



COMANCHE-3™

3 STAGE HIGH ALTITUDE ROCKET

SKILL LEVEL 3 - Recommended for Craftsman Rocketeers.



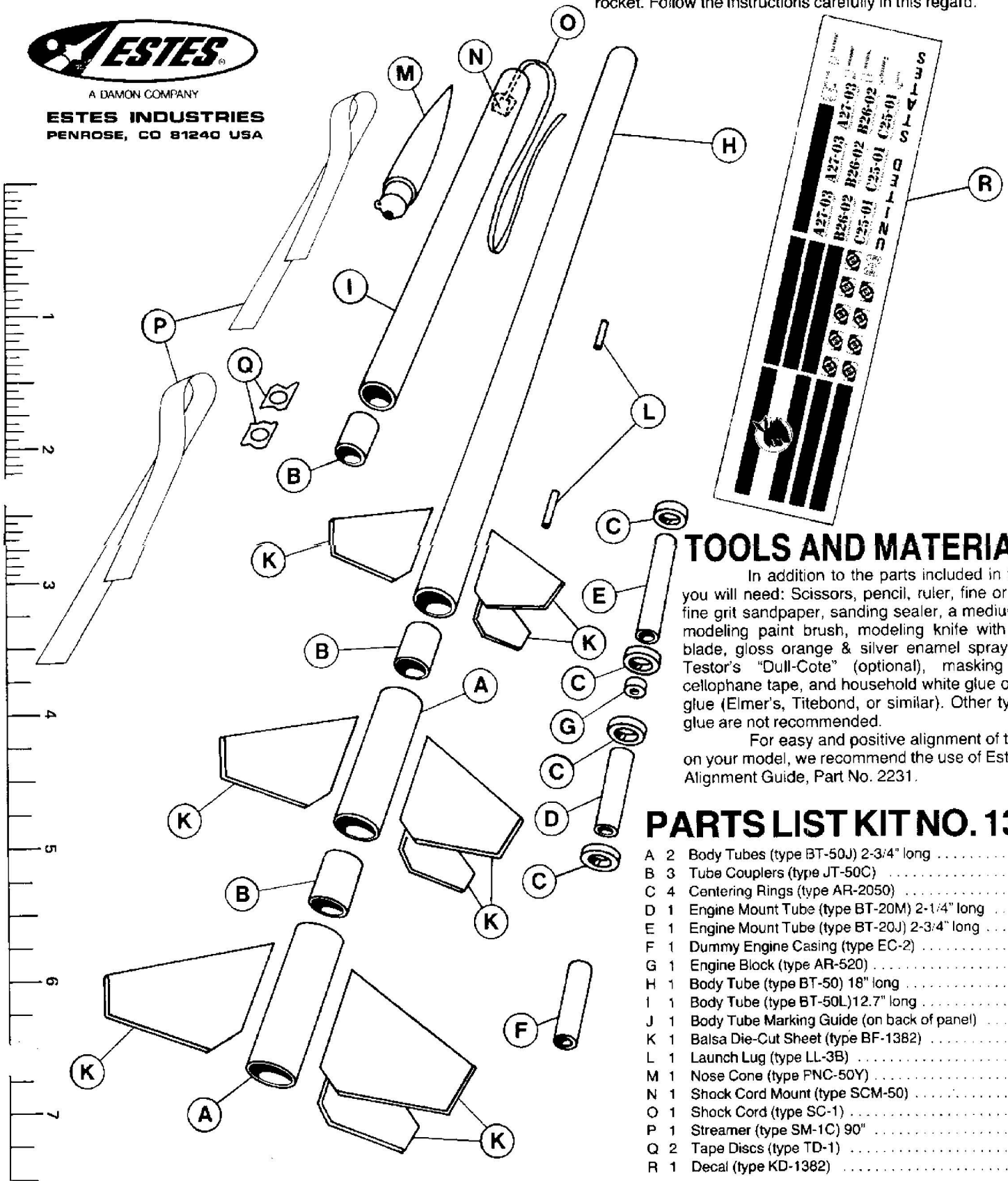
A DAMON COMPANY

ESTES INDUSTRIES
PENROSE, CO 81240 USA

BEFORE YOU START

Page 1

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



TOOLS AND MATERIALS

In addition to the parts included in this kit you will need: Scissors, pencil, ruler, fine or extra-fine grit sandpaper, sanding sealer, a medium-size modeling paint brush, modeling knife with sharp blade, gloss orange & silver enamel spray paint, Testor's "Dull-Cote" (optional), masking tape, cellophane tape, and household white glue or resin glue (Elmer's, Titebond, or similar). Other types of glue are not recommended.

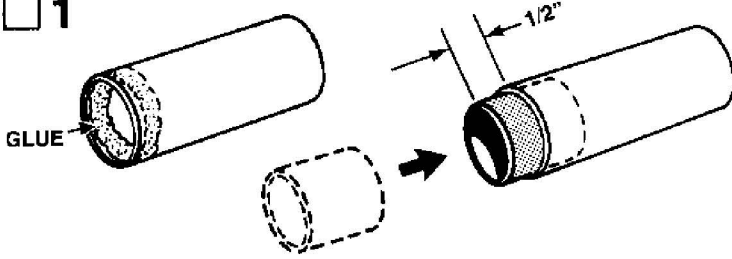
For easy and positive alignment of the fins on your model, we recommend the use of Estes' Fin Alignment Guide, Part No. 2231.

PARTS LIST KIT NO. 1382

A	2	Body Tubes (type BT-50J) 2-3/4" long	30362
B	3	Tube Couplers (type JT-50C)	30260
C	4	Centering Rings (type AR-2050)	30164
D	1	Engine Mount Tube (type BT-20M) 2-1/4" long	30334
E	1	Engine Mount Tube (type BT-20J) 2-3/4" long	30326
F	1	Dummy Engine Casing (type EC-2)	35010
G	1	Engine Block (type AR-520)	30162
H	1	Body Tube (type BT-50) 18" long	30352
I	1	Body Tube (type BT-50L) 12.7" long	30366
J	1	Body Tube Marking Guide (on back of panel)	83413
K	1	Balsa Die-Cut Sheet (type BF-1382)	32392
L	1	Launch Lug (type LL-3B)	38166
M	1	Nose Cone (type PNC-50Y)	71009
N	1	Shock Cord Mount (type SCM-50)	84444
O	1	Shock Cord (type SC-1)	85730
P	1	Streamer (type SM-1C) 90"	38273
Q	2	Tape Discs (type TD-1)	38401
R	1	Decal (type KD-1382)	37524

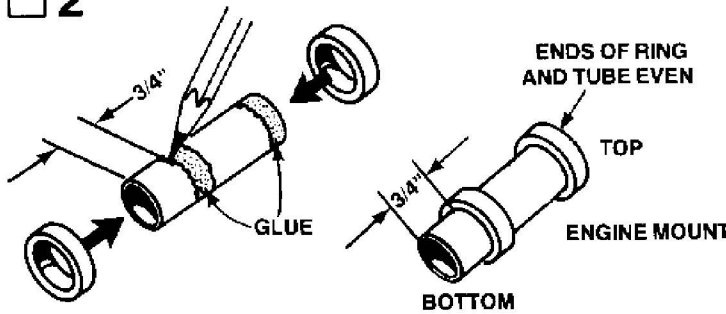
ASSEMBLY INSTRUCTIONS

1



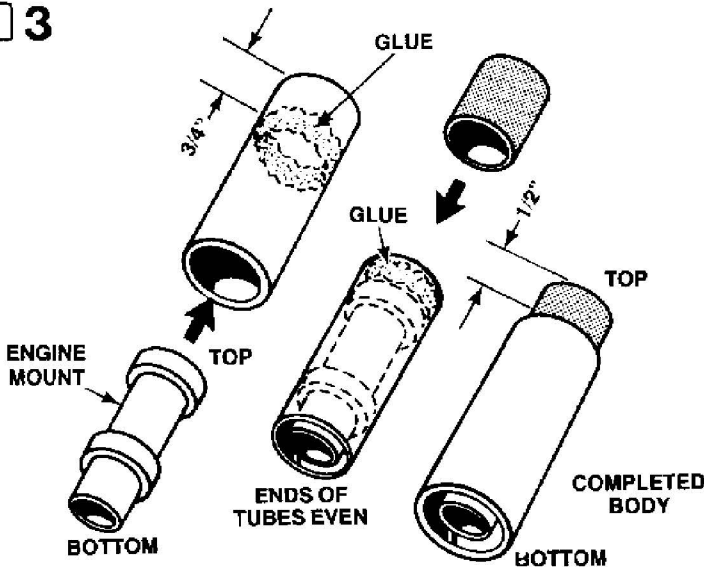
Locate one BT-50J body tube (part A) and one JT-50C tube coupler (part B). Apply a film of glue around the inside of one end of the body tube and push the coupler part way into the tube. Leave 1/2" of the coupler extending from the end of the tube. Wipe away excess glue. This completes the first stage body.

2



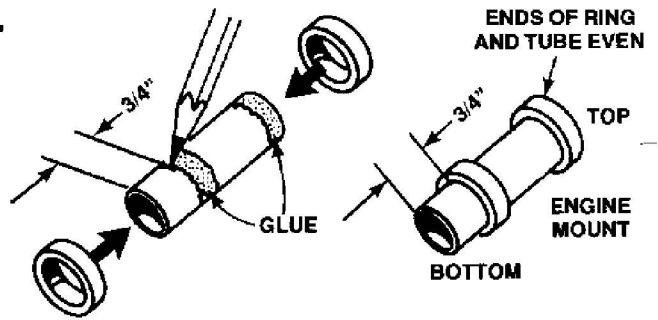
Locate two of the AR-2050 centering rings (parts C) and the BT-20M engine mount tube (part D). Note: The BT-20M tube is 2-1/4" long. There is a 2-3/4" long BT-20 tube that will be used later. **Make sure you use the shorter tube in this step.** Mark the engine mount tube 3/4" from one end. Apply a film of glue around the tube above this mark. Slide a centering ring onto the tube and position it as shown. Apply a film of glue around the top portion of the tube and slide the remaining ring into place. The end of this ring is even with the end of the tube. Allow glue to dry before proceeding to next step.

3



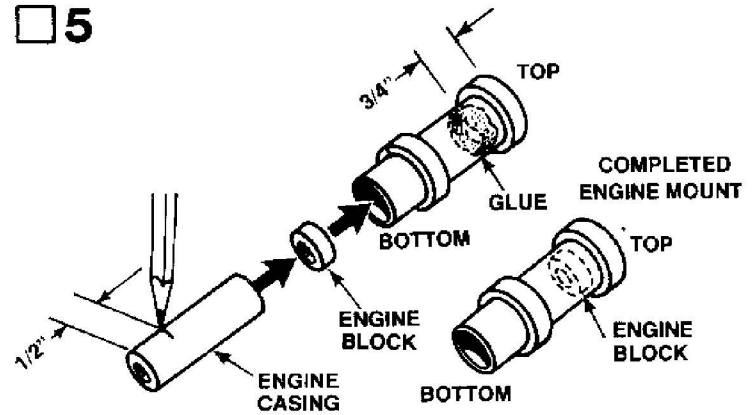
Locate the remaining BT-50J body tube and one JT-50C tube coupler. Apply a film of glue around the inside of the body tube, 3/4" from one end. Slide the engine mount into the opposite end of the body tube and push forward until the bottom ends of the tubes are even. Note: Make sure you have the engine mount oriented as illustrated. Do not glue it in place upside down. Apply a film of glue around the inside of the top of the body tube and slide the coupler into the tube. With the coupler butted against the top of the centering ring, 1/2" of the coupler should project from the top of the body. This completes the second stage body.

4



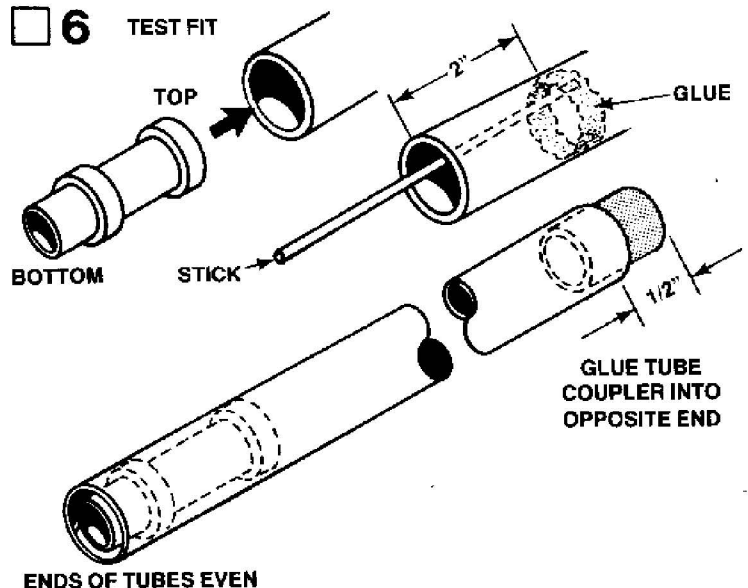
Locate the two remaining centering rings and the BT-20J engine mount tube (part E). Mark the tube 3/4" from one end and apply a film of glue around the tube above this mark. Slide a centering ring onto the tube and position as shown. Apply a film of glue around the top of the tube and slide the remaining ring in place. The end of this ring is even with the end of the tube.

5



Locate the EC-2 dummy engine casing (part F) and the AR-520 engine block (part G). Orient the parts as illustrated. Make sure you correctly identify the top and bottom of the engine mount. Mark the engine casing 1/2" from one end. Apply a film of glue around the inside of the engine mount tube about 3/4" from the top end. Insert the engine block into the bottom of the engine mount tube. The engine casing is used to push the engine block into place. Push the casing into the tube until the mark on the casing is even with the rear of the tube. This will correctly position the engine block 2-1/4" from the rear of the tube. **Caution:** Once you have started to push the engine block into the tube, do not stop until it is correctly positioned. Withdraw the engine casing immediately.

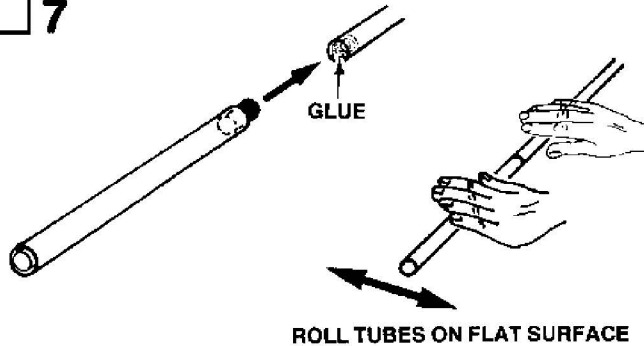
6 TEST FIT



Note: Do not proceed with this step until the glue on the engine mount is completely dry. Locate the remaining tube coupler and the BT-50J body tube (part H). This is the longest body tube in the kit. Test fit the

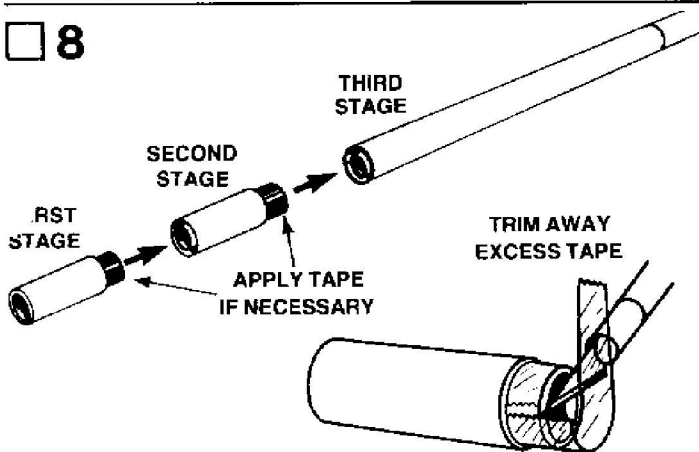
engine mount into the body tube. Sand the inside edge of the tube, if necessary, to obtain a good fit. Using a small stick for an applicator, apply a generous film of glue around the inside of the body tube about 2" from one end. Orient the engine mount as shown (top goes in first) and slide it into the tube. Push the mount forward until the ends of the tubes are even. Apply a film of glue around the inside of the opposite end of the body tube and push the tube coupler part way into the tube (leave 1/2" of the coupler exposed). Allow the glue to dry for 10 minutes before proceeding to the next step.

□ 7



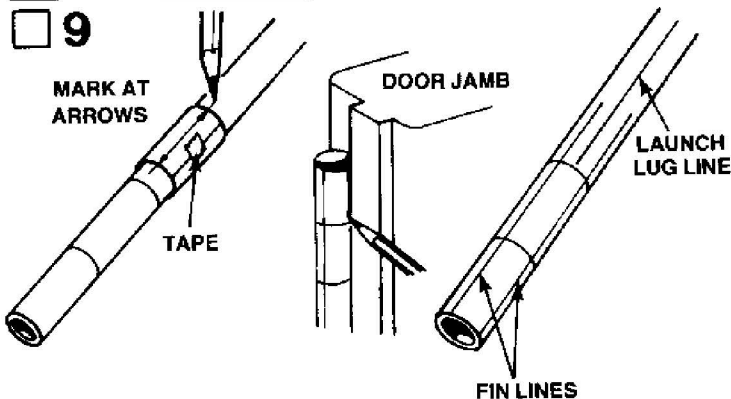
Locate the BT-50L body tube (part I). Apply a film of glue around the inside of one end of the tube. Slip this end of the tube over the exposed portion of the tube coupler. Butt the ends of the body tubes together and roll on a flat surface. This will insure that the tubes are straight. Wipe away excess glue.

□ 8



Test fit the first, second and third stage bodies together. The fit should be slightly snug. If the fit is loose, wrap cellophane tape around the exposed portions of the tube couplers to obtain the proper fit. Trim away any tape that extends beyond the ends of the couplers. Note: This step is important. A very loose or very tight fit could interfere with proper staging during flight.

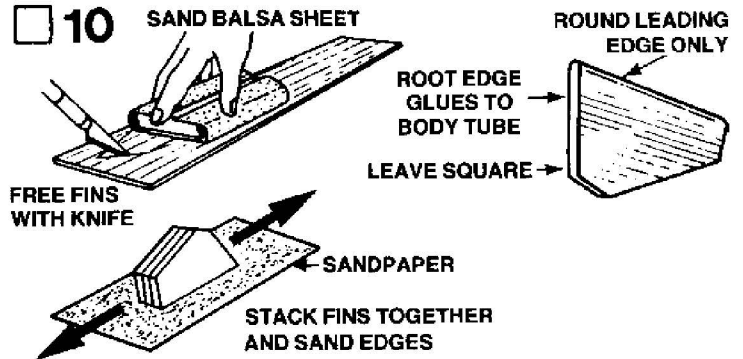
□ 9



Cut the body tube marking guide from the back of the kit panel (part J). Wrap the guide around the bottom portion of the third stage body and tape the ends together. Mark the body at each of the arrow points. Place an "L" next to the marks for the launch lug. Remove the guide from the body. A door jamb may be used as a guide to extend lines

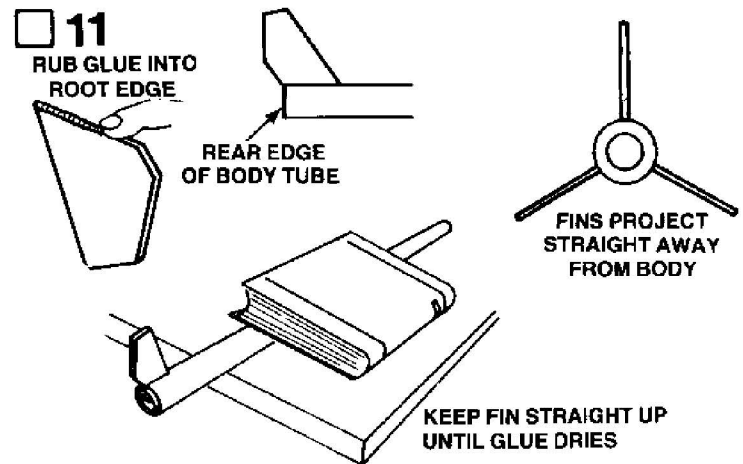
along the body tubes. Extend the launch lug line about 8" along the third stage only. Extend the fin lines about 3" forward on the third stage and to the rear of the first stage. After the lines are drawn, separate the three bodies.

□ 10



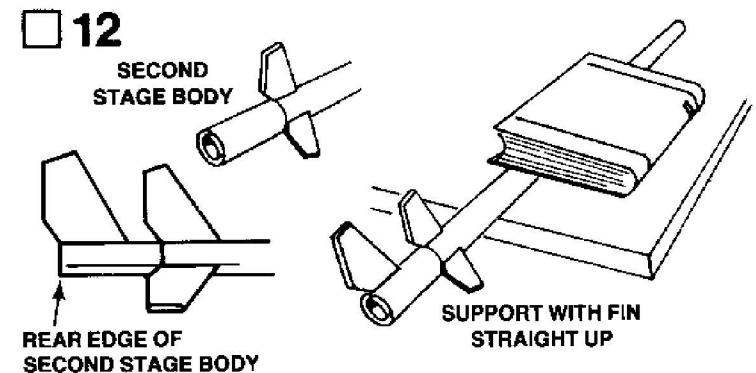
Wrap a piece of fine sandpaper around a wood block and sand both sides of the balsa die-cut sheet (part K). Free the fins from the sheet with a knife. Stack the three smallest fins together and sand all edges as shown. Repeat with the medium and large fin sets. Sand the leading edge round on each of the nine fins. Leave all other edges square.

□ 11



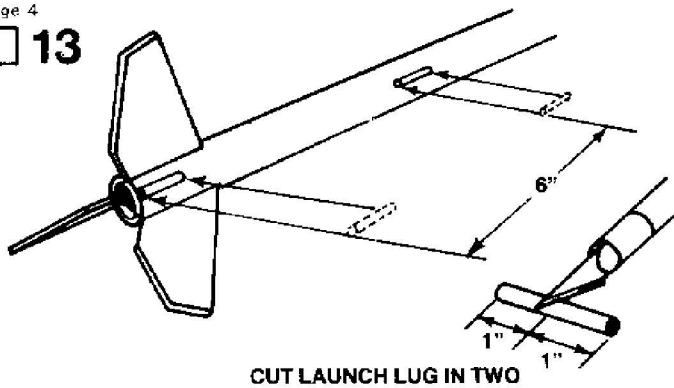
The third stage fins are attached first. These are the smallest set of fins. Rub a small amount of glue into the root edge of a fin. Allow the glue to partially dry. Apply a second bead of glue to the root edge of a fin and attach fin to body on one of the fin guide lines. Make sure the fin projects straight away from the body. Place the body on a flat surface with the fin pointing straight up. Weight the front of the body with a book and allow glue to dry. The two remaining fins are attached in the same manner.

□ 12



Socket the second stage body into the rear of the third stage. Rotate the body to line up the fin lines. Attach the medium-sized fins to the second stage as shown. Remember to allow the glue to dry on each fin before proceeding to the next fin. Sight along the fins to make sure second and third stage fins are aligned. After the glue has dried, socket the first stage body into the second stage and attach the three largest fins to the first stage body in the same manner.

13

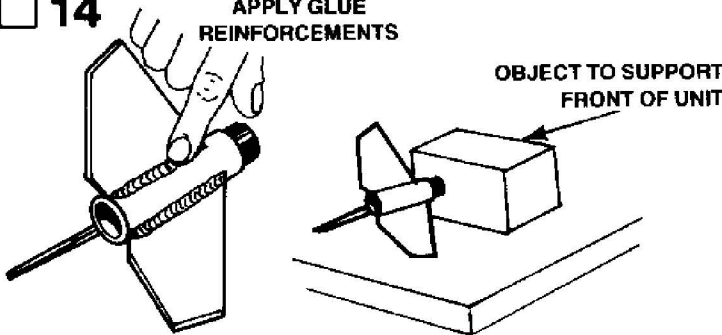


CUT LAUNCH LUG IN TWO

Cut the launch lug (part L) into two equal (1") lengths. Separate the three rocket stages. The launch lugs are attached to the top stage (main rocket). One lug is even with the rear of the body tube. The second lug is positioned with its rear edge 6" from the rear of the body. Glue the launch lugs to the body, centered on the launch lug pencil line. Sight along the rocket to make sure the launch lugs are aligned with each other.

14

APPLY GLUE REINFORCEMENTS

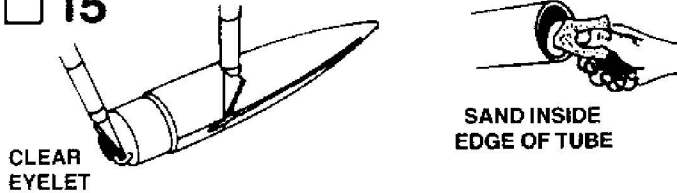


SUPPORT IN HORIZONTAL POSITION UNTIL GLUE DRIES

For adequate strength, glue reinforcements must be applied to all fin-body tube joints. Starting with the first stage, apply a bead of glue to both sides of a fin-body tube joint. Run your finger along the joints to smooth the glue. Wipe away any excess glue. This is repeated on all fin joints on all three stages. Support the units in a horizontal position while the glue dries. When the glue on the launch lugs has dried, apply glue reinforcements to both sides of the two lugs.

15

TRIM EXCESS PLASTIC

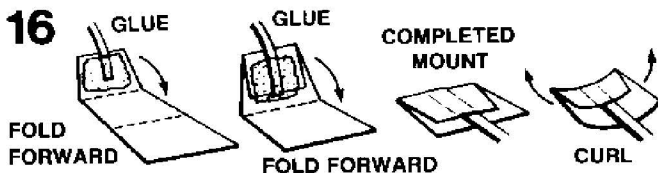


CLEAR EYELET

SAND INSIDE EDGE OF TUBE

Trim or sand any excess plastic from around the sides of the nose cone (part M). Use a sharp knife to remove any excess plastic from the inside of the molded eyelet at the rear of the nose cone. Wash the nose cone with lukewarm soapy water, rinse well, and dry. Check the fit of the nose cone in the body tube. The nose cone should slide easily into the tube, but not so loose that it could fall out during launch. If the fit is too tight, sand the inside edge of the body tube and, if necessary, the shoulder of the nose cone. If the fit is too loose, wrap a piece of cellophane tape around the shoulder of the nose cone.

16

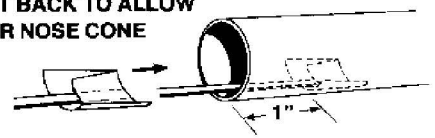


Cut out the shock cord mount (part N). Fold on dotted lines, then unfold and apply glue to Section 1. Lay the end of the shock cord (part O) into the glue. Fold over and apply glue to the back of Section 1

and the exposed portion of Section 2. Fold again to complete mount. Curl the edges of the mount up so it will match the contour of the body tube and hold with your fingers until the glue sets.

17

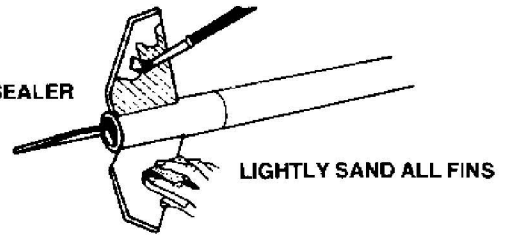
SET BACK TO ALLOW FOR NOSE CONE



Use a finger or stick to apply glue to the inside of the front of the body tube, 1" to 2" from the front of the tube. Press the shock cord mount firmly into position in glue far enough from the front edge of the tube to allow clearance for the nose cone to fit into place. To insure a good bond use a stick or your finger to smear a film of glue over the mount and surrounding area in the body tube.

18

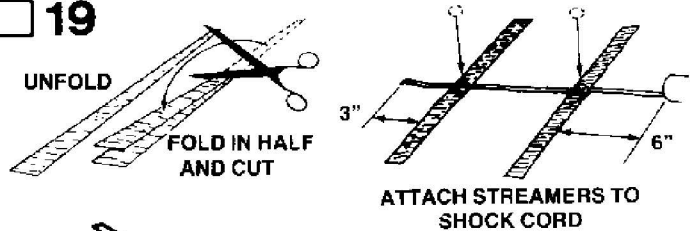
APPLY SANDING SEALER



LIGHTLY SAND ALL FINS

Do not proceed with this step until the fin glue reinforcements are thoroughly dry. Proper application of sanding sealer makes the rocket look better and reduces drag so that the rocket will fly higher. Apply a coat of sanding sealer to each fin. When sealer is dry, lightly sand all the sealed surfaces. Repeat sealing and sanding process until balsa grain is filled and smooth.

19

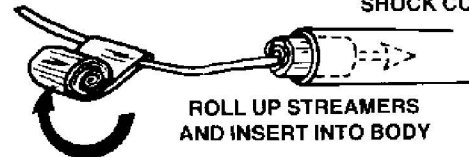


UNFOLD

FOLD IN HALF AND CUT

3"

ATTACH STREAMERS TO SHOCK CORD

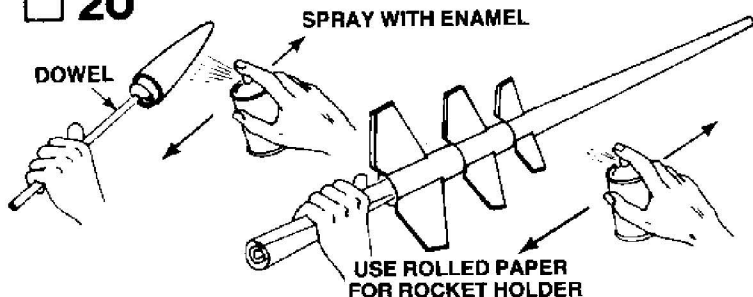


ROLL UP STREAMERS AND INSERT INTO BODY

Unfold the streamer (part P). Fold the streamer and cut into two equal lengths. Fold each streamer in half and mark the middle. Position one streamer 3" from the end of the shock cord and with the shock cord centered on the mark in the middle of the streamer, attach the streamer to the shock cord with one of the tape discs (part Q). Press the disc firmly down onto the streamer. Attach the second streamer in the same manner, 6" from the body tube. Fold the bottom streamer twice and roll it up. Insert the streamer and lower portion of the shock cord into the body tube. Fold and roll the upper streamer and insert it and the remainder of the shock cord into the body tube.

PAINTING AND DETAILING

20



SPRAY WITH ENAMEL

DOWEL

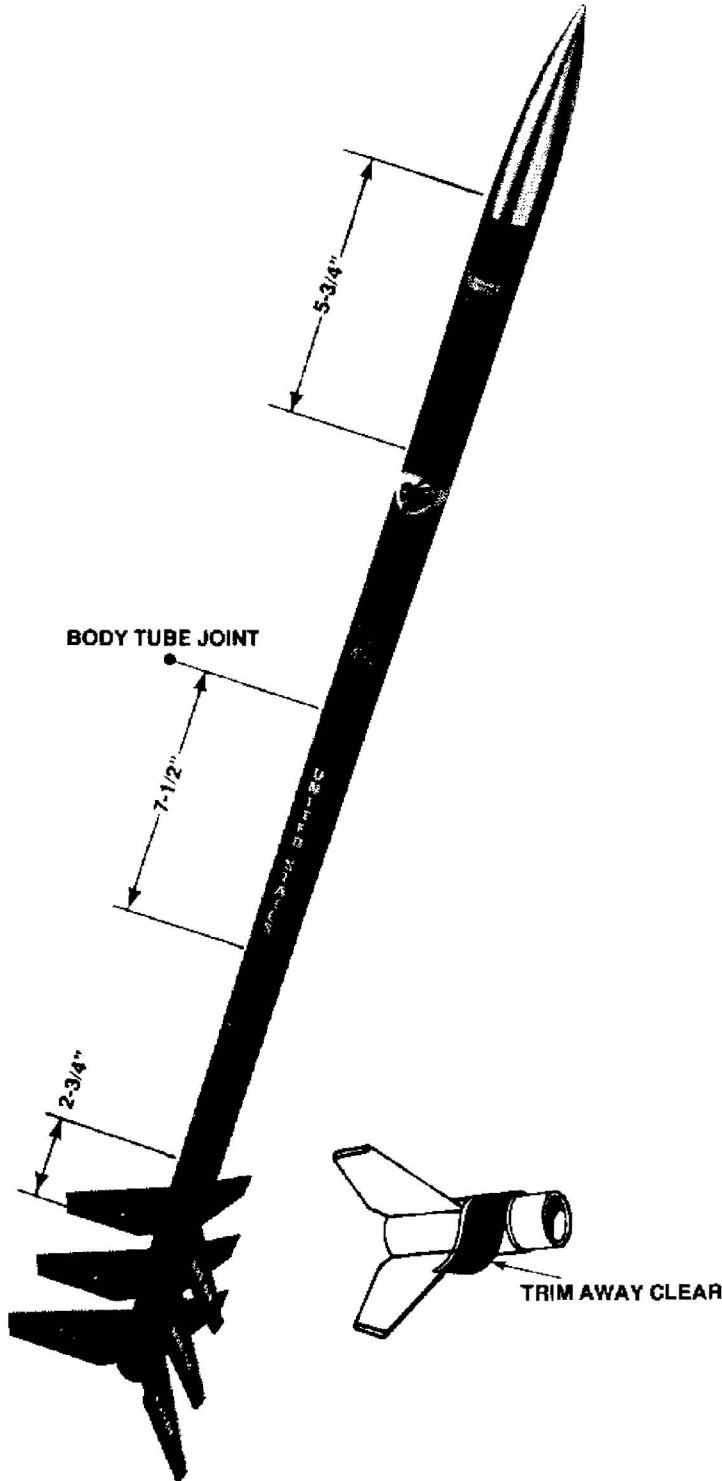
USE ROLLED PAPER FOR ROCKET HOLDER

Spray paint the nose cone with several light coats of silver enamel paint. The nose cone can be supported by a dowel or stick inserted in

the center opening in the nose cone while being painted and drying. A layer of masking tape around nose cone shoulder works well to protect the nose cone shoulder from "overspray" while painting. Paint the remainder of the model with Pactra insignia orange. Follow instructions on the spray can for best results. Shake can before spraying.

Hold the can straight up and spray in long, smooth "strokes". Spray the model with several light, dry mist coats of paint to avoid "runs". Shake can periodically. Be sure paint is completely dry before applying decals.

21 DECAL PLACEMENT

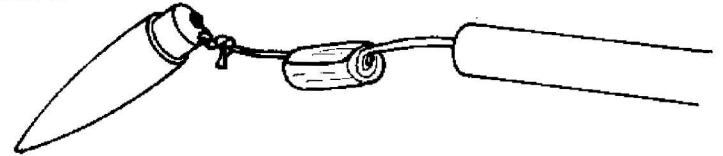


When all paint is dry, apply the decals (part R) in the positions shown. (A) Cut only one decal at a time from sheet. (B) Submerge decal in lukewarm water until decal slides on backing paper (usually 15 to 30 seconds). (C) Gently slide decal from backing paper onto model. (D) Move decal into exact position and carefully blot away excess

water with a soft cloth. (E) If the decal "sticks" before you have it in position, apply water over the decal with a brush. This will permit the decal to be moved. (F) Smooth out all wrinkles and air bubbles before the decal dries.

There are 6 narrow bands that are applied around the rocket body. Three of the bands are applied to the tops of the 1st, 2nd, and 3rd stage bodies. Since the bands are even with the tops of the tubes, the clear decal material must be trimmed away from the top edges of these bands before soaking in water. The remaining decals are applied in the positions indicated in the photograph. We recommend that the completed model be sprayed with Testor's "Dull-Cote". This is a clear flat spray paint that kills the decal shine and protects the model's finish. Note: Do not spray the silver nose cone with "Dull-Cote". It would cause the silver to turn gray.

22



Tie the free end of the shock cord to the eye on the nose cone. Tie a hard triple knot.

FLYING THE COMANCHE

The Comanche is a 3 stage rocket that may be launched in several configurations. In addition to the full 3 stage configuration, it may be flown as a 2 stage rocket using the first and third or the second and third stages. In addition, the third stage may be flown as a single stage sport rocket. The first stage uses a 'D' engine and the second and third stages use standard engines. Use of the most powerful engine combination (D12-0, C6-0, C6-7) produces extremely high flights. For this reason, the above engine combination should only be launched on very calm days. It is also advisable to have observers present during a multi-stage launch. Each observer can track one stage to insure recovery. The first and second stages are tumble-recovered. When separated from the rocket, they tumble end over end to a gentle landing. The third stage uses two streamers to slow its descent. The streamers produce less drift than would a parachute. Because of the high altitude, however, it is important to carefully track the descent of the third stage (preferably by two observers).

- To launch the Comanche, you will need the following items:
- An Estes model rocket launching system with a 3/16" dia. launch rod
 - Flameproof recovery wadding (Estes Cat. No. 2274)
 - Cellophane tape and masking tape
 - Estes model rocket engines as listed below

3 STAGE LAUNCHES			2 STAGE LAUNCHES (using 2nd & 3rd stages)		SINGLE STAGE LAUNCHES
1st Stage	2nd Stage	3rd Stage	2nd Stage	3rd Stage	3rd Stage
D12-0	A8-0	A8-5	A8-0	A8-3	A8-3
	B6-0	B4-6	B6-0	B4-4	B4-4
	B8-0	B6-6	B8-0	B6-4	B6-4
	C6-0	C6-7	C6-0	B8-5	B8-5
				C6-5	C6-5

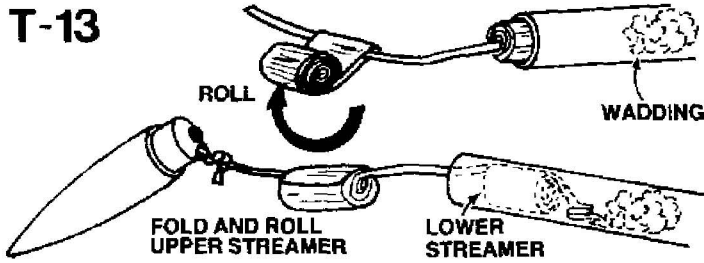
*For 2 stage launches using 1st & 3rd stages, use engines listed under "3 Stage Launches" for 3rd stage.

For the first launch, use the D12-0, A8-0, A8-5 engine combination.

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

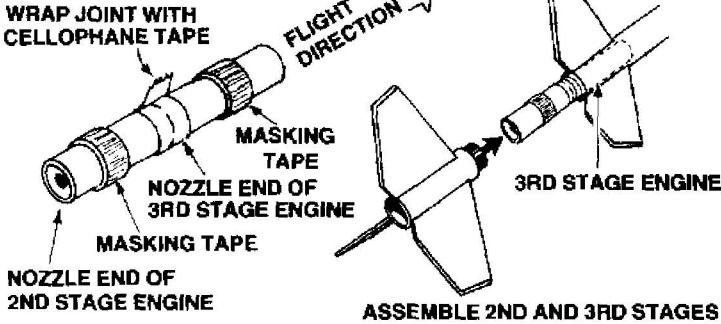
COUNTDOWN CHECKLIST

T-13



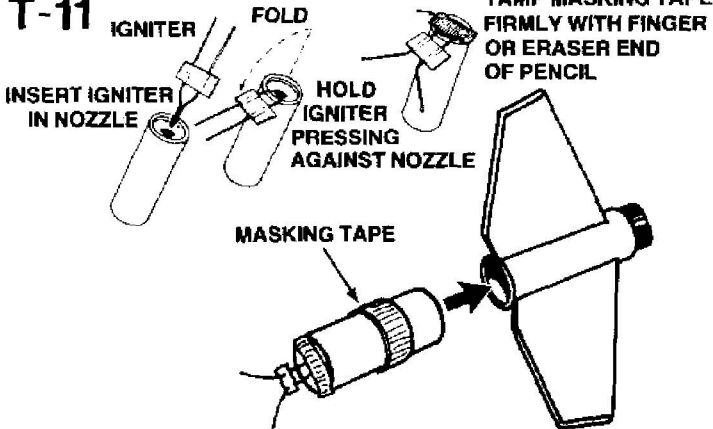
Insert 3 or 4 squares of loosely crumpled recovery wadding into the body tube. Fold the lower streamer twice and roll it up. Insert the streamer and the lower portion of the shock cord into the body tube. Fold and roll the upper streamer and insert it and the remainder of the shock cord into the body tube and socket the nose cone in place.

T-12



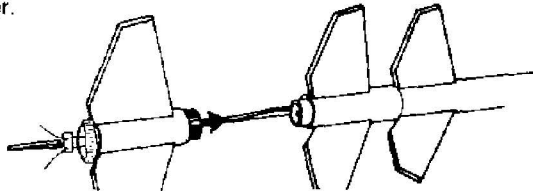
Position the nozzle end of the 3rd stage engine against the top of the 2nd stage (booster) engine. Wrap the joint tightly with cellophane tape. (Do not substitute masking tape for this.) Important: Make sure the engine nozzles are oriented as shown. For proper staging and streamer ejection, the engines must fit tightly into their respective engine mount tubes. Wrap a couple of layers of masking tape around both engines. Slide the 3rd stage engine into the 3rd stage engine mount tube. If the engine won't go in, remove a bit of masking tape. If the engine does not fit tightly, add more tape. Slide the 2nd stage unit onto the booster engine. Again, adjust with masking tape to provide a tight engine fit. Push the booster unit forward until it is socketed into the 3rd stage body. At this point, the nozzle end of the booster engine should extend 1/2" from the rear of the booster body tube.

T-11



Install an igniter in the first stage engine (D12-0) as shown above. Wrap several layers of masking tape around the engine and insert it into the 1st stage booster unit. As before, the engine should fit tightly into the body tube. Push the engine forward until it is butted against the tube coupler.

T-10



Socket the first stage unit into the bottom of the second stage and you are ready to launch.

Note: If you are flying the Comanche in other than a 3 stage configuration, the following engine preparations are used:

2 stage (1st & 3rd stages)—Friction fit 3rd stage engine into 3rd stage body. Prepare 1st stage as in T-11. Socket booster unit into 3rd stage.

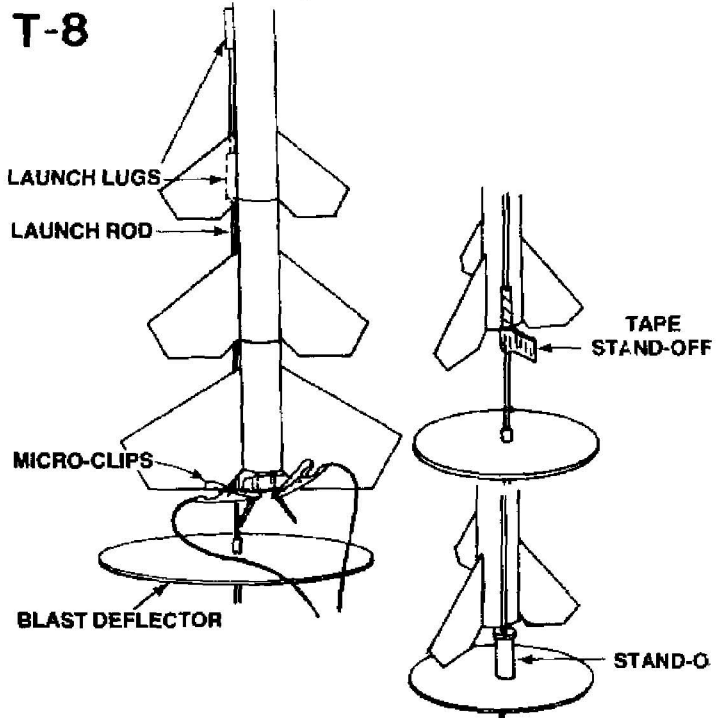
2 stage (2nd & 3rd stages)—Assemble engines as in T-12. Attach igniter to nozzle of 2nd stage engine.

Single stage—Attach igniter to 3rd stage engine and friction fit engine into 3rd stage body.

T-9

Disarm the launch panel—REMOVE SAFETY KEY!

T-8



Note: This model is to be used with a 3/16" diameter launch rod. Do not launch from a 1/8" diameter rod.

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

T-7

Clear the launch area. Alert recovery crew and trackers. Check for low flying aircraft and unauthorized persons in the recovery area.

T-6

Arm the launch panel—INSERT SAFETY KEY!

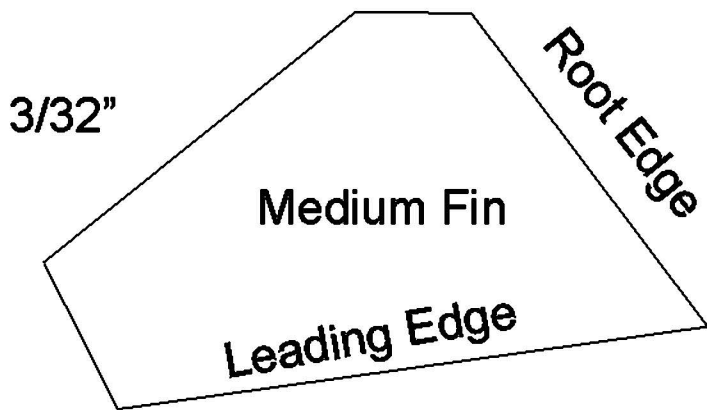
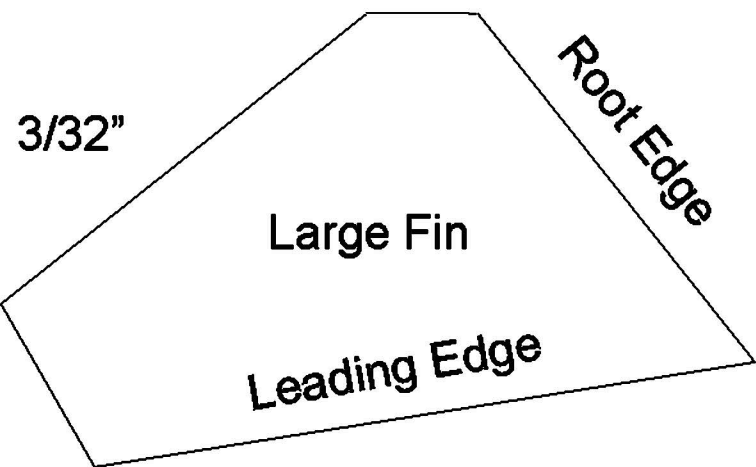
-5-4-3-2-1-LAUNCH!!

Repeat Countdown Checklist for each flight.

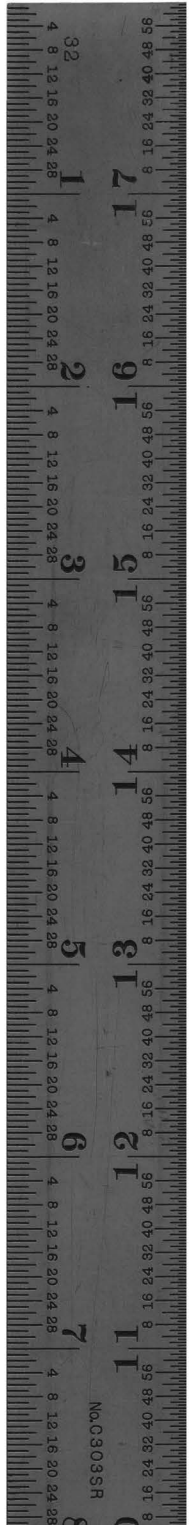
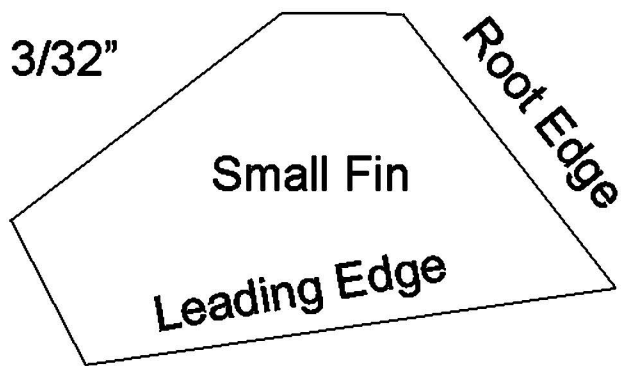
MISFIRE PROCEDURE

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

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



1 Inch



PARTS LIST KIT NO. 1382 - Comanche-3

Quantity	Description	Type	Number	Detail1	Detail2	Detail3	Detail4	Comment
2	PAPER BODY TUBE	BT-50J	30362	2.75" long	0.950" ID	0.976" OD	0.013" wall	Booster
3	STAGE COUPLER	JT-50C	30260	0.920" ID	0.949" OD	1" long	fits BT-50	
4	CENTERING RING	AR-2050	30164	1" long	.737" ID	.949" OD	0.106" wall	Green
1	PAPER BODY TUBE	BT-20M	30334	2.25" long	0.710" ID	0.736" OD	0.013" wall	Engine
1	PAPER BODY TUBE	BT-20J	30326	2.75" long	0.710" ID	0.736" OD	0.013" wall	Engine
1	Dummy Engine Casing	EC-2	35010	2.25" long				Used 18mm casing
1	CENTERING RINGS	AR-520	30162				BT-5 in BT-20	Engine Block
1	PAPER BODY TUBE	BT-50	30352	18" long	0.950" ID	0.976" OD	0.013" wall	
1	PAPER BODY TUBE	BT-50L	30366	12.7" long	0.950" ID	0.976" OD	0.013" wall	
1	BALSA FIN STOCK	BFS-30W	32114	3/32" thick	4" wide	18" long		
1	LAUNCH LUG	LL-3B	2328	7/32" ID	3/16" rod	2" long		
1	PLASTIC NOSE CONE	PNC-50Y		4.35" long	.974" dia.	.6" shoulder	BT-50 - Ogive	Cone & optional base
1	Body Tube Marking Guide (M	MG-503	37602	3 fins for BT-50				
1	Shock Cord Mount For BT-50	SCM-50	84444/900511					Paper
1	Shock Cord	SC-1	85730	18 " long	1/8" wide			Rubber
1	Paper Streamer Material	SM-1C	38273	1" x 90"				Flame Resistant Crepe Paper
2	Tape Disc	TD-1	2295	3/4" dia.				
1	Decal	KD-1382	37524	2.5" wide	2" long			Waterslide





FLYING MODEL ROCKET
ROCKET

MODEL LEVEL 2
COMANCHE-3

- Dual Streamer Recovery!
- Flies Over 2500 Feet High!
(760 meters)
- Waterslide Decals!

3 Stage Rocket!

Over 3 Feet Tall!

Laser Cut Fins!

Assembly Required!
This rocket, including recovery kit,
is designed for use with a standard
A Estes 29mm motor. It is not
designed for use with other
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ESTES FLYING MODEL ROCKET
ESTES MODÈLE DE FUSÉE VOLANT

Assembly Required!
This rocket, including recovery kit,
is designed for use with a standard
A Estes 29mm motor. It is not
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Recommended Age 12 and up
with adult supervision for
ages 10-12

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