

2 STAGE BOOSTER FOR
BIG PAYLOADS

Astron

DELTA

Recommended
launcher vehicle for
the Gamma
rocket engine

Rolls-Royce engines booster for payload capacity. Maximum capacity 27,000 lbs. and payload capacity 10,000 lbs. with nose cone or payload section of your choice. Flyable in single or 2 stage. Extreme delivery range capability for payloadability. Kit is complete with all parts, launch gear, engine and engine, and launch gear, accessories, and technical report TR-2. Minimum retail \$2,995.00.

Cat. No. 701-R-10

\$3.25



SPECIFICATIONS

Length 156.0 (54 Feet)
Base Dia 30.0 (111.8 Inches)
Wgt 27,000 lbs

RECOMMENDED ENGINE

FOR OPTIMUM PAYLOAD
USE ONLY

Get more info for the best
performance for the Gamma

Rolls-Royce Engines
Rolls-Royce, 10110
1900 S. 10th St.
Mesa, Arizona 85204

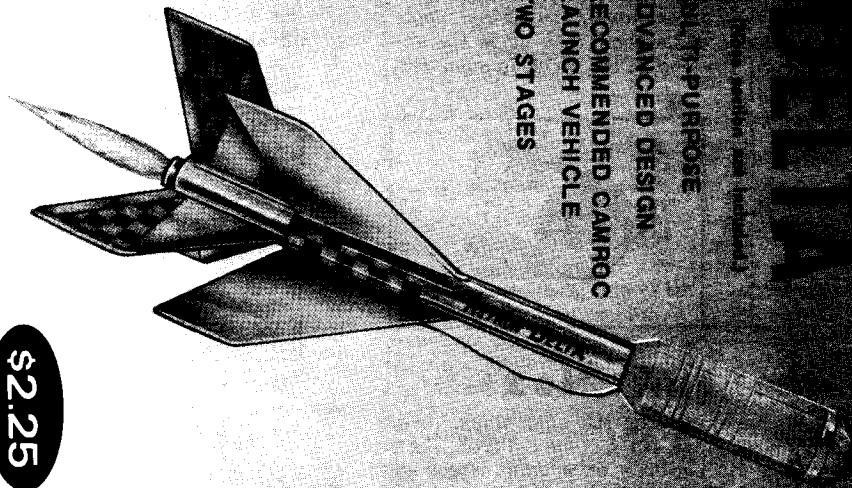
Rolls-Royce
Laser 2000
202-244-5119, FAX

Do not attempt to fly this model
without proper safety precautions.
See the instructions for details.

When using large quantities, see the nearest
retailer or write for price and shipping info.

ESTES

General Purpose (see Appendix)
 ADVANCED DESIGN
 RECOMMENDED CAMROC
 LAUNCH VEHICLE
 TWO STAGES



\$2.25

DELTA

KIT NO. K-16 \$2.25

SPECIFICATIONS RECOMMENDED ENGINES

Length 13.6"
 Body Dia. 1" Upper Stage—66, 814-6, 814-7
 For First Flight.
 Weight 1.45 oz. B14-0 Booster — B14-6 Upper Stage

PARACHUTE RECOVERY

KIT PARTS & OTHER NEEDS

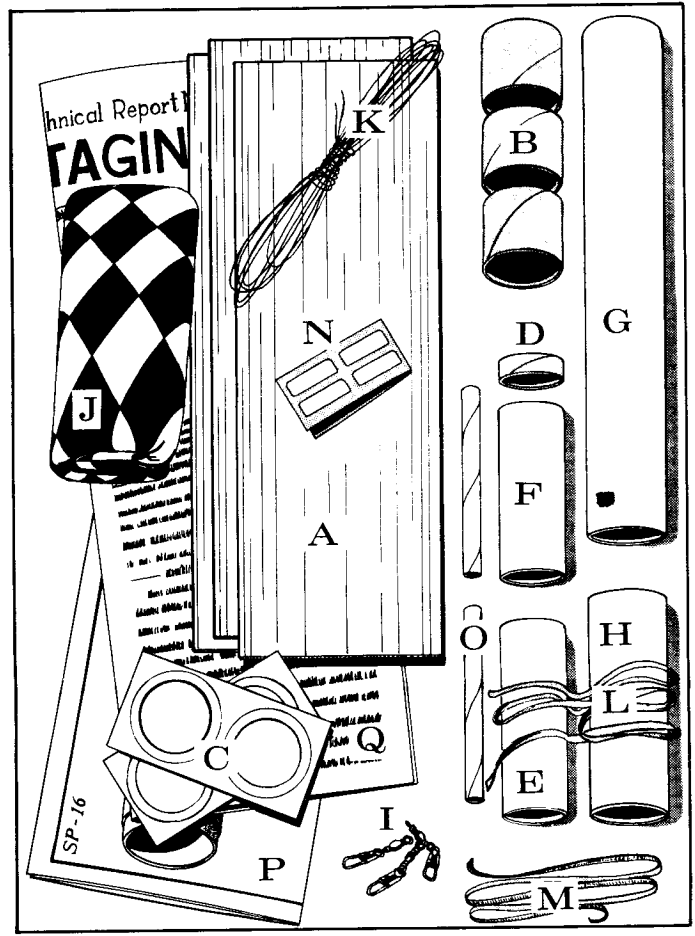
Your Astron Delta rocket kit has been especially designed as a launch vehicle for the Camroc model rocket camera. It will also accept a wide variety of nose cones and payload sections of your choice for general-purpose launchings. The kit consists of the following parts as illustrated in the drawing at right:

- (A) 3 sheets balsa fin stock--Part #BFS-30
- (B) 3 stage couplers--Part #JT-50C
- (C) 4 adapter rings--Part #RA-2050
- (D) 1 engine block--Part #EB-20A
- (E) 1 engine holder tube (2-3/4" long)--Part #BT-20J
- (F) 1 engine holder tube (2-1/4" long)--Part #BT-20M
- (G) 1 body tube (7-3/4" long)--Part #BT-50H
- (H) 1 booster body tube (2-3/4" long)--Part #BT-50J
- (I) 3 snap swivels--Part #SV-12
- (J) 1 parachute--Part #PK-12A
- (K) 72" shroud line cord--Part #SLT-12
- (L) 1 shock cord (18" long)--Part #SC-1
- (M) 1 shock cord (12" long)--Part #SC-1B
- (N) 8 tape strips--Part #TD-2H
- (O) 2 launching lugs--Part #LL-1B
- (P) 1 pattern sheet--Part #SP-16
- (Q) 1 technical report--Part #TR-2

In addition to the materials included with your kit you will also need the following tools and supplies:

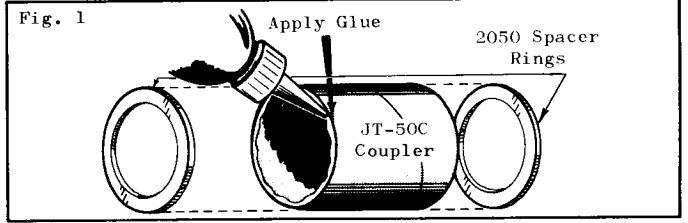
- 1) Modeling knife or single edge razor blade
- 2) Scissors
- 3) Extra strong white glue
- 4) Ball point pen or pencil
- 5) Fine and extra fine sandpaper
- 6) Paint or dope

Read the entire assembly instructions carefully before beginning work on your rocket. Then start construction, following each step in order, checking off each step as it is completed.

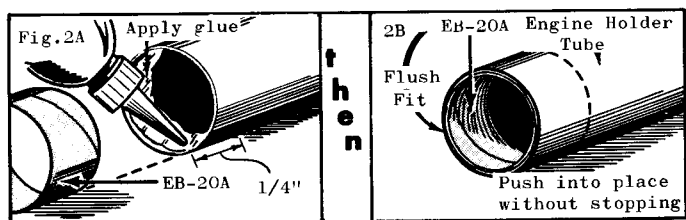


Assembly Instructions

(1) Glue one adapter ring to each end of two of the stage couplers. (Do not glue anything to the other coupler yet.) Apply glue to the very end of the stage coupler as in fig. 1, then press the ring in place so it is exactly centered. Wipe off any excess glue and set the two ring-coupler units aside to dry thoroughly.

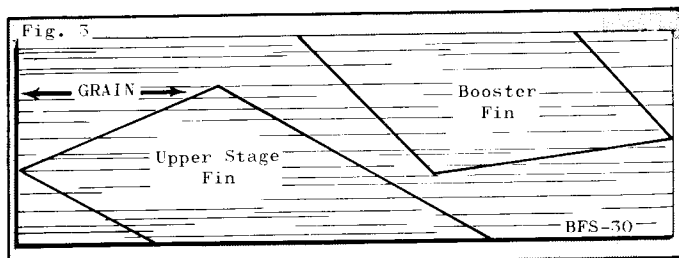


□ (2) Glue the engine block in one end of the 2-3/4" long engine holder tube (be sure you use the correct tube). To do this, apply glue to the last 1/4" of the inside of the tube, then slide the engine block into the tube until the end of the block is even with the end of the tube (see fig. 2).



Make the Fins Next

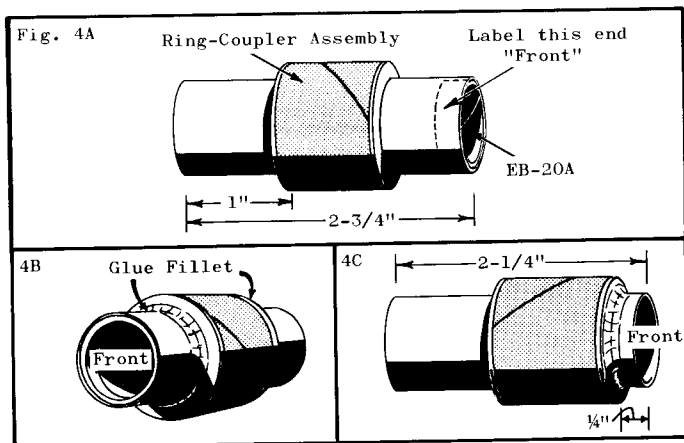
□ (3) Cut out the fin patterns exactly on the edge lines. One upper stage fin and one lower stage fin will be cut from each sheet of balsa. Position the fin patterns on a balsa sheet as shown in fig. 3 with the grain of the balsa matching the grain direction shown on the pattern. Trace around the patterns with a ball point pen, then repeat until three fins are marked for each stage.



Cut out the fins with a sharp modeling knife or single edge razor blade. Sand the sides of the fins until smooth. Sand until smooth and round all edges except the root edge (the edge which will be attached to the body). Sand the root edge of each upper stage fin so it is square and flat. Do not sand the root edge on the lower stage fins.

Finish the Engine Holder Units

□ (4) Mark the 2-3/4" long engine holder tube 1" from the end that does not have the engine block. Position one of the ring-coupler units on the engine holder tube as shown in fig. 4A. The rear ring should be exactly on the mark. Spread glue around

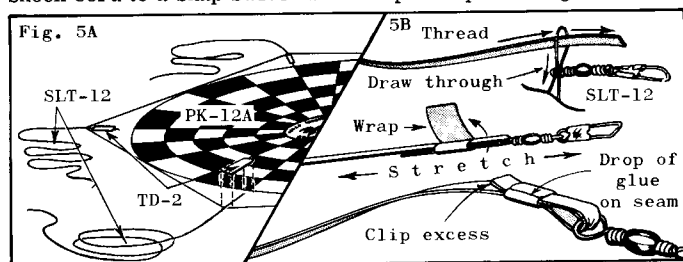


both ring-tube joints as in fig. 4B. Make sure the entire joint is well covered, wipe off any excess glue with your finger and set the unit aside to dry completely. Next mark the 2-1/4" long engine holder tube 1/4" from one end and glue the remaining ring-coupler unit in place as shown in fig. 4C. Set this aside to dry completely.

Now "Rig" the Parachute

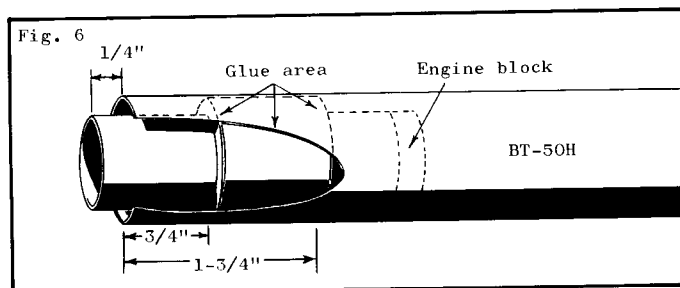
□ (5) Cut out the parachute on its edge lines as indicated on

the plastic. Cut six 12" lengths of shroud line cord and attach one shroud line to each point of the parachute with a tape strip as shown in fig. 5A. Tie the free ends of the shroud lines to one end of the short shock cord. Attach the other end of the shock cord to a snap swivel with a tape strip as in fig. 5B.

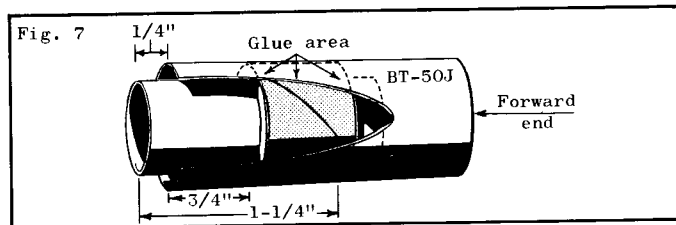


BEGIN FINAL ASSEMBLY

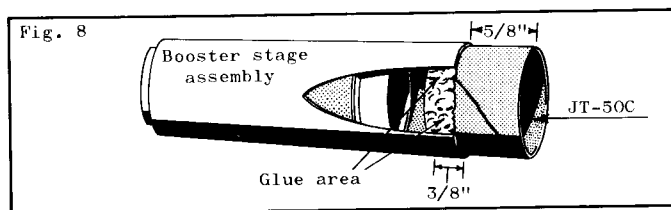
□ (6) When the engine mount units have dried completely check their fit in the BT-50 body tubes. Sand the edges of the rings until they make a smooth slide fit inside the body tubes. Mark the upper stage mount (the one with the longer engine holder tube) 1/4" from the end that does not have the engine block. Smear glue around the inside of the 7-3/4" long upper stage body tube to cover an area extending from 3/4" from the end to 1-3/4" from the end. Insert the engine mount unit, engine block end first, until the mark on the engine holder tube is exactly even with the end of the body tube. The completed assembly must be positioned as shown in fig. 6. Do not pause during this operation or the glue may set with the mount in the wrong place.



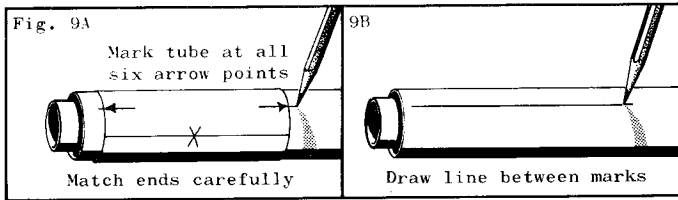
□ (7) Mark the remaining engine mount 1/4" from its end on the side that projects farthest from the ring-coupler unit. Apply glue to the inside of the 2-3/4" long booster body tube over an area 3/4" to 1-3/4" from one end and slide the engine mount unit into the tube. Position it as shown in fig. 7 with the mark on the engine holder tube even with the end of the body. (Be especially careful to make this assembly exactly as the illustration shows. The rocket will not operate properly if any error is made in positioning.)



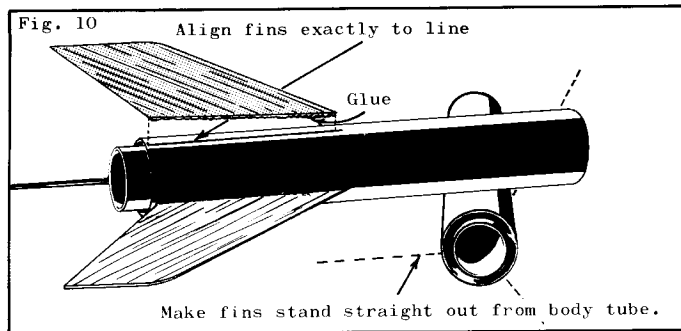
□ (8) Apply glue to the inside of the forward end of the booster body tube to a depth of 3/8". Slide the remaining stage coupler into the end of the tube so that 3/8" of the coupler is inside the body and 5/8" projects forward. Wipe away any excess glue.



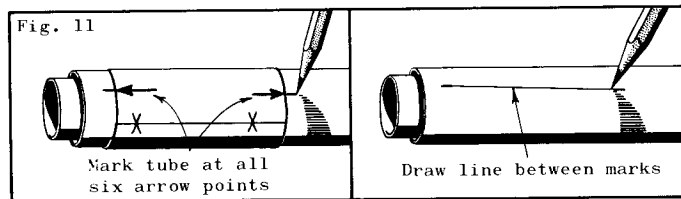
□ (9) Cut out the upper stage fin spacing guide from the pattern sheet. Wrap it around the upper stage body at the end with the engine mount unit as shown. The alignment marks on the pattern must match perfectly. Mark the body tube at each of the six arrows, top and bottom. These marks must be made carefully and accurately, since misaligned marks will result in misaligned fins.



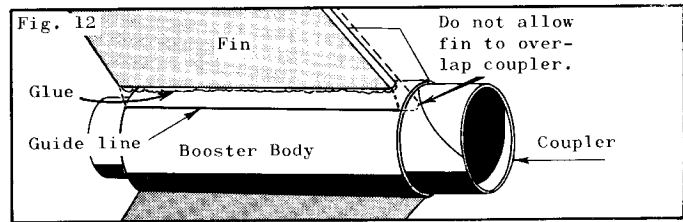
□ (10) Apply glue to the root edge of one of the upper stage fins. Attach the fin to the upper stage body tube with the edge of the fin exactly on a pair of the marks made in step 9. Align the fin so it projects straight away from the body tube. Following the same procedure, attach the other two upper stage fins. Do not set the rocket on its fins while the glue is wet. (This must be done carefully, as crooked fins will make the rocket spin, resulting in blurred pictures.)



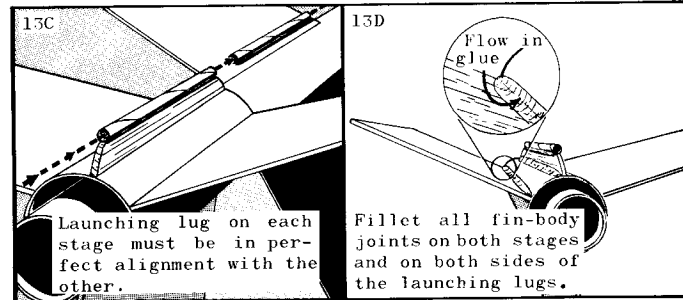
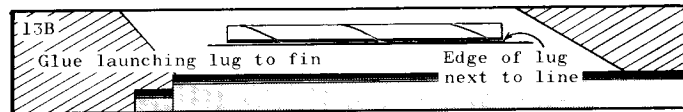
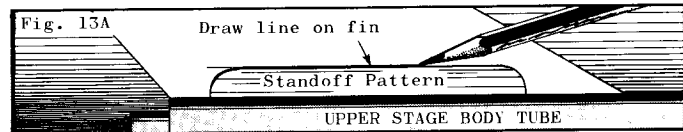
□ (11) Cut out the booster fin spacing guide and wrap it around the booster body tube. Mark the tube at each of the six arrows in the same way as for the upper stage. (Note that the booster is built with spin fins. These give a straighter lift-off, and the spin on the vehicle will stop at booster separation when the non-spinning upper stage takes over.)



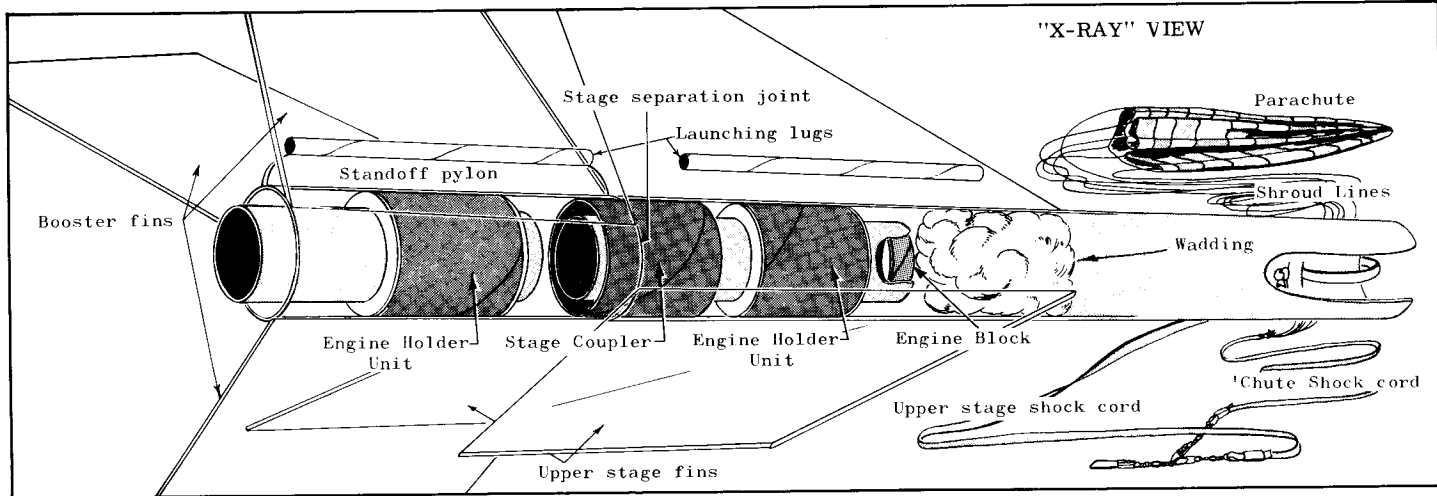
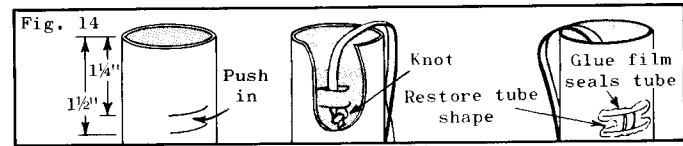
□ (12) Glue the booster fins to the booster body with the edge of each fin exactly on a pair of the marks made in step 11. The forward edge of each fin should be even with the front of the body but must not overlap the stage coupler (fig. 12).



□ (13) Cut out the launching lug stand-off pattern. Make the stand-off from the BFS-30 fin stock. Position the stand-off on the upper stage against a fin and the body tube. Apply a line of glue to one side of one of the launching lugs and attach it to the fin as shown. Do not glue it to the stand-off. With the upper stage lug glued in position on the fin, slide the stand-off out of the way. Next apply a line of glue along one side of the remaining launching lug and glue it to the stand-off. Slide the booster stage into place at the rear of the upper stage with the fins in the positions shown in fig. 13C. Glue the stand-off to the lower stage between two fins as shown. Finally, apply a glue fillet to the fin-body joints on both stages and to the launching lugs as in fig. 13D.

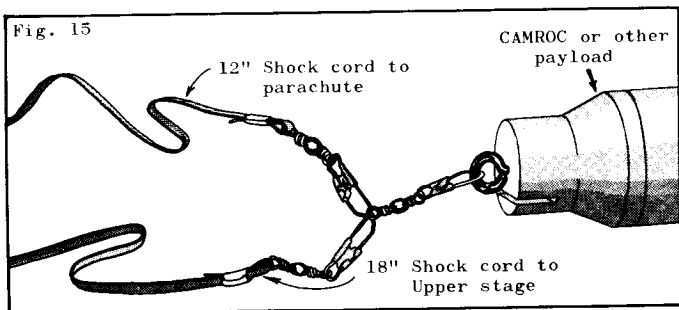


□ (14) Cut two slits in the forward end of the upper stage body tube, the one directly over the other and positioned 1-1/4" and 1-1/2" from the front of the body tube. Cave in the section between the slits and hook the shock cord through the slits as in fig. 14. Press the caved-in portion of the tube outward until it



is round again and apply glue to the cut edges and to the shock cord to anchor it in place. Attach a snap swivel to the free end of the shock cord with a tape strip.

(15) Connect the shock cords from the rocket and the parachute together as shown in fig. 15. The triple swivel arrangement helps eliminate tangling when a bulky payload such as the Camroc is flown.



PAINTING

(16) Before finishing let all the glue on the outside of the rocket dry so it is hard and clear. Sand all balsa surfaces with extra fine sandpaper. Apply a coat of sanding sealer to the balsa, let dry and sand again. Repeat until all surfaces look and feel smooth. Give the rocket at least one clean base coat of glossy white paint or dope, then give it at least one bright final coat of red, fluorescent orange, cerise or other high-visibility color to aid tracking.

ENGINES

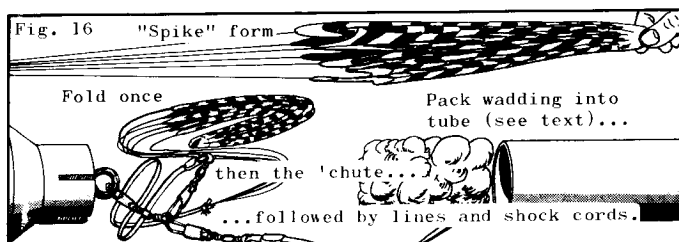
When launching a camera with your Astron Delta use Series II engines in both the upper and lower stages. Always use a B14-0 in the bottom stage. Either a B14-6 or a B14-7 may be used in the upper stage. The shorter delay will normally give an oblique picture of the ground; the longer delay a vertical picture.

General Information

The maximum recommended payload weight for the Astron Delta is 3 oz. with Series II engines. The launching rod used with this model must be at least 36" long. A longer rod will generally give more accurate flights. Read Technical Report TR-2 carefully before flying your Astron Delta. Follow the countdown procedure given below to eliminate mistakes and obtain top performance.

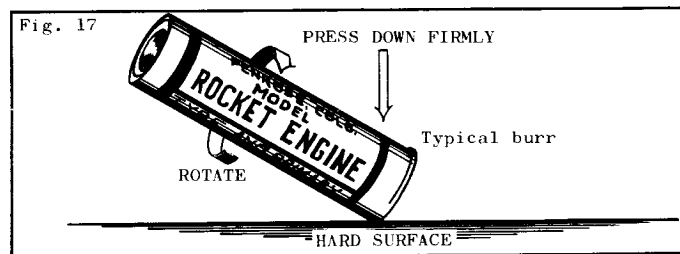
COUNTDOWN CHECKLIST

-16- Pack flameproof recovery wadding into the upper stage body tube from the top. The wadding should rest down against the engine holder, extend forward in the tube for 1-1/2" to 2", and seal tightly against the sides of the tube. Hold the parachute between two fingers at its center and pass the other hand down it to form it into a "spike" shape. Fold this spike in two sections as shown in the illustration. Push the folded parachute down into the tube on top of the wadding and pack the shroud lines and shock cord in on top of the parachute.

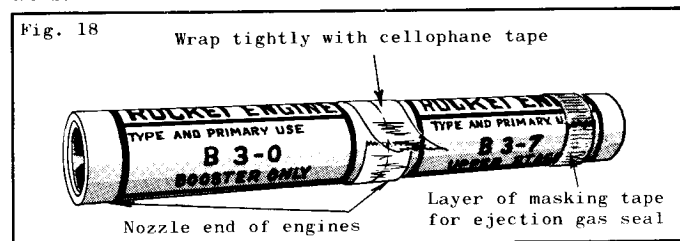


-15- Attach the camera (or payload section) to the center snap swivel. Cock the camera and slide it into place on the forward end of the rocket body.

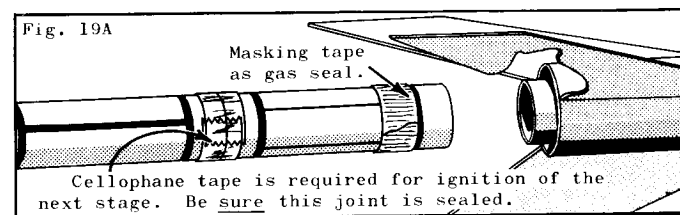
-14- Select an upper stage engine and a booster engine. Remove any burrs from the ends of the engines by holding them against a smooth surface and turning as in fig. 17.



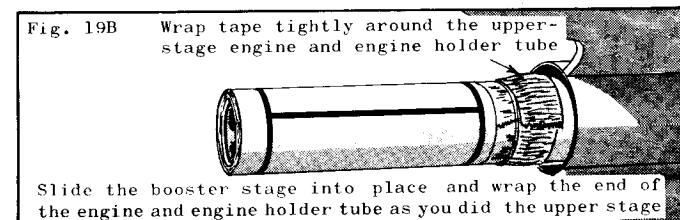
-13- Position the engines with the nozzle of the upper stage engine against the top end of the booster engine and wrap a layer of cellophane tape tightly around the joint as shown in fig. 18. Check to be sure the engines are in their proper relative positions.



-12- Wrap masking tape around the top of the upper stage engine so it makes a tight friction fit in the engine holder tube. Insert the upper stage end of the engine unit into the upper stage



engine holder and finish securing it in place by wrapping a layer of masking tape around the end of the engine holder tube and the end of the engine as shown in fig. 19B. Press the tape tight against the engine.



-11- Slide the booster into place on the engine unit from the bottom, positioning it so the stage coupler fits all the way into the upper stage and so the launching lugs match. Secure the booster in place by wrapping a layer of masking tape around the end of the engine holder tube and the engine and pressing the tape down tightly.

-10- Form an electrical igniter and insert it in the booster engine nozzle as directed in the instructions which came with the engine.

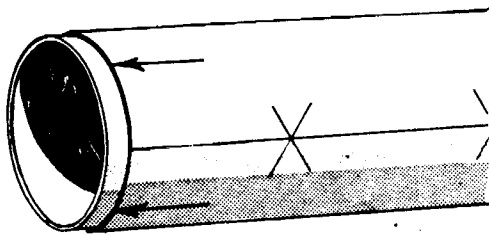
-9- Place the rocket on the launcher. Check to be sure the panel is disarmed. Clean the micro-clips and attach them to the igniter.

-8- Remove the slide from the camera film holder.

-7- Clear the launch area, check for low flying aircraft and alert recovery crew and trackers.

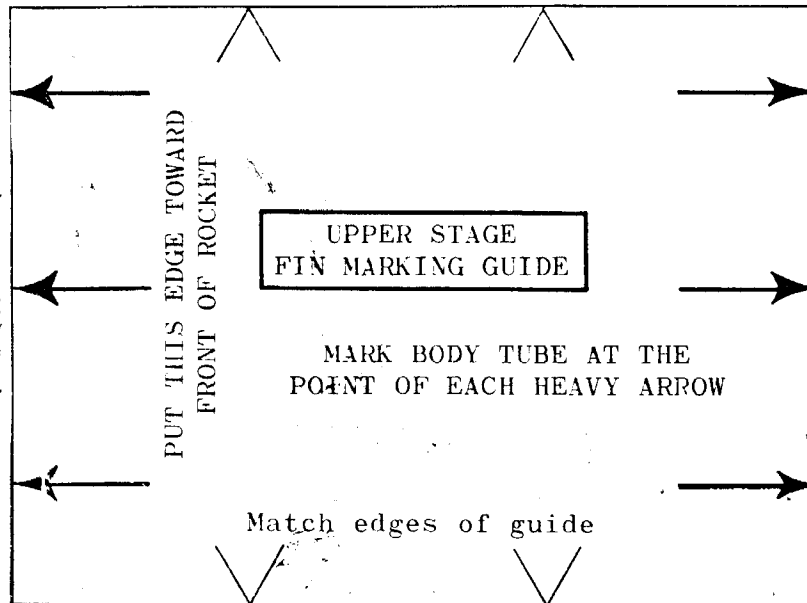
-6- Arm the launch panel.

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

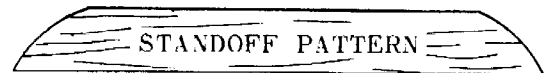
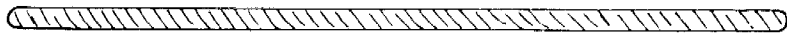


TO USE

Wrap the guide around the body tube as shown and mark tube as instructed on the guide.



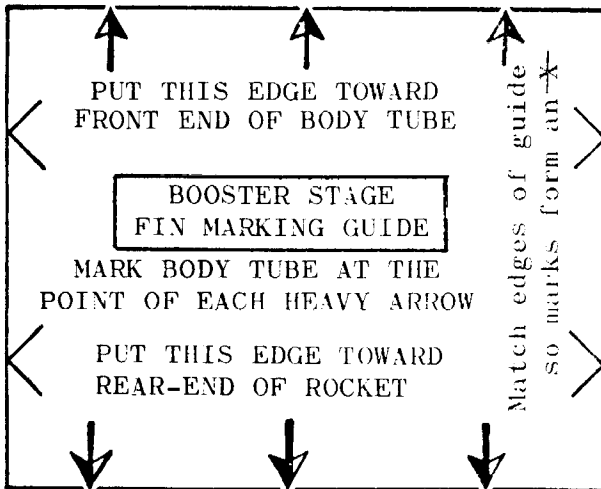
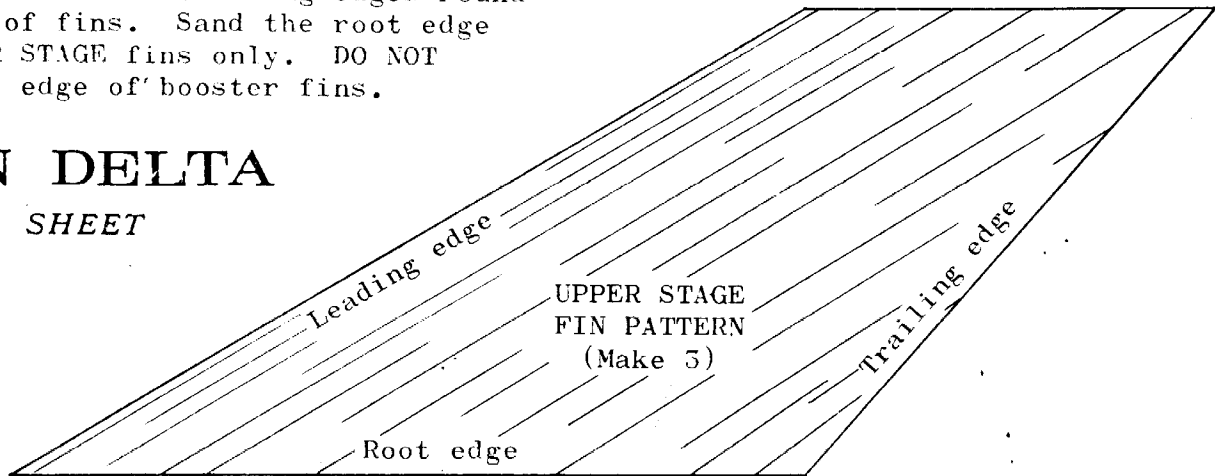
Typical fin cross section



Sand leading outer and trailing edges round on both sets of fins. Sand the root edge flat on UPPER STAGE fins only. DO NOT sand the root edge of booster fins.

ASTRON DELTA

PATTERN SHEET



★ Cut carefully as this curve is necessary to seat fin on body tube.

