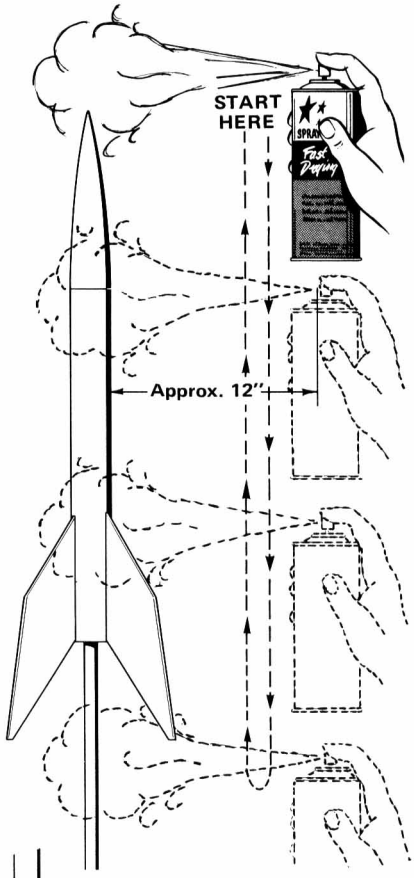
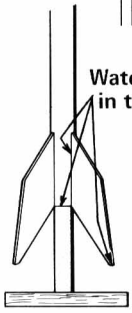
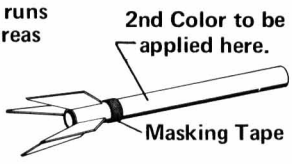
The third coat is known as a "wet coat" and requires more care in application. Move the spray can up and down in slower arcs, allowing a heavier coating of paint to be applied. This heavy coat will have a wet glossy appearance. Care must be taken not to deposit too much paint in one area or runs will result. Once the wet coat has been applied to the model, allow it to dry for 3 to 4 hours before handling. If you did the job right, the paint should dry with a glass-smooth, hi-gloss finish.

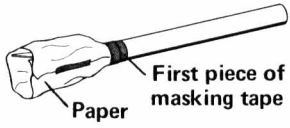
If the model is to be a two color job, it will have to be masked before application of the second color. The model should be allowed to dry for at least 24 hours before any masking is done. Otherwise, the paint may pull loose when the masking tape is removed. Before applying masking tape to a model, press it against a piece of glass. This will remove some of the adhesive and reduce the possibility of lifting the paint. The masking tape should be applied carefully to the areas where the color change will occur. Large areas should be covered with paper which is carefully taped in place. Be sure there are no breaks or open seams in the paper through which the second color might sift and cause an overspray condition.

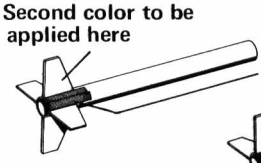
After all painting is completed, the model is ready for decals or trimming (using colored tape designed for that purpose). In applying decals, follow application instructions printed on the back of the decal sheet. Be sure to press all air bubbles from the surface of the decal and and remove any excess water by gently blotting. Trim tape is quite easy to apply. Since it has an adhesive backing, just apply the tape to the model and cut off where desired. To preserve the finish and to prevent possible loosening of decals or trim tape, it is advisable to give the completed model a coat of clear spray paint. This should be done only after the decals are thoroughly set and all water has evaporated from the surface. Clear spray paint sometimes takes longer to dry than colors, so it is a good idea to let the model dry overnight before handling.

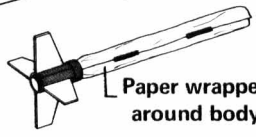


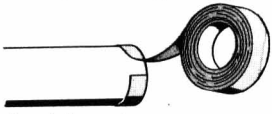












Applying trim tape. (Centuri Pro-Stripe Tape)

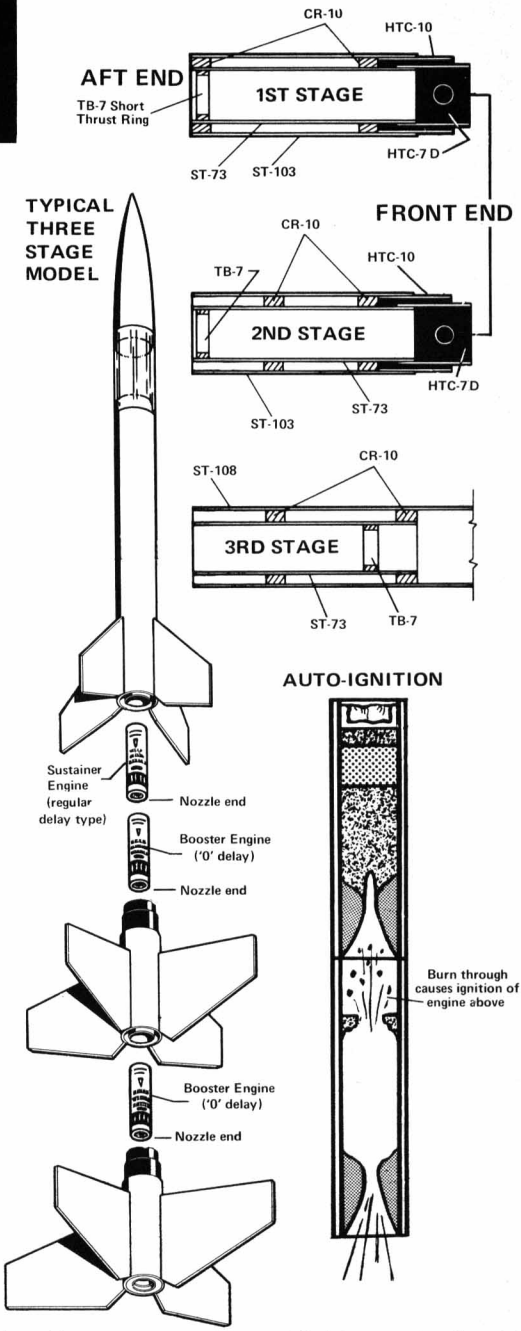
Remove all air bubbles by gently pressing them to the decal edge with a soft cloth.

Chapter 8:
Multi-Staging

This system utilizes specially constructed rockets which feature "break-away" booster stages. Engines are fitted into the stages and coupled to form a "stack". Special booster engines, having no delay or ejection charge, are used. The firing of a typical three stage rocket would work as follows: The engines are inserted into the stages and held in place by friction fitting with tape. Notice that the top or sustainer stage contains a regular delay-ejection type engine. With all engines in place, the stages are coupled together and an igniter is attached to the first stage engine. The rocket is set on the pad and the electrical leads connected. Upon ignition, the rocket lifts off with the thrust of the first stage engine. When this engine "burns through", bits of hot fuel are retro-fired up into the nozzle of the second stage engine, causing it to ignite. When the second stage engine begins to thrust, it pushes the first stage away. The first stage with its large fins tumbles safely to earth. When the second stage reaches burnout, it auto-ignites the third stage. The second stage is ejected and recovered in the same manner as the first stage. The third stage behaves as a single stage rocket, thrusting for a time then coasting to apogee where the recovery system is ejected for normal parachute recovery.

Multi-staging is an excellent way to attain high altitudes with a model. The number of stages possible is limited only by the available boost power of the first stage engine (the first stage engine must be able to lift the weight of all the stages and their engines). Four stages is probably the maximum and this would require extreme care in design and construction. For best results, booster stages must be kept to no more than 3" in length. Large fins are required for adequate stability and to slow the "tumble" speed during recovery. Stage coupling is important and Centuri's Pass-Port Staging System* is a must for effective auto-ignition. Best all round results are obtained from rockets using a # 10 series body tube. One feature of multi-stage rockets (especially 3 stagers) is the tendancy 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 tendancy to "weathercock". For this reason, it is advisable to fly multi-stagers only in calm weather.

TYPICAL THREE STAGE CONSTRUCTION EMPLOYING CENTURI'S "PASS-PORT" STAGING SYSTEM*



*Patent Application pending. Any individual who wishes to construct an assembly incorporating the invention covered by this pending application and any patent which issues thereon on a non-profit, non-commercial basis is hereby granted a royalty-free, non-exclusive license to practice this invention. Such license is not granted to persons or firms which practice this invention or induce the practice of this invention for profit or on a commercial basis.

Chapter 9: Large Scale Model Rocketry

Large Scale model rockets are termed those which are powered by the E and F class of Mini-Max and Enerjet engines. Because of the size of the engines, rockets in this category are rather large and heavy. In comparison, the Centuri Saturn V is larger than many of the "Large Scale" rockets, but is is designed to fly primarily with the C-D type engines. It is, therefore, not considered to be a "Large Scale" rocket. Rockets in this advanced category are high performance types and must be constructed to take much higher thrust levels than the regular line of Centuri rockets.

ENGINES:

Mini-Max E and F engines are constructed like the standard line of rocket engines. 1-1/8" in diameter and 4-3/4" (E) or 7-3/4" (F) in length, they feature a wound paper casing, ceramic nozzle and a propellant, delay, ejection system very similar to the 1/2A through C engines. These engines range up to a maximum thrust level of 39 pounds as compared to 7 pounds maximum thrust in the standard engine categories. From this you can see why this is called "advanced" model rocketry.

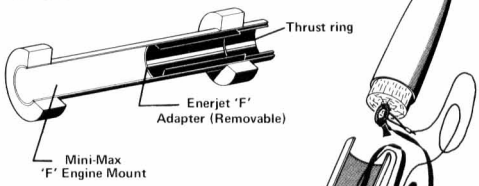
Enerjet E and F engines are constructed of a new type propellant which is bonded into a filament wound, epoxy impregnated casing. The expansion nozzle and delay charge housing are machined from graphite. While these engines do not have as high of a maximum thrust peak as the Mini-Max engines, they burn for a much longer time at a high average thrust level, providing them with the highest total impulse figure of any engine in the model rocket field. Enerjet engines are of the same diameter but are shorter than the corresponding Mini-Max engines. They may be flown interchangeably in the large-scale rockets by simply inserting an adapter into the engine mount. Like the Mini-Max engines, Enerjet E and F engines are intended to be used only by the advanced, knowledgable rocket enthusiast.

ROCKETS:

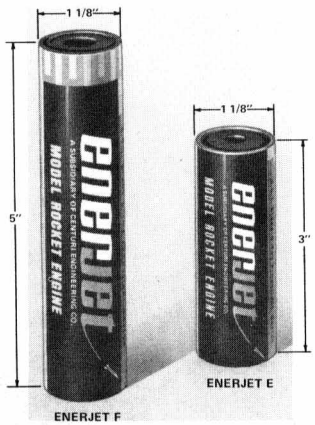
Large scale rockets differ in construction from the standard rocket line. Body tubes are heavier, most have a .040 wall thickness. Engine mounts are more heavily built to take the greatly increased thrust. The fins are of heavier balsa and are strengthened with reinforcing material to prevent their being stripped from the body during initial thrust.

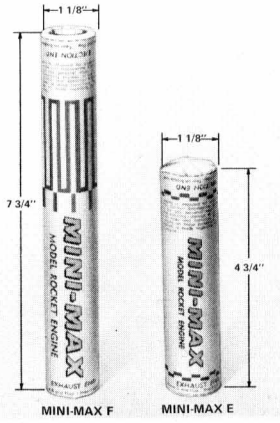
The shock cord system consists of a steel cable in addition to the elastic shock cord. The nose cone must fit precisely into the body and the finish must be smooth. Fins, too, must be carefully sanded to a streamline shape. Recovery parachutes are made from mylar or silk. Proper materials and construction methods are absolutely necessary in this advanced field of "Large Scale" Rocketry.

TYPICAL ENGINE MOUNT SHOWING ADAPTER FOR ENERJET



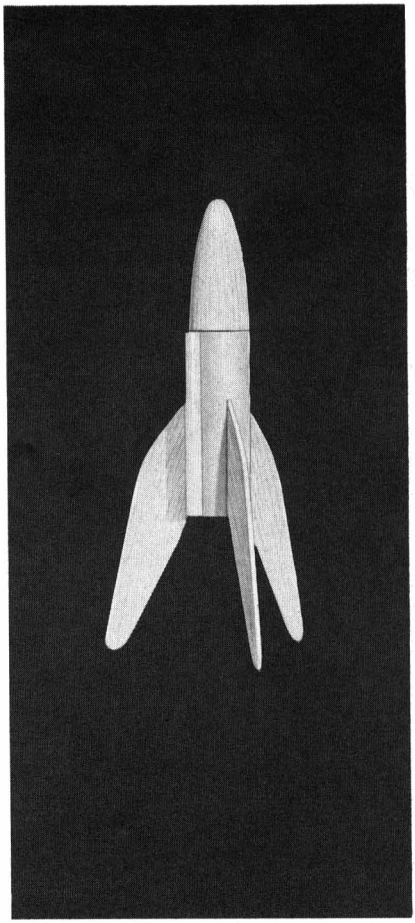
TYPICAL LARGE SCALE ROCKET CONSTRUCTION





Chapter 10:
4 Model Rockets You can build

The following rocket designs demonstrate the use of components, designs, and construction techniques described in this booklet.

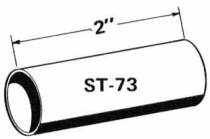


THE BUG
Flyweight Model

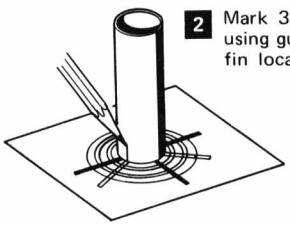
PARTS LIST

1 ST-73	Body Tube—cut to 2" long
1 BFM-8	Balsa Fin Material
1 LL-2	Launch Lug
1 BC-70	Nose Cone

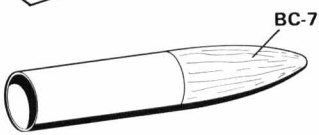
Use paint and decals of your choice



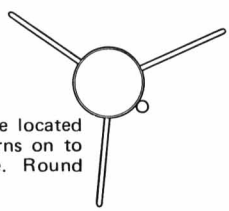
1 Cut body tube to 2" long.



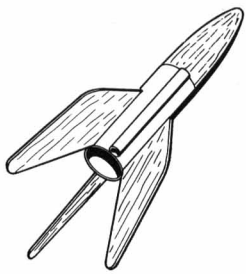
2 Mark 3 fin locations on body using guide on Page 19. Extend fin location lines along body.



3 Glue nose cone into body.



4 Using the appropriate fin template located on back cover, transfer fin patterns on to balsa. Cut out and sand to shape. Round all edges except root edge.



Fly the BUG with the following "short" engines:

½A6-2S ½A6-4S

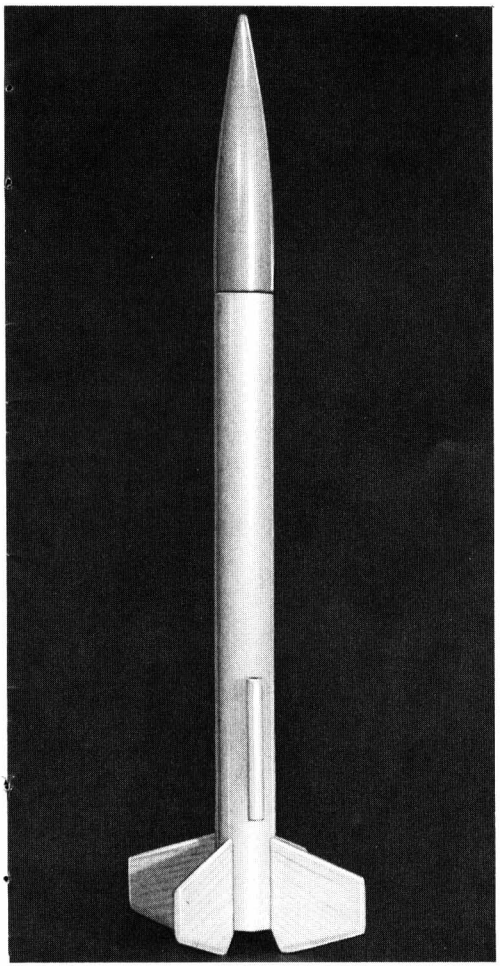
5 Attach fins and launch lug.

6 Finish balsa parts, paint and apply decal, if desired.

The step-by-step assembly instructions are to be coordinated with the general construction techniques described in detail in Chapter 6 (Construction Techniques).

ACHILLES

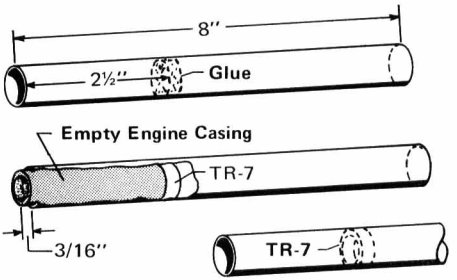
Pseudo Scale Model



PARTS LIST

1	ST-712	Body Tube—need piece 8" long
1	TR-7	Thrust Ring
1	EL-1	Engine Lock (optional)
1	LRR-77	Mylar Lock Ring (optional)
1	PNC-76	Nose Cone
1	BFM-10	Balsa Fin Sheet
1	SC-18	Shock Cord
1	SCF-1	Shock Cord Fastener
1	RS-20	Streamer
1	LL-2	Launch Lug

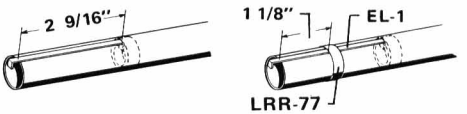
Use paint and decals of your choice.



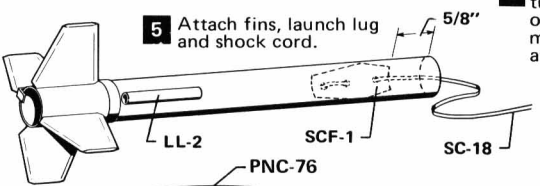
1 Cut body tube 8" long. Apply glue to inside of tube at 2-1/2" depth. Using an empty engine casing, push the thrust ring down into the tube until the engine casing is extended 3/16". Remove casing immediately.

2 Place 4 fin location marks on body tube by using guide on Page 19.

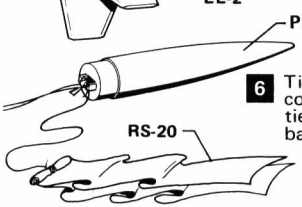
3 Mark appropriate fin pattern on the balsa sheet by using the ACHILLES fin template located on back cover.



4 (OPTIONAL) Cut a short slit in the body tube at the base of the thrust ring. Insert one end of engine lock into slit. Glue the mylar lock ring over engine lock and body at the appropriate distance.



5 Attach fins, launch lug and shock cord.



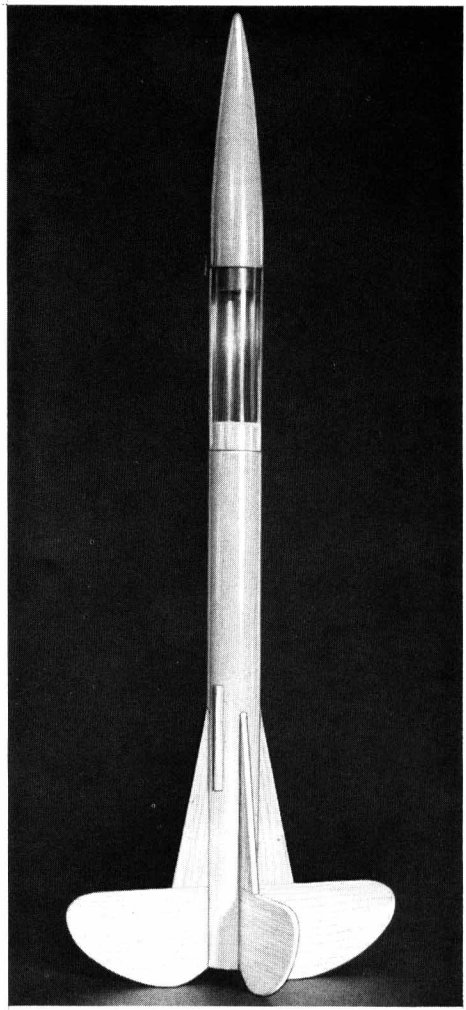
6 Tie free end of shock cord to nose cone base. Assemble streamer and tie attachment string to nose cone base.

7 Sand and finish fins. Paint and apply decals to model.

Fly the ACHILLES with the following engines:

½A6-4	B4-6	B14-6
A8-5	B6-6	C6-7

PAY DIRT
Payload Carrier

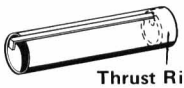


PARTS LIST

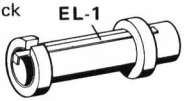
1 ST-1010	10" Body Tube
1 EM-10	Engine Mount
1 EL-1	Engine Lock
1 LL-2	Launch Lug
1 BFM-10	Balsa Fin Material
1 BTC-10	Balsa Tube Coupler
1 PNC-106	Nose Cone
1 CPT-103	Payload Tube
1 CP-20	Parachute
1 SC-18	Shock Cord
1 SCF-1	Shock Cord Fastener
1 SE-12	Screw Eye

Use paint and decals of your choice

1 Glue thrust ring into end of engine mounting tube.

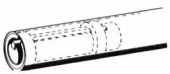


2 Assemble engine mount with modification for engine lock as shown at right.

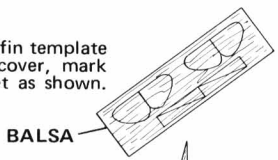


3 Mark 4 fin locations on an ST-1010 pre-cut tube. Refer to Design #1 for illustration.

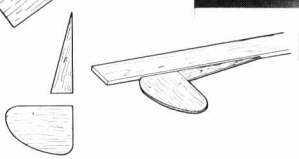
4 Glue engine mount into body tube as illustrated.



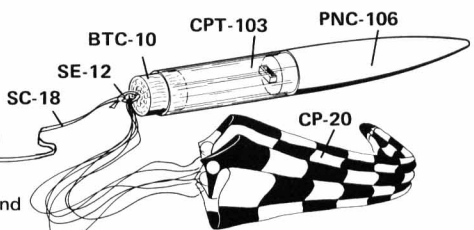
5 Using appropriate fin template located on back cover, mark fins on balsa sheet as shown.



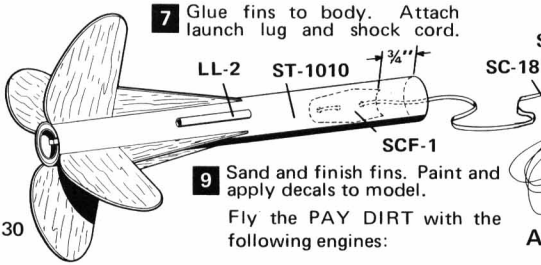
6 Glue the 2 fin pieces together to form completed fin. Check alignment against straight edge.



8 Socket tube coupler, payload capsule, and nose cone together. Attach screw eye and the free end of shock cord to the base of tube coupler. Assemble parachute and tie shroud lines to screw eye.



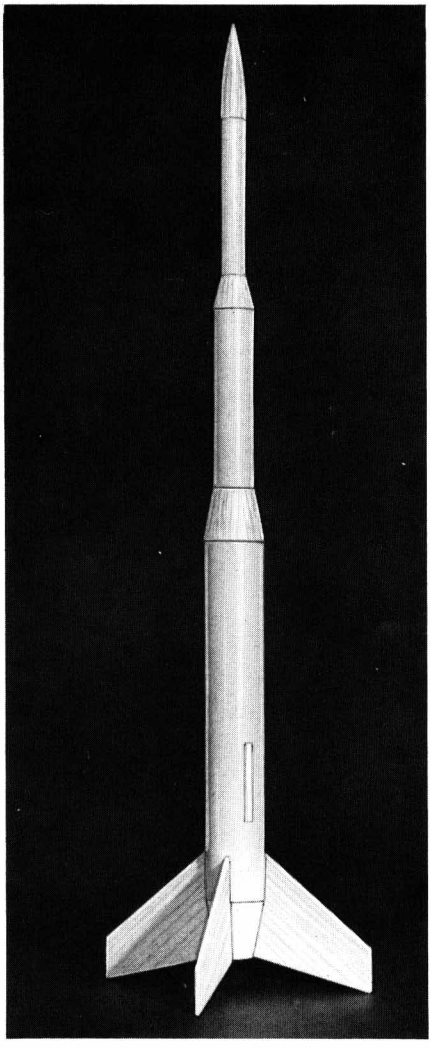
7 Glue fins to body. Attach launch lug and shock cord.



9 Sand and finish fins. Paint and apply decals to model.

Fly the PAY DIRT with the following engines:

A8-3 B6-4 B14-5 C6-5



CLOUD BUSTER

Sports Rocket

PARTS LIST

1 ST-138	Body Tube
1 ST-812	Body Tube—need piece 4" long
1 ST-512	Body Tube—need piece 3½" long
1 EB-13	Ejection Baffle
1 PR-713	Paper Reducer
1 SCF-1	Shock Cord Fastener
1 BFM-10	Balsa Fin Material
1 CP-20	Parachute
1 BC-54	Nose Cone
1 BR-8-13	Balsa Reducer
1 BR-5-8	Balsa Reducer
1 LL-2	Launch Lug
1 SE-12	Screw Eye
1 ST-73	Engine Mounting Tube
1 TR-7	Thrust Ring
1 SC-18	Shock Cord

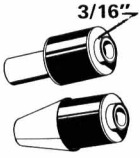
Use paint and decals of your choice

1 Assemble the two segments of the paper reducer (PR-7-13).

2 Glue thrust ring into end of engine mounting tube.

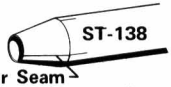
3 Glue engine tube into the sleeve mount of the PR-7-13.

4 Glue paper reducer over exposed portion of tube.

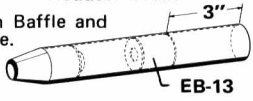


5 Use ST-138 or cut 8" body tube from ST-1318. Mark 4 fin locations using guide on Page 19.

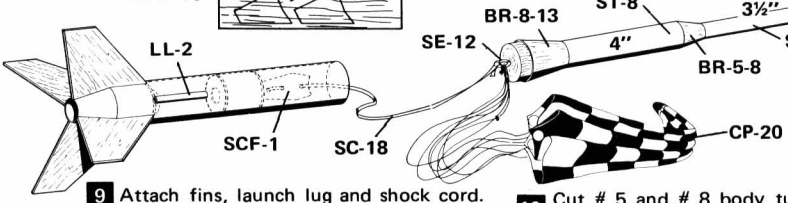
6 Glue engine mount into body tube. Draw fin location lines on body and boat tail.



7 Assemble Ejection Baffle and glue into body tube.



8 Using appropriate fin template located on back cover, mark fins on balsa sheet as shown, and cut out.



9 Attach fins, launch lug and shock cord.

10 Cut # 5 and # 8 body tubes to length, socket tubes and reducers together to form upper body. Attach screw eye to BR-8-13. Assemble parachute. Attach chute shroud lines and free end of shock cord to screw eye.

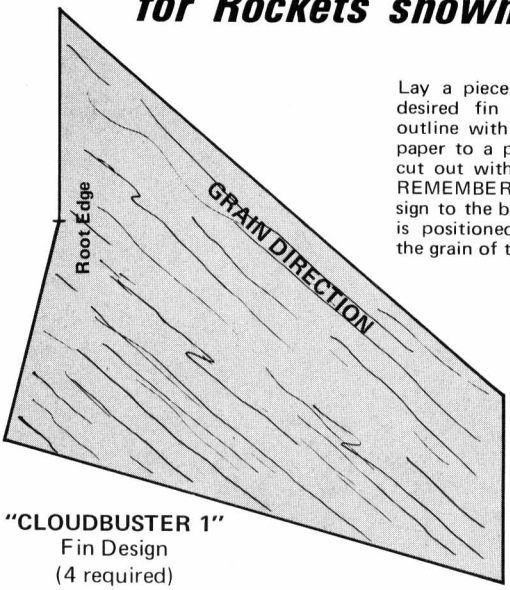
11 Finish balsa parts, paint and apply decals.

Fly the CLOUD BUSTER with the following engines:

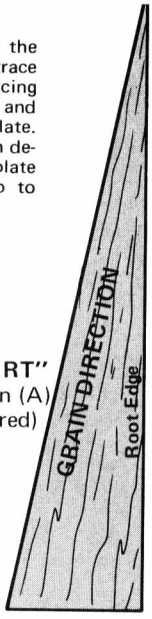
A5-2 B4-4 B6-4 B14-5 C6-5

FULL SIZE FIN TEMPLATES
for Rockets shown on pages 28-31

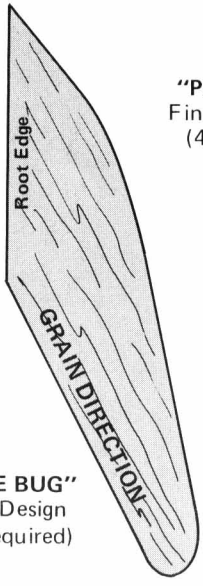
Lay a piece of tracing paper over the desired fin design and carefully trace outline with a pencil. Glue the tracing paper to a piece of light cardboard and cut out with scissors to form template. REMEMBER: When transferring fin design to the balsa, make sure the template is positioned in proper relationship to the grain of the wood.



"CLOUDBUSTER 1"
Fin Design
(4 required)

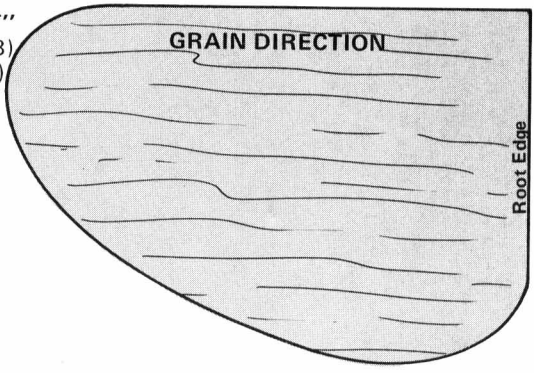


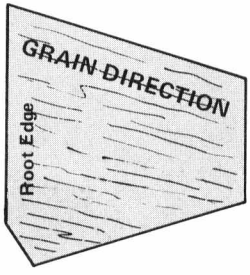
"PAY DIRT"
Fin Design (A)
(4 required)



"THE BUG"
Fin Design
(3 required)

"PAY DIRT"
Fin Design (B)
(4 required)





"ACHILLES"
Fin Design
(4 required)

Although custom parts are available for purchase from Centuri to construct various model rockets, it is not necessary to purchase any unpatented parts from Centuri in order to acquire any license under any of Centuri's patent rights.