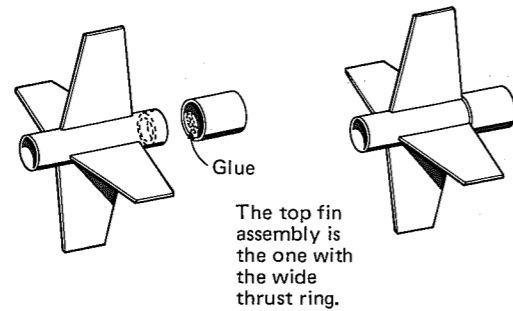
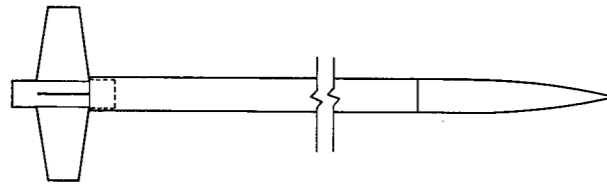


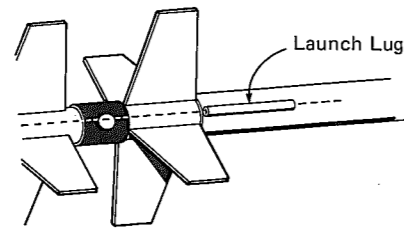
- 15 Apply a glue bead inside the long centering ring. Slide it over the forward end of the top engine tube, until it touches the fins.



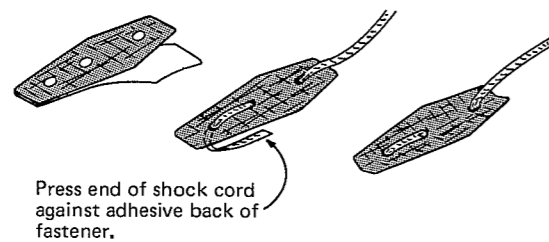
- 16 Run a generous glue bead around the rear inside of the main body tube. Insert the fin unit and check to be sure it's in straight.



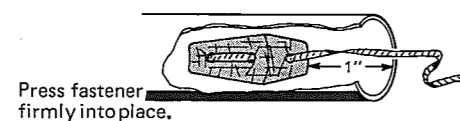
- 17 Glue the launch lug onto the lower part of the main body tube. Be sure it is in line with the body, but not in line with any fins.



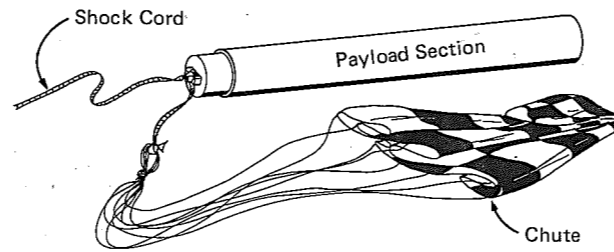
- 18 Peel the backing from the shock cord fastener. Thread the end of the elastic shock cord through the fastener as shown. Take care not to touch the adhesive backing any more than absolutely necessary. Slightly crease the fastener lengthwise to allow easy insertion into the tube.



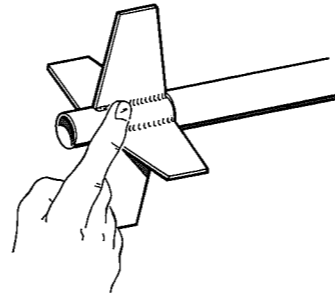
- 19 Insert the fastener 1" past the top of the body tube. Press firmly against the inside wall of the tube with a finger or eraser end of a pencil. NOTE: All edges of the fastener must be firmly contacted to the tube to insure a permanent bond.



- 20 Tie the other end of the shock cord thru the eyelet in the plastic connector. Tie the short free end of the shock cord thru the shroud lines of the assembled parachute.



- 21 You must reinforce all glue joints where the fins attach to their tubes. Run a fine bead of glue along the joints on each side of each fin and smooth into neat fillets with your fingertip. Be patient, as there are 12 fins, and therefore 24 fillets to do. Because of the high speeds, stresses in flight, and the tumble-recovery of the lower stages, we recommend a second series of fillets after the first have dried. This filleting will temporarily soften the glue joints and allow you to correct any slight mis-alignments.

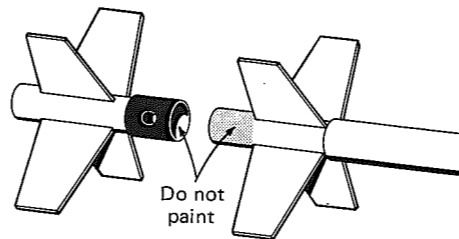


- 22 Painting can begin after all glue joints have been allowed to dry for several hours.

Spray painting your finished model with fast-drying enamel will produce the best results... IF IT IS DONE PROPERLY!!! For best results, spray first with enamel primer.

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, THEN a finish coat. Let each dry before applying the next.

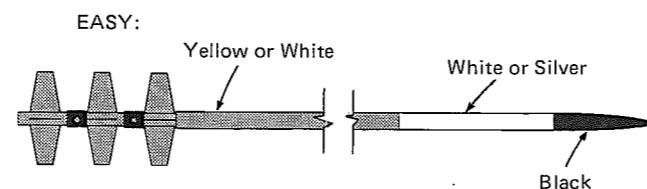
- 23 IMPORTANT: Do NOT get paint inside the passport couplers, or on the part of a tube which slides into a coupler. Paint on these surfaces will cause poor fits and separation failure in flight.



- 24 The simplest way to avoid painting those surfaces is to paint the rocket with all components socketed together.

RECOMMENDED COLOR SCHEMES

Choose colors that the decals will show up against.



CHALLENGING:

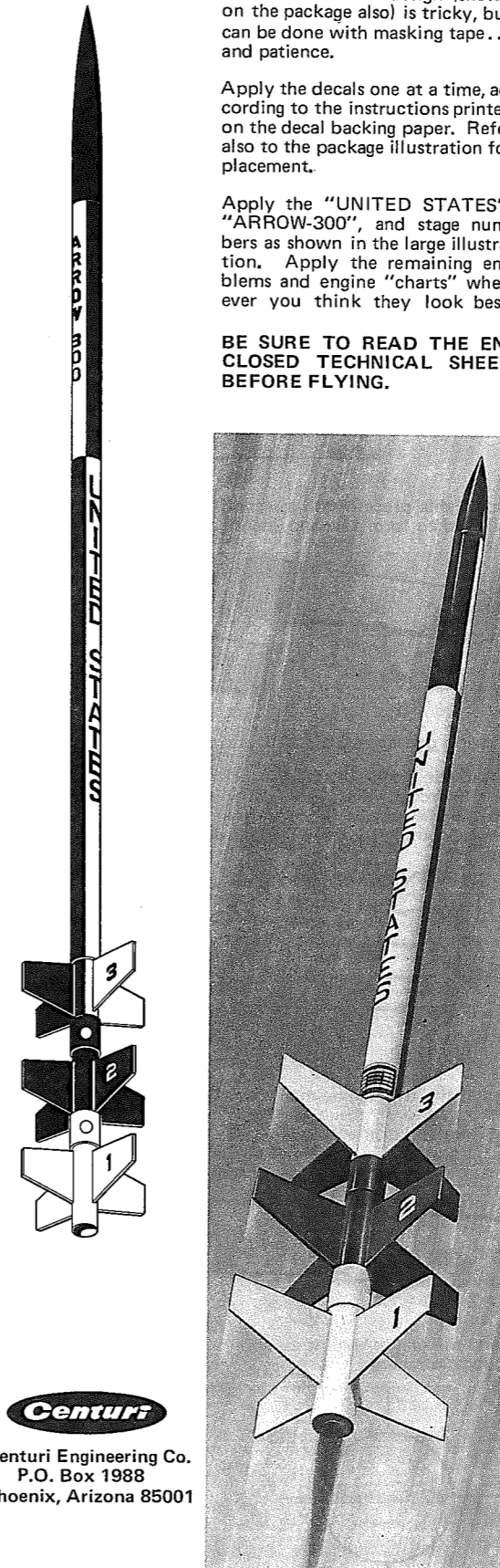


This checkerboard design (shown on the package also) is tricky, but can be done with masking tape... and patience.

Apply the decals one at a time, according to the instructions printed on the decal backing paper. Refer also to the package illustration for placement.

Apply the "UNITED STATES", "ARROW-300", and stage numbers as shown in the large illustration. Apply the remaining emblems and engine "charts" wherever you think they look best.

BE SURE TO READ THE ENCLOSED TECHNICAL SHEET BEFORE FLYING.

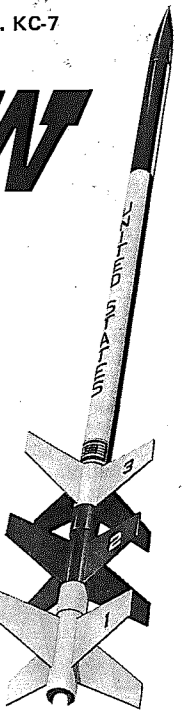


Centuri Stock No. KC-7

ARROW 300

Multi-staging is an excellent way to attain high altitudes with a model. An understanding of basic staging principles is needed to fly any 2 or 3 stage "bird" successfully. Staged models require extra care in assembly and handling as they are about twice as challenging as standard model rockets.

We strongly recommend that you engage the assistance of a more experienced model rocketeer, if you have never built and flown a multi-stage model before.



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 rockets 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

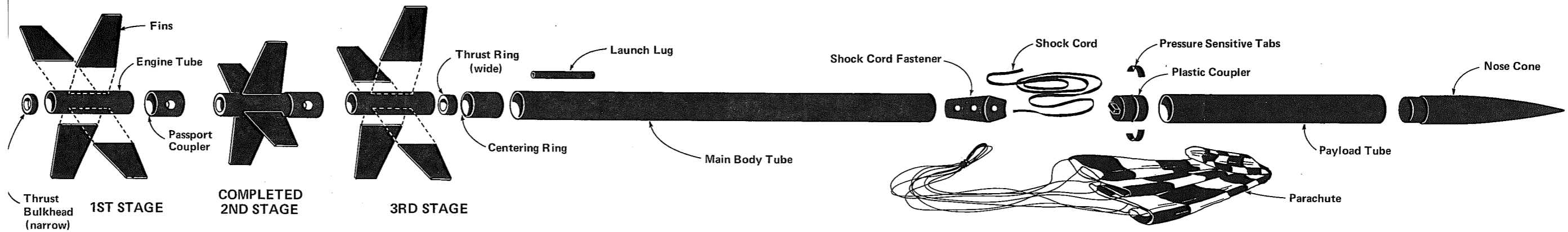
When conducting research activities with unproven designs or methods, I will, when possible, determine their reliability through pre-launch tests. I will conduct launchings of unproven designs in complete isolation from persons not participating in the actual launching.

FLYING CONDITIONS

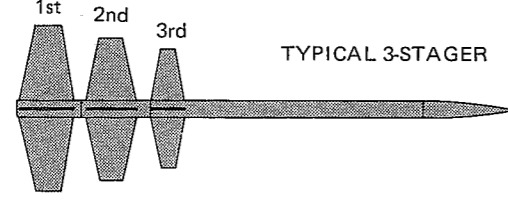
I will not launch my model rocket in high winds, near buildings, power lines, tall trees, low flying aircraft or under any conditions which might be dangerous to people or property.

Centuri

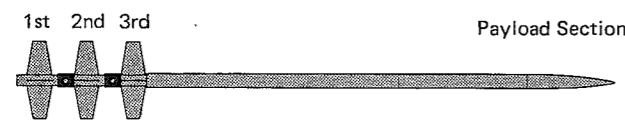
Centuri Engineering Co.
P.O. Box 1988
Phoenix, Arizona 85001



The Centuri ARROW-300 is a totally new departure in multi-stage rockets. Our R & D test have shown that, despite popular opinion, lower stage fins do not have to be oversize for good flight stability.



The ARROW-300 has been designed with an extremely long body which gives it "camber" (or leverage) to correct for stable flights.



This extreme length allows for much smaller fins . . . in fact they are all the same size. The relatively small fin size decreases the frontal area (cross-section exposed to the air-stream) and allows for flights up to 1/2 mile high. The first and second stage are identical and interchangeable.

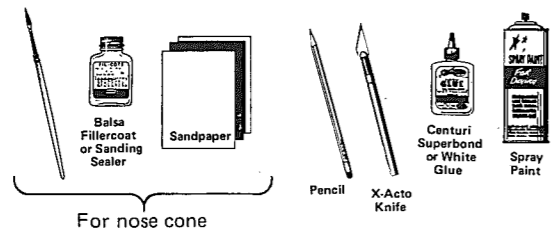
The rocket components look like this when completed.



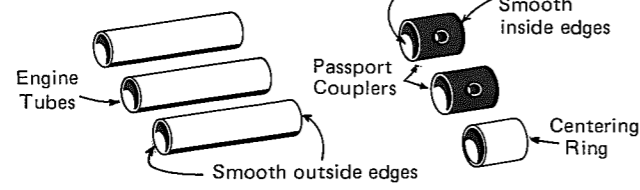
ASSEMBLY INSTRUCTIONS

(Flying instructions are on a separate sheet)

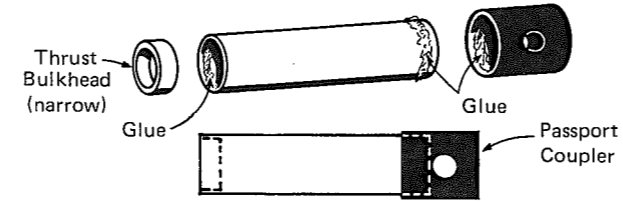
TOOLS: In addition to the parts supplied, you will need the following standard model rocket tools to assemble and finish this kit. **DO NOT** use model airplane glue for building flying model rockets.



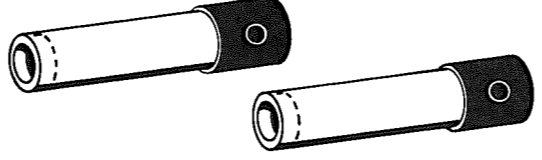
1 The tubing used in model rocket kits often has unavoidable slight "burrs" or rough edges, which must be removed before slipping tubes together. Use your fingers and very fine sandpaper to smooth the inside edges of the couplers and the outside edges of the engine tubes.



2 Run a bead of glue around the outside of the engine tube end, and around the inside of the passport coupler. Slip coupler over tube until tube just exactly comes to edges of the holes. Glue the thrust bulkhead (narrow ring) flush with the engine tube's other end.

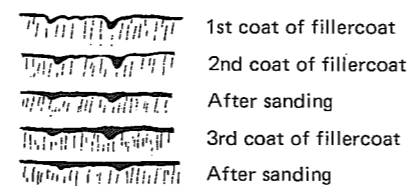


3 Repeat this process with a second tube, coupler, and thrust bulkhead to form a second, identical engine mount. Set aside to dry.



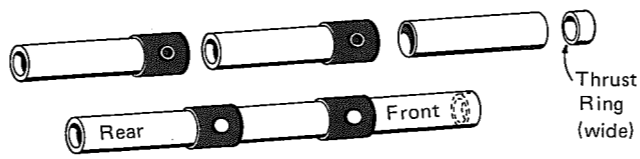
4 Now is a good time to start working on the balsa nose cone

To provide a smooth realistic surface, coat balsa surface with balsa fillercoat. Work it in, allow to dry thoroughly, and sand lightly. Repeat the filling and sanding steps until a smooth surface, completely free of grainline, is obtained.

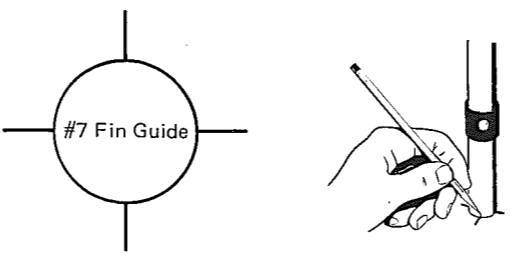


The fillercoating can be worked on between other steps.

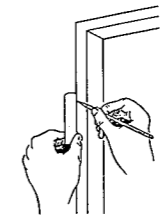
5 Socket the two engine mounts and remaining engine tube together as shown. Glue the thrust ring into place, flush with the front end of the tube.



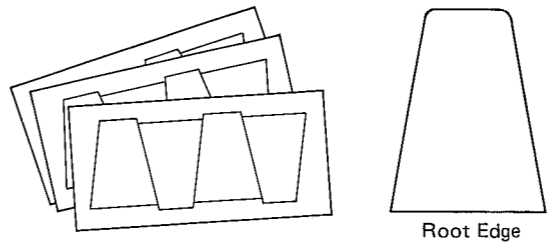
6 Stand the engine mount assembly on the fin guide and make fin location marks.



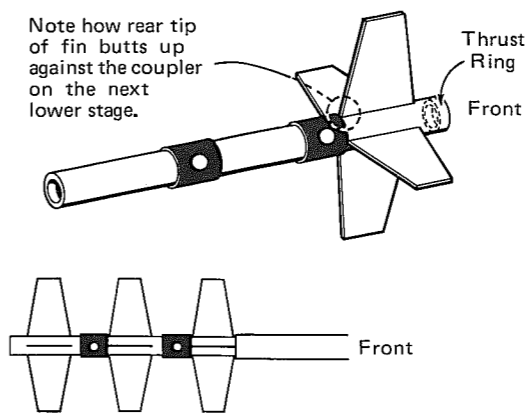
7 Find a convenient channel or groove, such as a door jamb, partially open drawer, or molding. Extend the marks the full length of the assembly. Do not juggle the engine mounts out of alignment.



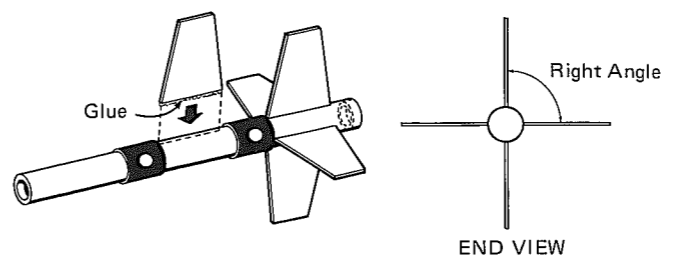
8 Carefully remove the pre-cut fibre-fins from their sheets. Trim away the little tick marks. The fins are symmetrical (there is no "front" or "back"), which simplifies assembly.



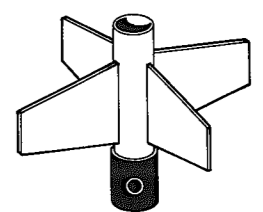
9 Each of the 12 fins will be attached to their engine tubes in the same relative position.



10 One at a time, apply a small bead of glue to the root edges of the fin and press in place on the line drawn on an engine assembly. Remove the fin. Repeat with remaining fins. Apply fresh glue to each fin and re-position on the tube.



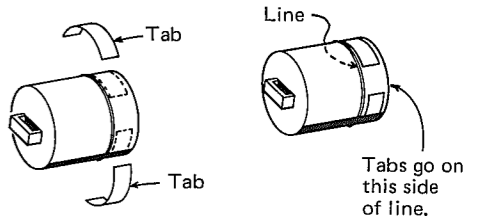
11 Work slowly and carefully, so fins don't fall off before having a chance to dry. If some fins are a little out of alignment, don't worry about it now . . . this can be corrected later.



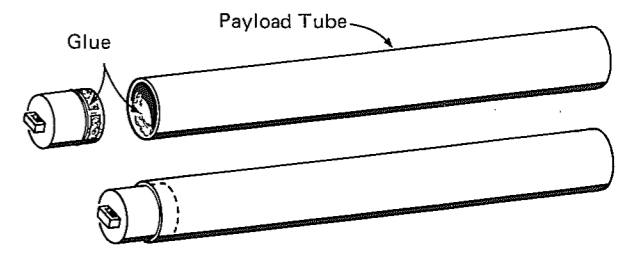
As you complete each fin section, remove it carefully and stand it upright to dry.

12 While the fins are setting up, assemble the payload section (and continue to sand and seal the balsa nose cone.)

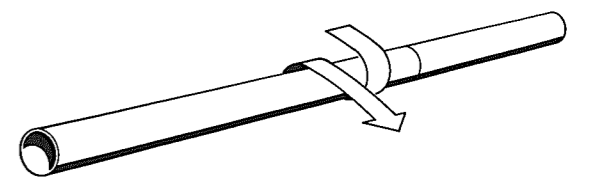
Peel the backing from the two pressure sensitive tabs and apply them to the forward end of the plastic connector. (These tabs allow gluing of plastic without special glues.)



13 Smooth the inside edges of the 8" long payload tube. Run a fine bead of glue over the tabs and inside the tube. Join parts until tube butts up against the plastic line on the coupler.



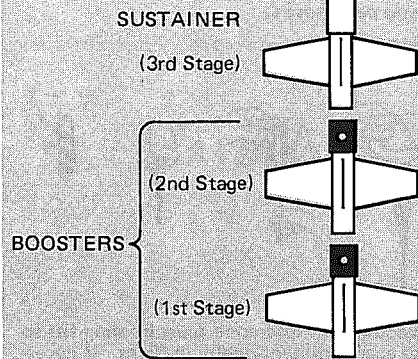
14 Quickly, before the glue sets, socket this payload assembly into the main body tube. Roll the entire assembly on a flat surface to be sure the plastic connector is glued in perfectly straight.



FLYING THE *Centuri* ARROW 300

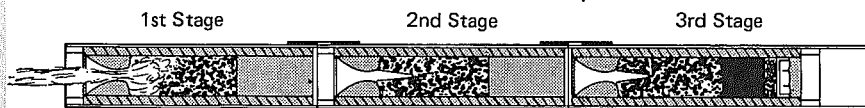
PLEASE READ ALL THIS INFORMATION BEFORE PREPPING AND LAUNCHING THE ARROW-300.

Staging is a concept where one engine's velocity is added to an already existing velocity of another engine. A variety of terms are used to name the main parts of a multi-stage rocket.

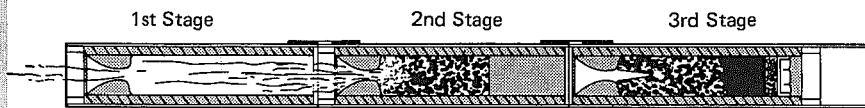


HOW PASS-PORT STAGING* WORKS:

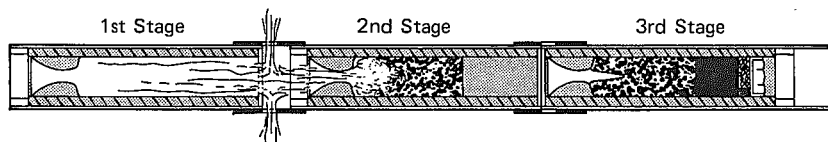
The booster (or 1st stage engine) is ignited by a standard electrical model rocket launch system.



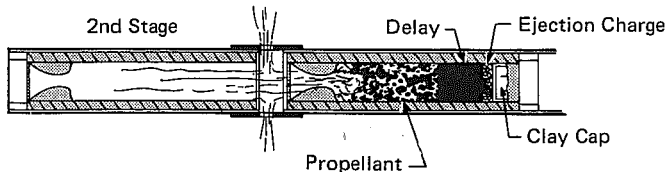
This engine contains propellant, but no delay or ejection material, and is designated with a code ending in zero (example: B6-0). As the intense flame burns forward, it breaks through the top of the propellant grain. Hot particles of still-burning propellant shoot forward into the nozzle of the second stage engine, igniting its propellant. (Ordinary flame, such as from a match, will not ignite model rocket engines.)



In the Centuri Pass-Port Staging System*, some of the rapidly expanding gases are allowed to escape through the 2 ports in the coupler joining the stages. This allows just enough time (a split second) to ignite the next stage before the first stage blows away completely.



The first stage alone is an aerodynamically unstable body that will tumble safely to Earth. Meanwhile, the second stage climbs, the thrust of the second stage being added to the already existing velocity created by the first stage. The process repeats itself with the second stage, finally igniting the uppermost engine.



The upper stage contains a recovery system and an engine with the standard configuration of propellant, delay and ejection material.

* Pat. No. 3,721,193

One feature of multi-staging rockets (especially 3 stages) is the tendency to "weathercock". Because of the large amount of fin area, the rocket tends to be over-stable. When flown in a breeze, this over-stable condition causes the rocket to turn into the wind. The harder the wind, the more the tendency to "weathercock".

The ARROW-300, with its extreme length and small fins will not weathercock as much as other 3-stage designs, but it still is advisable to launch only in calm weather.

PREPPING AND LAUNCHING

Altitudes will depend on engines chosen and on model workmanship. Remember that extremely high flights are usually unable to be "tracked" by inexperienced observers. Do not launch on overcast days as the model may be lost to sight forever.

ENGINES

Igniters and complete engine installation instructions are included in "Engine Operating Instructions" which accompany all Centuri engines.

IP-524-1172 (continuation)

Models built from Centuri multi-stage kits should be launched with the recommended engines listed below (and on the decal, for your convenience).

The engine for an uppermost stage should be the longest available delay time in its' class. (Example: ½A6-4, A5-4, A8-5, B4-6, B6-6, B14-7, or C6-7.)

RECOMMENDED ENGINES			
1st STAGE (Lower)	2nd STAGE (Middle)	3rd STAGE (Upper)	APPROX. ALTITUDE
B6-0	A8-0	½A6-4 or A5-4	600 - 1000 ft.
B6-0	B6-0	A8-5 or B4-6	1000 - 1800 ft.
C6-0	C6-0	B6-6 or C6-7	1400 - 2500 ft.

OR ANY COMBINATION FROM EACH COLUMN

FOR BOOSTING "HEAVY" PAYLOADS:			
B14-0	B14-0	B14-7	Depends on weight

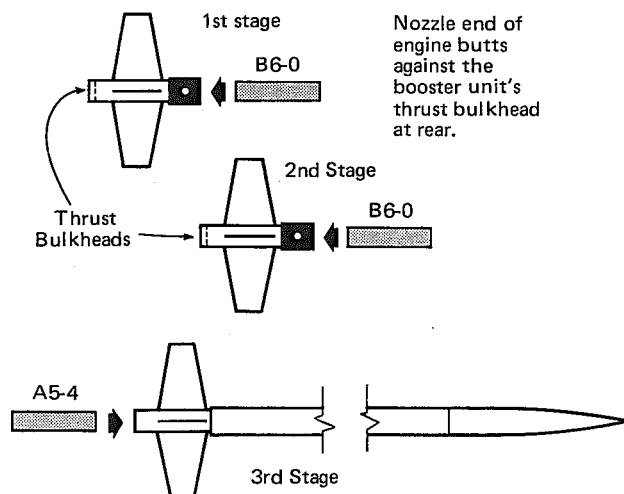
MAXIMUM PAYLOAD WEIGHT: 1.5 oz.

This chart is only a rough guide. You may note that while "C" engines are twice as powerful as "B" engines, the "C"s do not necessarily give twice the altitude. Likewise, a two-stage rocket will not quite go twice as high as a single stage. This is because some aerodynamic efficiency is lost through drag at higher airspeeds.

MOUNTING ENGINES

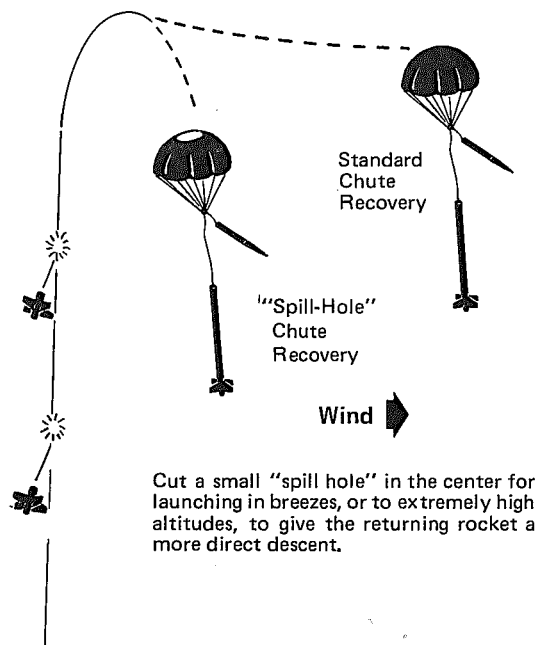
Engines must be held firmly in place to withstand forward movement while thrusting, and rearward motion during burn-through.

Test-fit the recommended upper stage engine into the upper stage vehicle to see how far up it must go. Remove, wrap engine with masking tape and insert again. Enough tape must be used to insure a firm, tight fit. When properly taped, leave engine in place. Repeat this "friction-fitting" with the two booster engines, noting that they are inserted from the front.



RECOVERY SYSTEMS

Staged model rockets are capable of reaching altitudes over 2000 feet. At extreme altitudes the wind speed is often greater than at surface level. A staged rocket equipped with a standard parachute may be caught in a breeze, and drift as much as several miles before returning to earth.

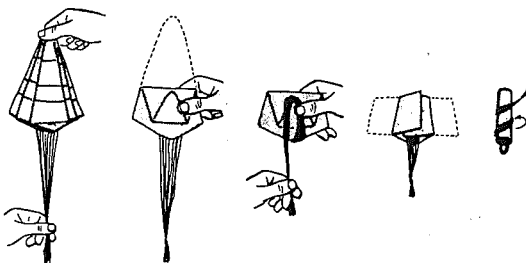


FLIGHT PREPARATION

1. Inspect booster fins to make sure they were not weakened on any previous flight.
2. Tape and insert recommended engines.
3. Be sure booster type engines are in 1st and 2nd stage, and standard type engine in the uppermost stage.
4. Be sure all engines have their nozzles pointing rearward.
5. Never use a standard engine in a booster because this will almost certainly cause a crash.
6. Clean any exhaust residue from coupler area to insure a good fit.

NOTE: When fully prepared, stages must couple together smoothly and snugly. Fit should be tight enough to that boosters do not fall out of upper stage by their own weight.

7. Inspect shock cord and fastener for firm bond.
8. Insert Flameproof Parachute Wadding according to its directions.
9. Fold parachute and pack neatly.



10. The plastic connector and nose cone must be snug fits so they won't come apart unintentionally in flight. If necessary, apply a little tape to their bases for a snug fit.

Carefully prepare and check all parts of your rocket before each flight.

Launch the ARROW-300 from any standard model rocket launcher having a 1/8" diameter x 36" long steel launch rod.

Do not leave the rocket sitting in the sun for long periods as this may soften the adhesives.

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 the exposed tip of the launch rod when not actually launching!

Why not roll this sheet up and tuck it into your rocket? You'll have it to refer to when going out to launch!

