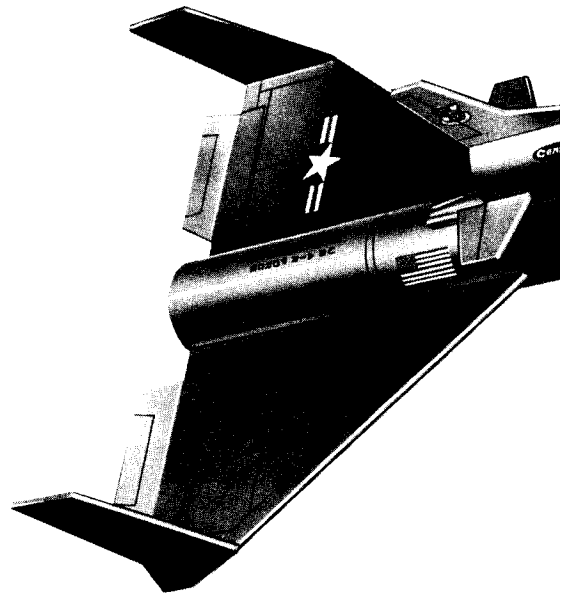
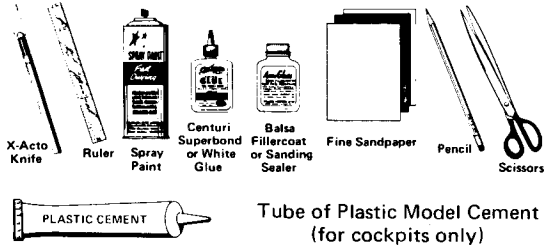
I will not launch my model rocket in high winds, near buildings, power lines, tall trees, low flying aircraft or under any conditions which might be dangerous to people or property.

ASSEMBLY INSTRUCTIONS

The SPACE SHUTTLE is a challenging kit! Read the instructions before starting assembly, to be sure you understand them.

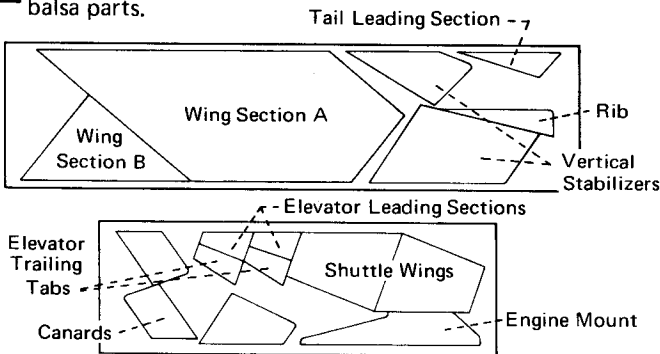
NOTE: SET THE EXPLODED VIEW SHEET OUT WHERE YOU CAN EASILY REFER TO IT AS YOU PROCEED THROUGH THESE INSTRUCTIONS.

TOOLS: In addition to the parts supplied, you will need the following tools to assemble and finish this kit. **DO NOT** use model airplane glue for building flying model rockets.

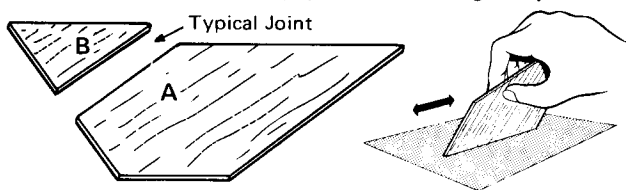


BOOSTER SHIP ASSEMBLY

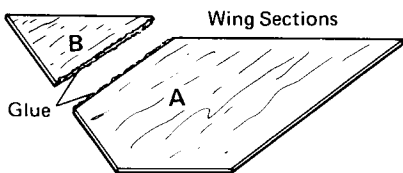
- 1** Study this illustration to understand the different balsa parts.



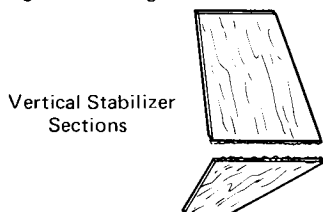
- 2** Carefully push the die-cut parts from their sheet. Start at one point on the fin and work gently around. While assembling, test fit balsa pieces and square up edges on fine sandpaper, to insure good joints.



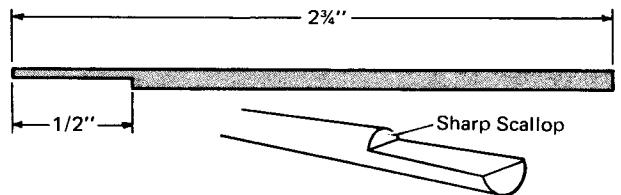
- 3** Glue wing sections A and B together, laying both on a flat surface to dry. Wax paper spread on a table is ideal for this purpose as it protects table tops and glued pieces don't stick to wax paper.



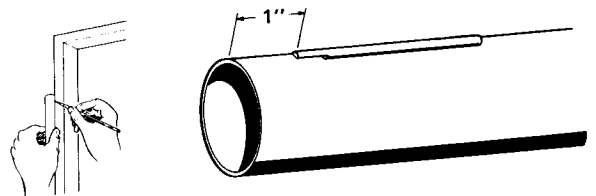
- 4** Glue the upper and lower pieces of the vertical stabilizers together using the same method. Allow to dry.



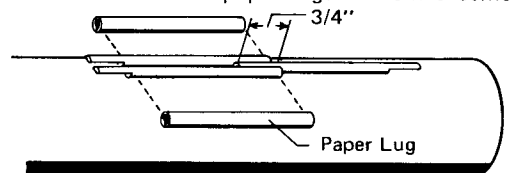
- 5** To start the lug assembly, cut the round dowel material into three pieces of 2-3/4" length. With your x-acto knife, scallop away part of each dowel for a length of 1/2".



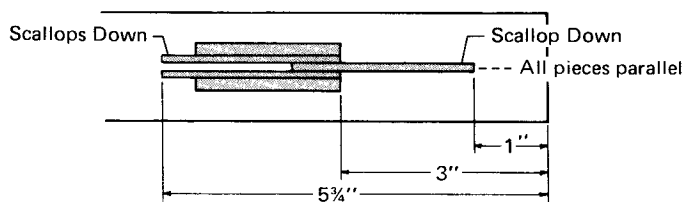
- 6** Find a convenient channel or groove, such as a door jamb, partially open drawer, or molding. Draw a straight line the length of the large booster tube. Glue a dowel on this line with the scallop 1" from the tube end.

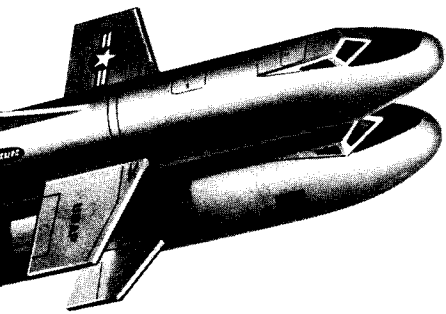


- 7** Glue the other two dowels on either side (overlapping 3/4") with scallops pointing towards the other end of the tube. Glue on the paper lugs for reinforcement.



- 8** Check your construction against this diagram. If your measurements are off more than 1/16", adjust pieces quickly before the glue sets. Apply a bead of glue at all joints and smooth into fillets with your finger.



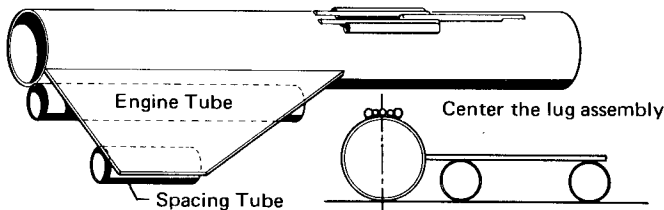


SPECIAL OPTION: Complete decals for a "NASA" style Space Shuttle are provided in this kit. However, using silver paint and decals of your own, you may wish to create a "customized" Air Force color scheme as shown here.

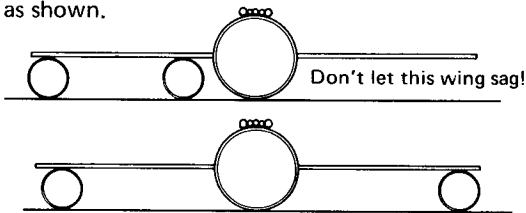
- 9** Lay the booster body tube flat on the table. Next to the body tube, lay the engine tube and a few inches from it, the wing spacing tube.

Run a bead of glue along the root edge of one wing and lay it down on the two small tubes. Center the booster tube's lug assembly. Then carefully roll the wing into place against the body tube as shown. Now roll wing away from tube, allow a minute for the glue to become tacky, and re-apply.

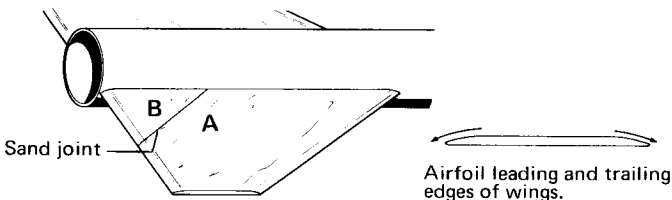
Be sure the engine tube does not accidentally become glued to the body tube.



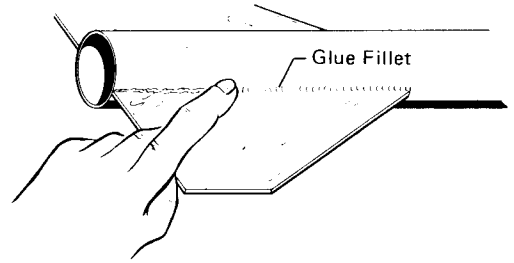
- 10** After the wing has dried completely, lay the tubes on the other side of the body tube and glue the second wing in place. Sight along the table to make sure wings are in line. After the glue on the second wing has begun to set up, switch one of the support tubes over to the other wing and allow the unit to dry as shown.



- 11** Wait until both wings have dried enough to handle. Using first medium and then fine sandpaper, airfoil the leading and trailing edges of the wings. Support the undersides of the fins with your fingers and be sure the airfoils are on the same sides of both wings. Sand the glue joint of wing sections A and B.

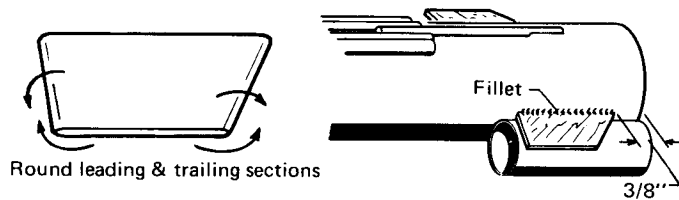


- 12** Apply beads of glue along the body-wing joints and smooth out with your finger. Allow to dry resting on supports as at the end of step 10.



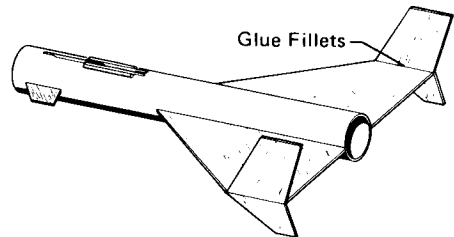
- 13** Round the leading and trailing edges of both canards with fine sandpaper.

Lie the booster flat. Roll the two support tubes against each side of the ship near the nose. Apply beads of glue to the root edges of the canards and press into place with the leading edge 3/8" from the end of the tube. Apply beads of glue along joints and smooth with your finger into fillets.



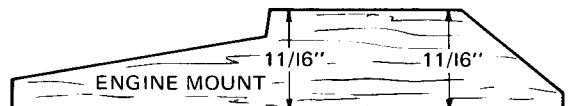
- 14** Apply a bead of glue to the outside edges of both wings and press the vertical stabilizers in place as shown. The tall section of the stabilizer should face up on the top (airfoiled) surface of the wing. Stand the unit up on the forward end of the body tube while the stabilizers dry in place.

When dry enough to handle, apply beads of glue to the wing-stabilizer joints and smooth out with your finger. Lay the booster flat while fillets dry.

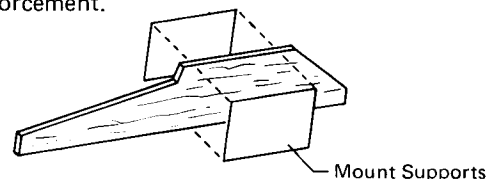


POWER-POD ASSEMBLY

- 15** Sand the engine mount down until it is exactly 11/16" high. Measure the height at both ends to be sure the top and bottom edges are parallel. This is important.

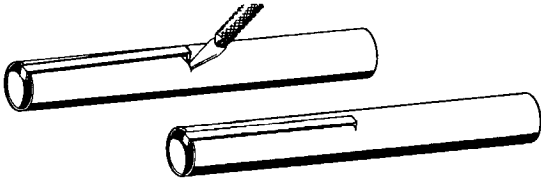


- 16** Cut the mount supports from the exploded view sheet and glue to the engine mount piece as shown, for reinforcement.

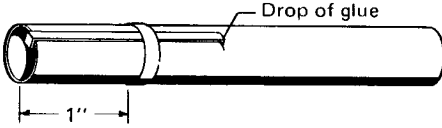


SHUTTLE CRAFT ASSEMBLY

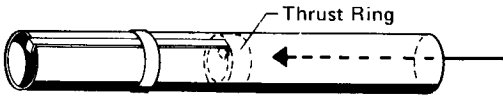
- 17** Lay the engine lock on the engine tube, hooking one end of the lock over the end of the engine tube. Slit the engine tube where the other end of the hook touches the body tube and push the hook into place.



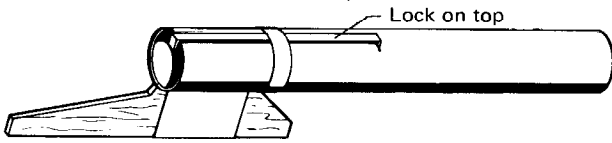
- 18** Slide the mylar lock ring over the engine tube and glue in place 1" from the end of the tube.



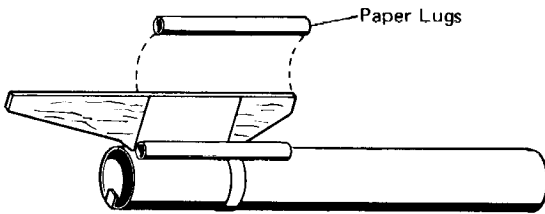
- 19** Run a bead of glue around the inside of the tube at the forward end. Push the thrust ring down through the glue with a pencil until it butts against the engine lock.



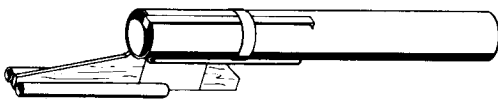
- 20** Apply a bead of glue to the top of the balsa engine mount and press the engine tube upon it as shown with the engine lock on the top.



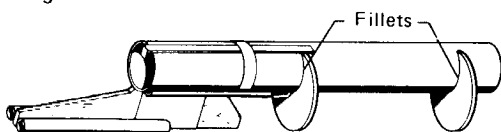
- 21** Apply glue generously to both sides of the tube-mount joint and press a paper lug into place on each side to support the joint.



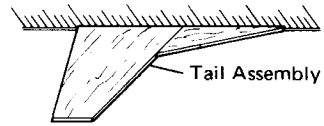
- 22** Glue two more of the paper lugs to the stem of the standoff as shown. Place the unit against the table, mount down, and make sure the lugs are in line with the bottom of the mount. Apply a fillet of glue to the top of both lug joints and smooth with your finger.



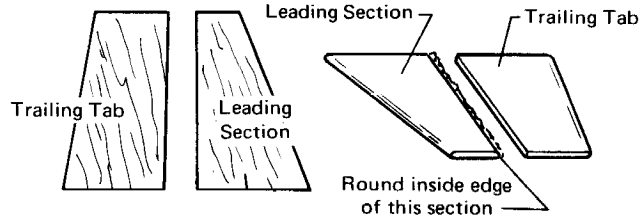
- 23** Glue the two die-cut rings into place on the engine tube as shown. Slide the unit carefully into the shuttle craft's body tube to make sure the disks are properly aligned. Apply fillets of glue to strengthen the rings.



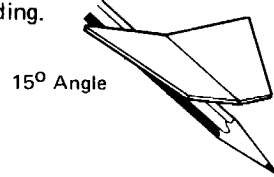
- 24** Glue the leading section to the tail as shown. Lay the assembly on a flat surface and place a ruler along the root edge to check alignment. Allow to dry.



- 25** Round the leading and trailing edges of the elevator pieces. Also round inside edge of leading section. Apply a bead of glue to the inside rounded edge of each leading section and push the trailing tabs into place.

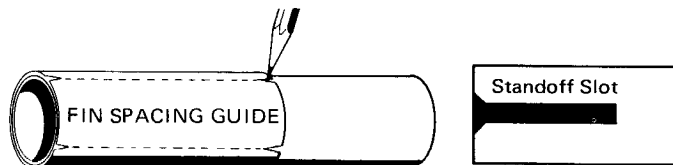


- 26** Lay the two tabs on a flat surface with root edges facing each other and leading (narrow) sections forward. Lift the elevator (trailing) tabs up and roll a pencil under them so that the elevators rest with their trailing flats up at about a 15° angle. Allow to dry before proceeding.

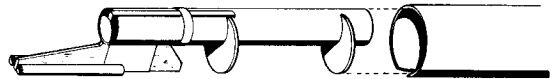


- 27** Cut out the fin spacing guide and wrap it around the orbiter body tube. Mark the locations of wings, tail, elevators and standoff slot with a pencil.

Cut out the standoff slot with scissors and chop the corners of the slot as shown.

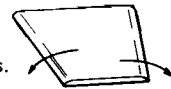


- 28** Test fit the engine mount by carefully sliding it into the shuttle craft body tube. If it hangs up at all, sand the die-cut ring edges, to obtain a good fit.



- 29** Airfoil the upper leading and trailing edges of the orbiter wings with fine sandpaper. Sand the sides of the tail assembly to smooth out the joint line. Apply a thin film of glue to the root edges of the tail assembly, both wings and both elevators. Allow to dry.

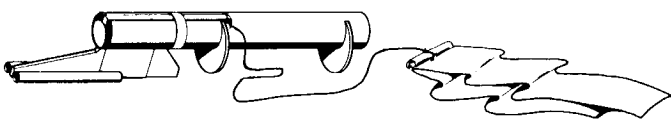
Airfoil upper leading & trailing edges of wings.



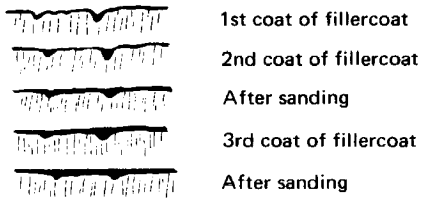
- 30** Apply additional beads of glue to the tail assembly, wings and elevators and press into place as shown. NOTE: Be sure the pieces are glued on with grain parallel to leading edges. Stand the shuttle on end to dry.



40 Tie one end of the string around the center of the strands of streamer material. Lift the forward hook of the engine lock and slide other end of the string under the hook, and tie. Let the lock snap back in place.



41 Coat all balsa parts with sanding sealer or balsa fillercoat and allow to dry. Sand lightly with fine sandpaper. Paint and sand again, repeating the process until all grainline is filled.



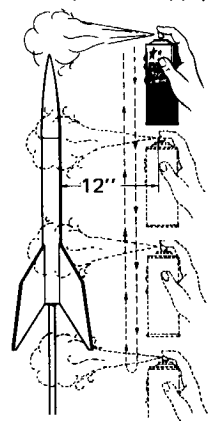
Spray painting your finished model with a fast-drying enamel will produce the best results . . . IF IT IS DONE PROPERLY!!! Most important is the number of coats of paint. DO NOT try to paint your model with one heavy coat! Instead, give it a couple of quick, light coats first and then a finish coat. Let each coat dry before applying the next.

SPRAYING A TYPICAL MODEL ROCKET

RECOMMENDED COLOR SCHEMES:

- 1. All white
- 2. All silver
- 3. Booster: White
Orbiter: Yellow

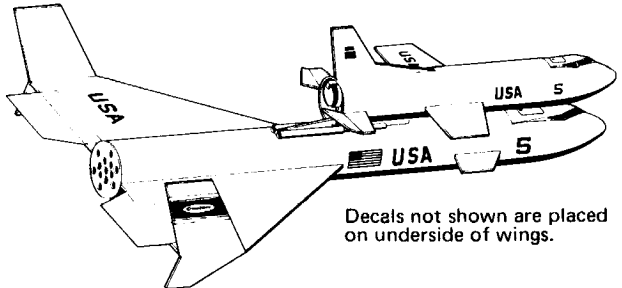
(In all schemes, nozzle plate is red.)



When painting plastic parts, never use dope or lacquer! First, spray with an enamel primer. The plastic parts may then be spray painted in-place on the model with the same spray paint used on the rest of the model. Or the parts may be masked off or removed for painting a separate color.

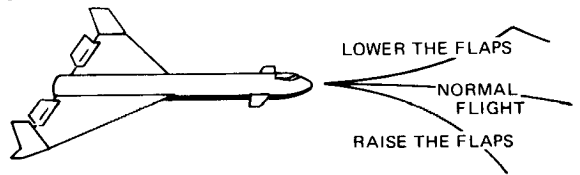
Following the printed instructions on the decal sheet, apply the decals to the Space Shuttle as shown on the full perspective view below. Additional lines and detail may be added with narrow colored tape, or a ruler and pen.

After decals have dried, a coat of crystal clear acrylic will protect the paint and markings from scratches.

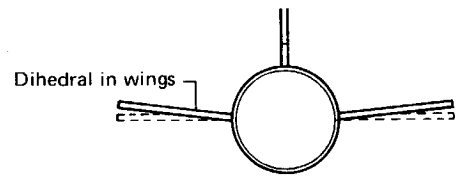


TRIMMING THE SPACE SHUTTLE

Find a clear grassy spot and face the wind. Bend the flaps of the booster ship up about 45° and hand launch it smoothly from shoulder height. If the glider tends to stall, lower the flaps and try again. If it dives, raise the flaps. Properly trimmed it should glide smoothly and land lightly. If it turns in flight, lift the flap on the side opposite the turn until the glider is trimmed to fly properly.



Trim the orbiter craft in the same manner. To adjust the balsa flaps on the elevators, heat the joints over a lightbulb and bend slowly to the angle desired. Hold the flap in position as the glue cools and hardens. A small amount of "dihedral" in the wings is occasionally helpful. The shuttle takes a bit of patience to trim but once trimmed will glide realistically. The design is rugged; don't be afraid to hand launch many times to get the best possible trim.



LAUNCHING THE SPACE SHUTTLE

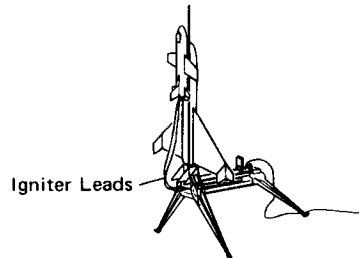
First of all, it helps to have other people help you launch the Space Shuttle . . . remember there are 3 separate vehicles to watch descending!

Fold the streamer material and lay it between the die-cut rings on the power-pod. Slide the power-pod halfway into the orbiter.

Slide the power-pod forward on the booster ship, locking the two pins in place. Now slide the shuttle craft back onto the engine mount engaging the bottom lug over the forward pointing holding pin located on the booster ship. The two ships are locked in place and the system is ready to fly. Insert a prepared engine into the engine mount. The CG-3 is the only engine recommended.

The paper lugs on either side of the booster lug assembly serve as launch lugs.

NOTE: For use on the Servo Launcher, simply remove the metal deflector plate to allow the igniter leads to reach the engine. (The Space Shuttle engine is far enough from the launcher so that no deflector plate is necessary.)

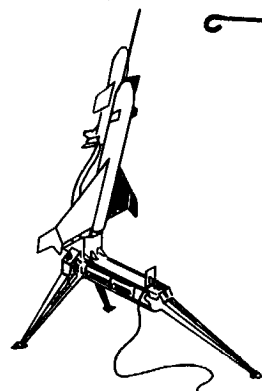


On other launchers, if your ignition wires are not long enough to reach the engine, make two extensions with paper clips as shown. Wire the sure-shot igniters to one end and attach the micro-clip to the other. Repeat this procedure with the other extension. Centuri's igniter-clip assembly (ECA-44) is made for this purpose and is also recommended for this operation.

PAPER CLIP EXTENSION

If there is a breeze blowing, position the Space Shuttle so the orbiter is on the down wind side of the launch rail.

If separation happens at low altitude, tilt launch pad forward.

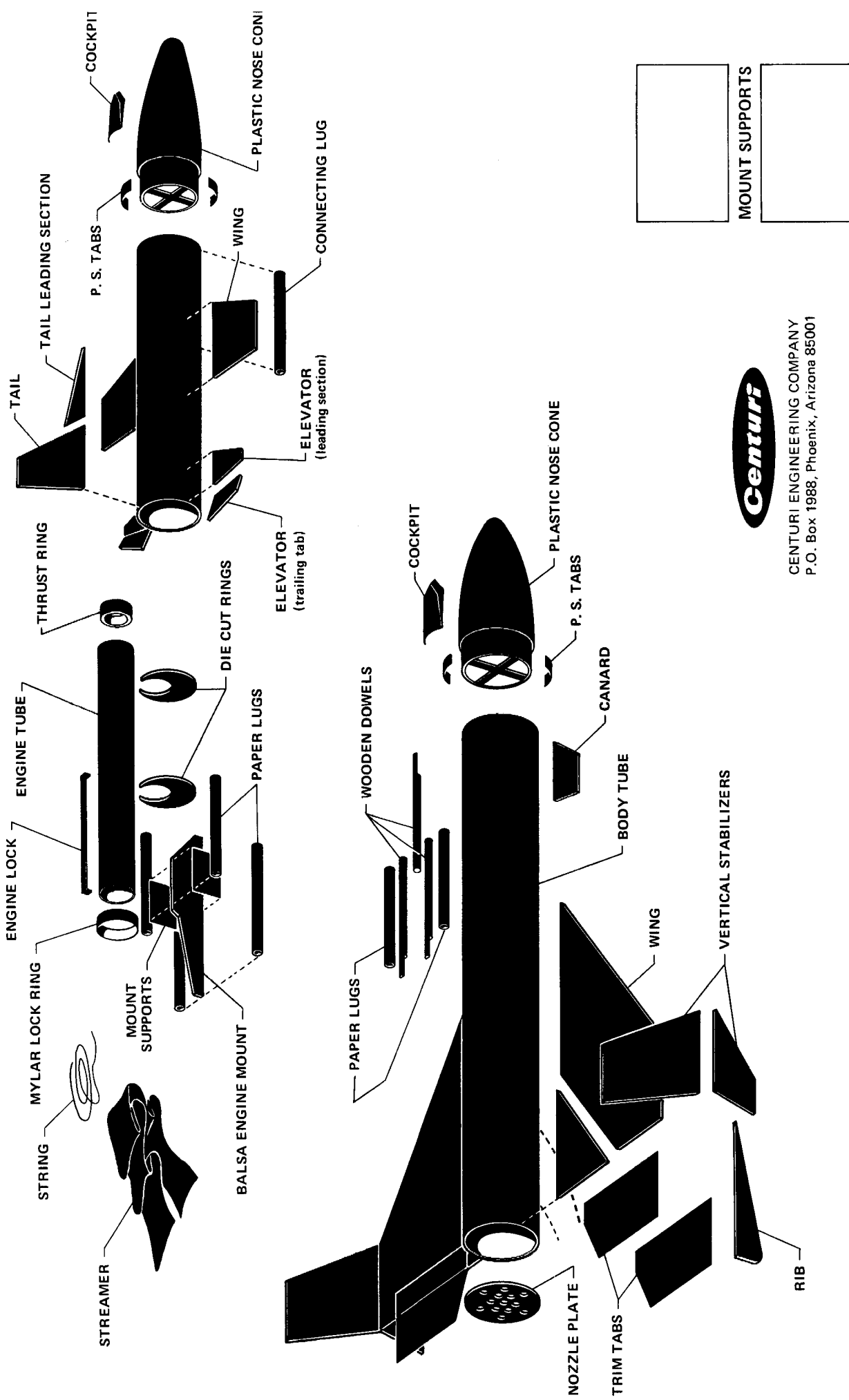


IMPORTANT: First flights should be done over soft grass or dirt areas. Flight tests may show that it needs additional trim and you'll want the model to survive these tests!

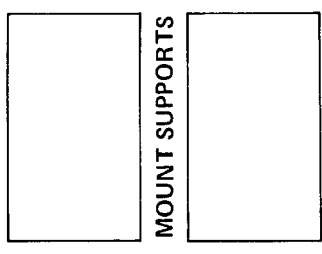
Referring to the specific instructions which accompany Centuri launchers and firing panels, mount the rocket on the launcher and prepare for ignition. Avoid eye injury by capping exposed tip of launch rod when not actually launching! Follow instructions and the Safety Code, and have many happy hours with Model Rocketry!

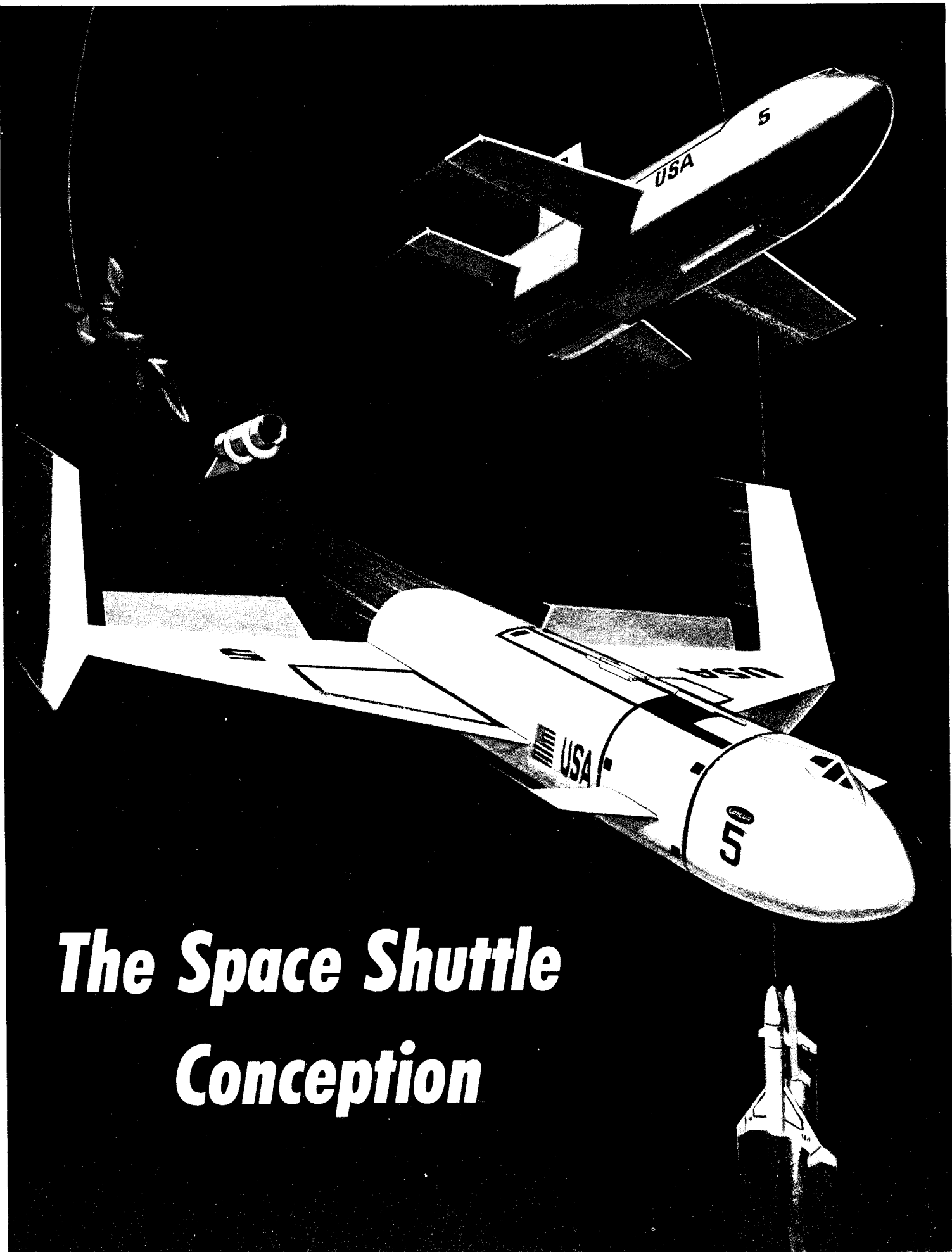


Expended Engine



CENTURI ENGINEERING COMPANY
 P.O. Box 1988, Phoenix, Arizona 85001





***The Space Shuttle
Conception***

The Space Shuttle Conception

The United States Space Program as it enters the Seventies is swinging into a new phase that promises to dramatically revolutionize man's role in space.

The Sixties saw the entry of man into space experimentally climaxed by a bold step to the moon, proving that man could survive in space and operate there successfully. The decade to come will see space flights become routine. The cornerstone of operational (as opposed to experimental) space flight is an economical transportation system with principal components that can be used many times.

The National Aeronautics and Space Administration (NASA) is currently studying a variety of proposals for an economical system to deliver men and payloads to and from earth orbit. The term "Space Shuttle" has been given to this operational system. Current concepts call for a two stage vehicle weighing three and a half million pounds. Both stages would be winged and would land at airfields to be refurbished and used again.

As this report goes to press, the external configuration of the Space Shuttle is still undecided. The fly-back booster appears in almost every proposal as a large delta winged rocket. Some versions show a single tail surface mounted on the after end of the airframe. Our flying model has vertical stabilizers mounted on the wingtips to prevent their being disintegrated by the exhaust gas from the shuttle craft's engine. For the same reason other proposals also have wing mounted tail surfaces. Model Rockets share many of the same design problems with their full scale brothers.

The shuttle craft appears in two different modes. One design type calls for a delta winged shuttle with very little wing area. This type is designed to re-enter at a low angle of attack — nose down meeting the airstream head on. This design would experience severe heating over its entire surface and would require an elaborate cooling system (which would reduce payload capability through the penalty of its own weight). The attractive feature of the low angle of attack shuttle is that it could literally "fly" during the complete re-entry operation and reach any landing point within a range of 2500 miles to either side of the initial flight path.

The second shuttle type was conceived by Maxim Faget, the "father" of the Mercury, Gemini and Apollo configurations. The Faget shuttle would pitch its nose up as it re-entered, presenting its flat underbelly and wing undersides to the airstream. This flat area would have a great breaking effect and the shuttle would lose its speed in the same manner as the re-entering Apollo capsule. After sufficient speed had been lost, the shuttle would pitch its nose down and begin to fly to its landing point. Its landing "footprint" would be considerably reduced over that of the first shuttle described, however, with reduced cooling requirements the shuttle could carry over twice the payload. The accuracy of the Apollo landings would seem to indicate that a huge 2500 mile wide footprint might be unnecessary especially in light of the payload reduction in the low angle of attack shuttle.

For model rocket purposes, Centuri has selected a Faget type shuttle.

Blasting off at Cape Kennedy, the Space Shuttle system would rise vertically for a few seconds and then go into a slow pitch-over programming the system down range. At the edges of space and some 300 miles down range the shuttle craft would separate from the upper body of the mother ship and continue under its own power to orbital speed and altitude. Meanwhile, the mother ship would re-enter, bank away and head back for the Cape. It would probably be assisted in its return by Jet engines. Both stages would be powered by liquid Hydrogen-oxygen fuels during rocket powered flight.

The Space Shuttle could be used to deliver weather, communications and earth resources satellites into Earth orbit. Since the system would be re-usable it would make orbital delivery much less expensive than it is today. Payloads could be orbited at a cost of \$20 to \$50 per pound. Space Shuttles could regularly service space stations or become small experimental stations themselves. The Space Shuttle would open space to routine use through its flexibility, reliability and high cost-effectiveness.



CENTURI ENGINEERING COMPANY

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FIN SPACER GUIDE

Centuri

Carefully cut this guide out on the solid lines. Then wrap the guide around the body tube. Mark the locations of the wings, tail, elevators, and standoff slot with a pencil.

IP-89

WING & ELEVATOR

STANDOFF SLOT

WING & ELEVATOR

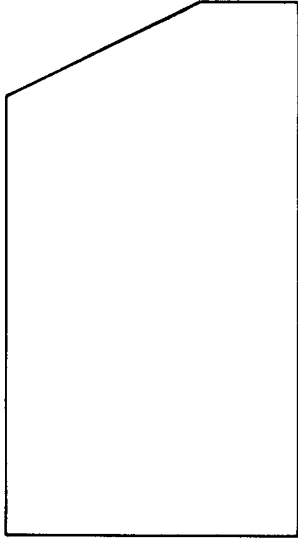
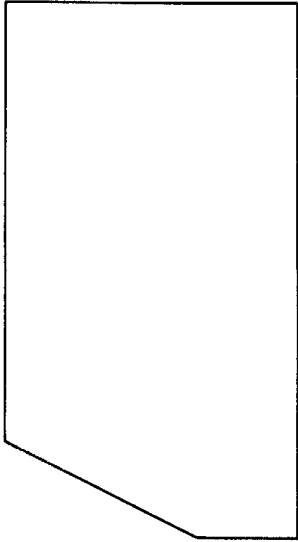
TAIL



SPACE SHUTTLE

TRIM TAB SHEET

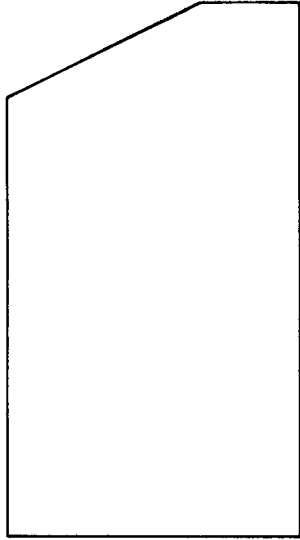
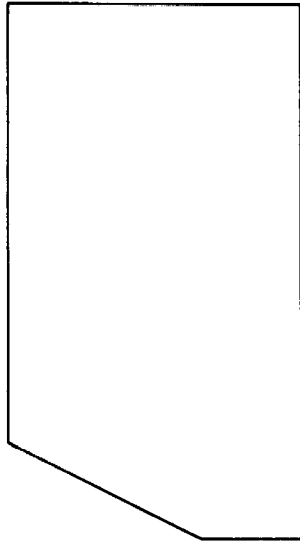
IP-86



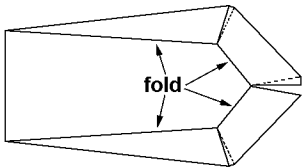
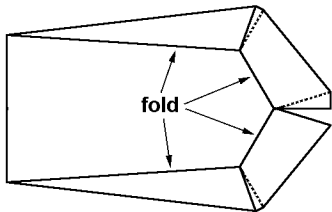
SPACE SHUTTLE

TRIM TAB SHEET

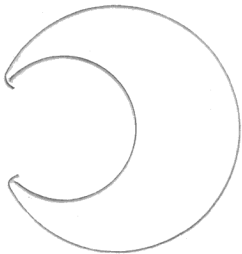
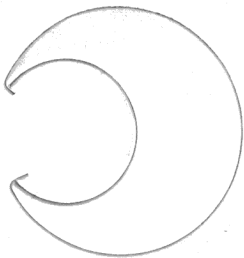
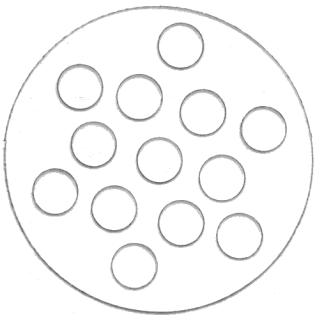
IP-86



Fold on dashed lines to form glue tabs
Cut on outside of heavy lines



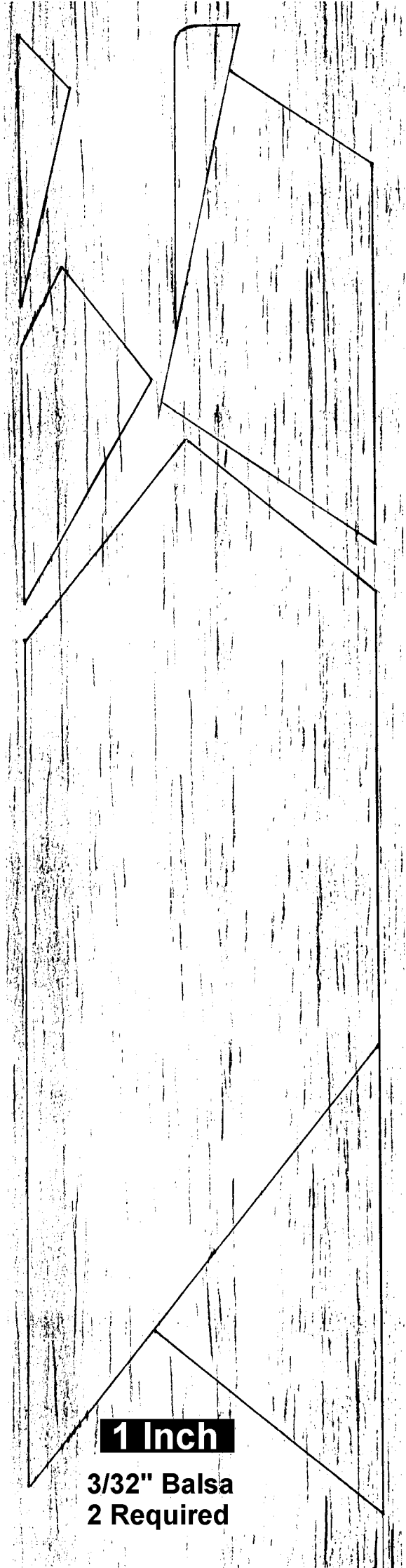
Print on 65lb. card stock





1 Inch

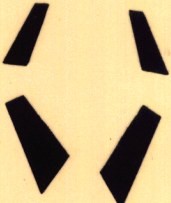
3/32" Balsa



1 Inch

**3/32" Balsa
2 Required**

USA



USA



USA



555

5

USA

USA

USA



5

SPACE SHUTTLE

SPACE SHUTTLE

LL-2 2 1/4" Long

1/8"

ST-7 3" Long

ST-7 5 3/4" Long

ST-13 6 7/32" Long

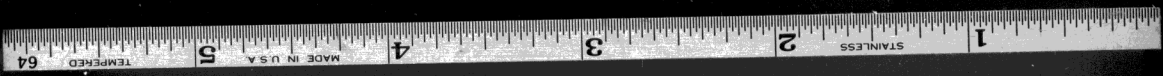
ST-16 12" Long

EL-1

TR-7

PNC-160

PNC-132



Space Shuttle



The amazing new shuttle based on NASA's program, writing the book shuttle for future flight.

Includes the following:



Instructions
1. Cut out the pieces.
2. Assemble the pieces.
3. Launch the shuttle.
4. Enjoy the flight.

Century

FLYING MODEL
ROCKET KIT

DESIGNED BY
NASA

SPACE SHUTTLE

WITH 100% PLASTIC
PARTS



FOR AGES 8 AND UP

100% PLASTIC PARTS

100% PLASTIC PARTS



FLYING MODEL ROCKET KIT

ORION MODEL ROCKETRY, INC. 100% PLASTIC PARTS