

PARTS LIST

BASIC MODEL

Α	1	Engine Mount Tube (type BT-20J) 2-3/4"				
	2	Adapter Rings (type AR-2050) 1/4"30164				
С	1	Engine Hook (type EH-2)35025				
D	1	Pattern Sheet (type SP-1329)				
Е	1	Shock Cord (type SC-1)				
F	1	Body Tube (type BT-50L) 12-3/4"30366				
G	-	Die Cut Balsa Sheet (type BF-1329A) 9"				
Н	1	Launch Lug (type LL-2B) 2-3/8" 38178				
ı	1	Parachute (type PK-12A) 85564				
J	1	72" Shroud Line Cord (type SLT-72)				
K	6	Self-Adhesive Tape Discs (type TD-3F)38406				
L	1	Line Clip (type SV-2)				
M	1	Plastic Nose Cone (type PNC-50X)				
Ν	1	Water Transfer Decal (type KD-1329)				
	DAVI OAD OFOTION					

PAYLOAD SECTION

U	- 1	Balsa Nose Block (type NB-50)
P	1	Payload Section Body Tube (type BT-50EE) 5-1/2"30358
_	-	147. 14 20 1/2 1.1.30336

GLIDER

		Die Cut Balsa Sheet (type BF-1329C)		
S	1	Wood Dowel (type WD-2A) 1"		
Т	1	Balance Weight (type NCW-1A)		
U	1	Glider Support Lug (type LL-2AM) 3/8"38176		
BOOSTER STAGE				

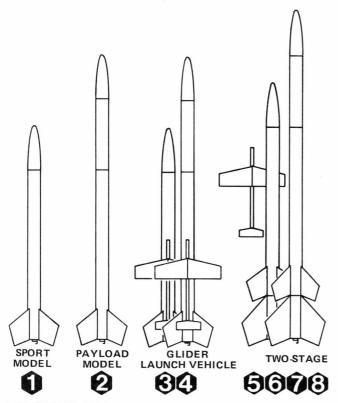
BOOSTER STAGE				
٧	1	Engine Mount Tube (type BT-20M) 2-1/4" 30334		
		Adapter Rings (type AR-2050) 1/4"30164		
Х	1	Stage Coupler (type JT-50C) 1"		
Υ	1	Booster Body Tube (type BT-50J) 2-3/4"		
Z	1	Die Cut Balsa Sheet (type BF-1329B)		

IN ADDITION

You will need a few tools and supplies, so collect them before you start. Here's the list:

- A. White Glue: Estes Rocket Glue, Elmer's, or similar.
- B. Knife: A sharp model knife or single edge razor blade.
- C. Scissors: Almost anything which will cut paper is fine.
- D. Pencil: A pencil's best; marker and ball point ink can show through the paint.
- E. Ruler: Measure distances---don't guess.
- F. Sandpaper: Fine and extra-fine for a smooth finish.
- G. Sanding Sealer: Fills the holes in the balsa.
- H. Paint: White, and flourescent green spray enamel for models.

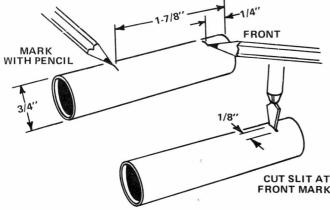
Your model can be assembled and flown eight different ways as shown below. Build and fly the sport model first, Next add the payload section and launch again. Move on to the other model systems as you follow the "Launching Procedures" at the end of these instructions.



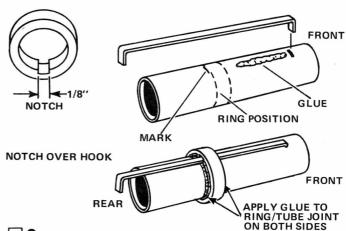
IMPORTANT:

Read all instructions before beginning work on your model. Make sure you have all parts and materials. When you are thoroughly familiar with the assembly procedure, begin construction. Check off each step as you complete it. In each step, test-fit the parts together before applying any glue. If some part doesn't fit properly, sand lightly or build up as needed for precision assembly.

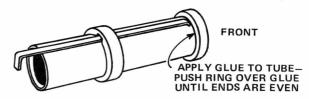
BASIC MODEL ASSEMBLY



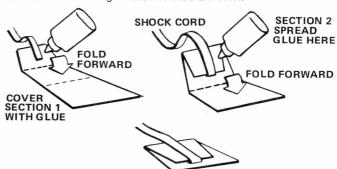
Locate the main stage engine mount tube (part A). Check its size (2-3/4" long and 3/4" diameter) with a ruler to be sure you have the correct tube. Mark the tube at 1/4" and 1-7/8" from one end. Cut a 1/8" long slit in the tube on the front mark as shown in the illustration.



Cut a shallow notch in the inside of one adapter ring (part B) as shown. Apply a 1" long line of glue to the engine mount tube, starting at the slit as illustrated. Push one end of the engine hook (part C) into the slit and press the main part of the hook into the glue. Slide the notched adapter ring over the tube and hook so the rear of the ring is on the mark as shown. Apply glue around the ring/tube joint on both sides to hold the ring in place.



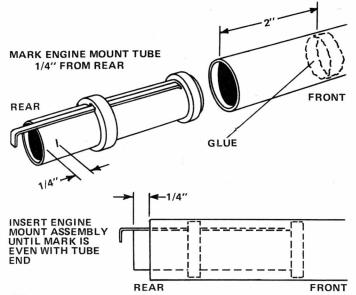
Apply a line of glue around the engine mount tube ahead of the engine hook. Slide a second adapter ring onto the tube and over the glue until the front end of the ring and the front end of the engine mount tube are even.



Cut out the shock cord mount from the pattern sheet (part D). Crease it on the dotted lines by folding. Spread glue on the first section (1) and lay one end of the shock cord (part E) into the glue. Fold over and apply glue to the back of the first section and the exposed part of section 2. Lay the shock cord as shown and fold over again. Clamp the unit together with your fingers until the glue sets.



Apply glue to the back side of section 2 and the exposed part of section 3 of the shock cord mount. Hold the mount (wide end toward tube) as shown, and press it into place in the main body tube (part F). Make sure the front of the mount is at least 1" from the end of the tube. Hold the mount in place until the glue sets.



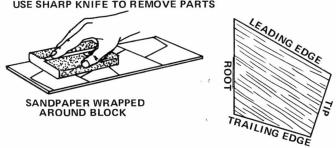
Mark the engine mount tube 1/4" from the rear (the end with the overhanging hook). Apply a line of glue around the inside of the main body about 2" from the rear of the tube (the end opposite the shock cord mount). Slide the engine mount unit into the body until the mark is even with the body end. (The engine mount is in the right place when 1/4" of the engine holder tube sticks out of the body.) Do not pause when pushing the mount in, or the glue may "grab" at the wrong place!

MARK AT ARROW POINTS

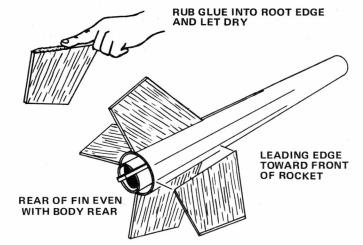
HOLD TUBE IN GROOVE, MARK ALONG STRAIGHT EDGE

7 Cut out the body tube marking guide from the pattern sheet. Wrap it around the rear (engine mount end) of the main body tube. Mark the tube at each arrow point, front and rear. Draw a straight line connecting each matching front and rear mark. The "V" formed by the side of the stop on a door frame makes a good guide for drawing straight lines on a tube. Extend the launch lug line forward 7".

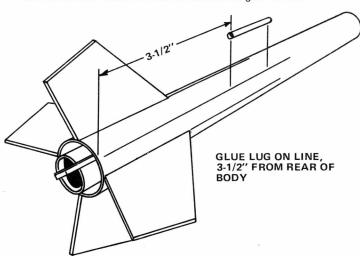
SAND BOTH SIDES OF BALSA SHEET, THEN USE SHARP KNIFE TO REMOVE PARTS



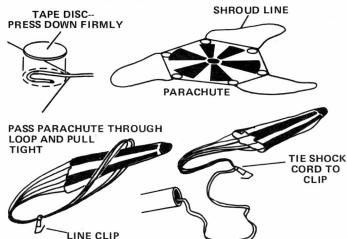
Fine-sand the 9" long upper stage fin die-cut sheet (part G), then carefully remove the fins from the sheet. Free the edges with a sharp knife. Sand all edges except the root edge to a rounded shape. Make sure the root edge stays square.



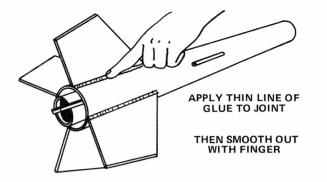
Rub a line of glue into the root edge of each fin and allow to dry. Glue the fins to the main body on the alignment lines, with the rear of each fin even with the rear of the body tube. Adjust the fins so they stick straight out from the body. Do not set the rocket on its fins while the glue is wet.



10 Glue the launch lug (part H) to the body on its line. The rear of the lug should be 3-1/2" from the rear of the main body. Align the lug straight on the body.



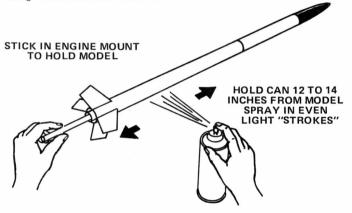
11 Cut out the parachute (part I) on its edge lines. Cut three 24" lengths of shroud line (part J). Attach line ends to the top of the parachute with tape discs (part K) as shown. Pass the shroud line loops through the small loop on the line clip (part L). Pass the parachute through the loop ends and pull the lines tight against the clip. Set the knot with a drop of glue. Tie the free end of the shock cord to the clip as shown.



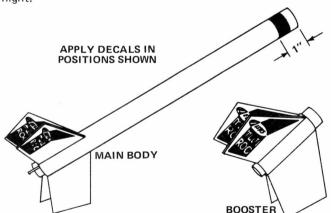
12 When the fin joints have dried, apply glue reinforcements to each joint. Holding the model level, apply a narrow line of glue to both sides of each fin joint. Smooth out the glue with your finger. Keep the model level until the glue dries.

13 When all glue on the outside of the body is dry, prepare the fins for painting. Apply at least two coats of sanding sealer to the fins. Let dry and sand thoroughly between coats. Do this until the tiny holes in the wood are filled and every-

thing looks and feels smooth.



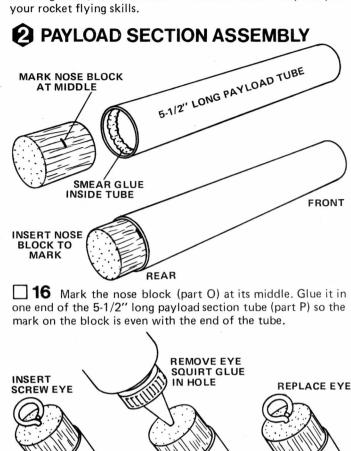
14 Give the entire rocket two or three coats of white enamel spray paint. Let the paint dry thoroughly, then paint only the nose cone with flourescent green. Let the paint dry overnight.



15 When all paint is completely dry, clip the shock cord and shroud lines to the nose cone. Next, apply decals (part N) in the positions shown. To apply the decals, cut out a decal section, dip it in lukewarm water for 10 seconds, and hold it until it starts to uncurl. Slip the decal off the backing sheet and onto your model. Blot excess water away. When all decals are in place, let the model dry overnight. After drying, apply a coat of clear spray to protect the decals.

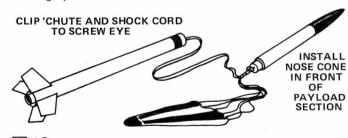
Your model is now ready for launch. Follow the Basic Countdown Checklist (list #1) as you send your bird on its first flight.

As a basic single stage model your rocket is ideal for holding parachute duration contests (use a stopwatch to see whose model can stay aloft the longest) and spot landing contests (see whose model can land by parachute nearest a target on the ground). You'll find these contest events really sharpen your rocket flying skills.



17 Insert the screw eye (part Q) into the rear of the nose block. Remove the screw eye and squirt a small amount of glue into the hole. Re-insert the screw eye.

18 Paint the payload section body with two or three even, light coats of white spray enamel paint. Let the paint dry thoroughly between coats.

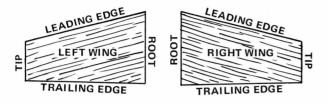


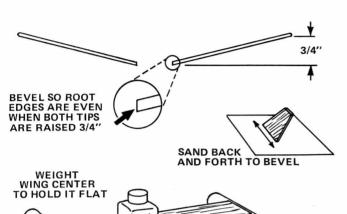
19 Unclip the parachute and shock cord from the nose cone. Snap the clip in place on the payload section's screw eye. Check the fit of the nose cone in the front of the payload section. If it is loose, wrap the shoulder of the cone with masking tape until it makes a snug fit. Make sure the nose cone will not come loose when the model is turned upside down and shaken.

In its payload launch form, your model can carry instruments such as miniature radio transmitters, or biological specimens. (Send a grasshopper on a really high hop!) When launching a payload, special care in preparing the model for flight is important to insure the safety of the payload. Follow the steps in Payload Countdown (list #2) when you fly your model in this configuration.

GLIDER ASSEMBLY

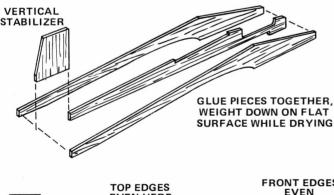
20 Fine-sand both sides of the die-cut balsa glider parts sheet (part R), then carefully remove the parts from the sheet. Free the edges with a sharp knife.

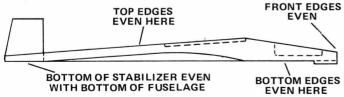




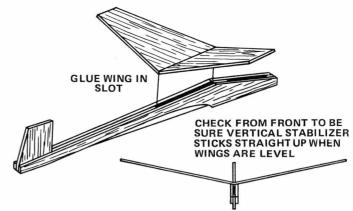
21 Bevel the root edges of the wing halves exactly as shown. Use a sheet of sandpaper face-up on a flat, smooth surface, and run the wing root back and forth on the sandpaper until the edge is beveled. Notice that one wing bevels to the right, the other to the left. Glue the wing halves together, with the root edges resting on a flat surface and the tips supported 3/4" above the root. Weight the center of the wing to hold it flat on the surface.

SUPPORT TIPS 3/4" OFF **FLAT SURFACE WHILE GLUE DRIES**

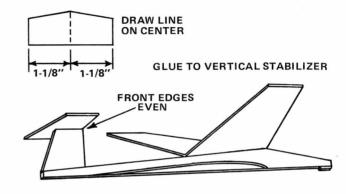


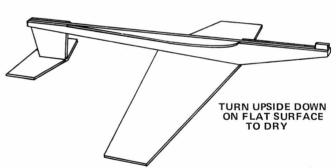


■ 22 Glue the vertical stabilizer and the three fuselage pieces together as shown. Lay the fuselage assembly on a flat surface and weight it down (small paint bottles make good weights) to hold it flat while the glue dries.

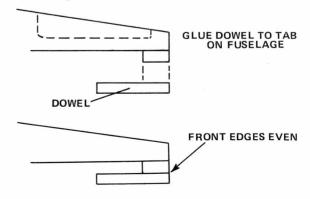


23 When the fuselage and the wing assemblies have dried thoroughly, glue the wing to the fuselage. Notice that there is a slight slot in the fuselage where the wing fits. Check to make sure the wing is lined up straight on the fuselage, then hold it tightly in place until the glue sets.





24 Draw a straight line between the front center and the rear center of the horizontal stabilizer. Glue the horizontal stabilizer to the top of the vertical stabilizer as shown. Turn the glider upside-down on a flat surface to hold the stabilizer straight while the glue dries.

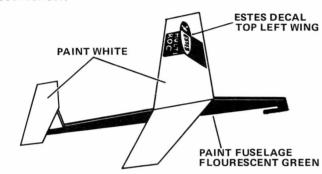


 $oxedsymbol{oxed} 25$ Glue the dowel (part S) to the fuselage at the front to form a hook.

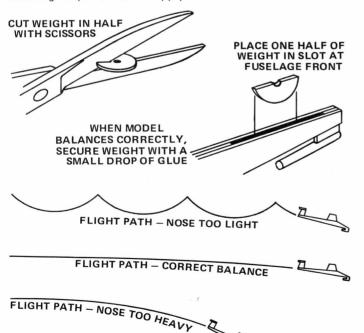


26 Apply glue reinforcements to the wing, stabilizer and hook joints. Reinforce by applying a thin line of glue to the joint, then smoothing it out with your finger tip.

27 When all glue on the glider is thoroughly dry, sand the fuselage, stabilizer and wing edges to round them and smooth them. Apply a coat of sanding sealer, let dry, and sand with extra-fine sandpaper. Repeat two or three times to get a good smooth surface.



28 When the balsa has been sealed, apply one or two very light coats of white enamel paint. When dry, apply one light coat of flourescent green to the fuselage only. Paint very lightly because heavy coats of paint add weight which will reduce the models glide performance. Apply decal as shown.



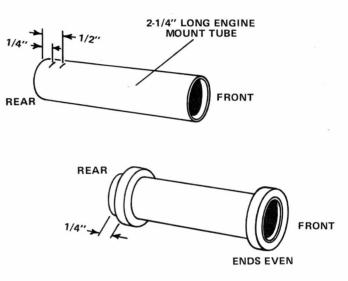
29 Cut the balance weight (part T) in half. Place one half in the slot in the front of the fuselage and check the glider's balance point. For best results it should balance about halfway back along the wing root. Add or remove weight until the

glider balances at mid-wing. Check the glider's trim by giving it a straight, smooth, gentle toss into the wind. If the glider tends to dive, remove part of weight from the front. If the glider tends to pull up, lose speed, and then fall, add weight to the nose. The ideal glide will be a straight, smooth, gentle descent.

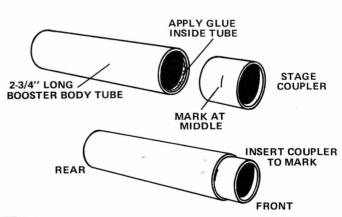
Your glider is called a "parasite glider' because it hitches a free ride on a rocket like a flea on a dog. The Glider Launch Countdown (list #3) explains how to add an extra lug to the rocket's body. The glider hooks onto this lug and is carried aloft by the rocket. At ejection the glider's own momentum carries it forward and off the hook, releasing it to soar freely on its return flight.

With a stopwatch you can hold glide duration contests to see whose glider is the best. For more excitement, you can loft two gliders at the same time, mounted on opposite sides of the same launch vehicle.

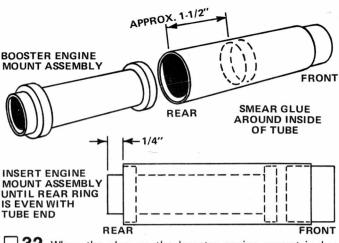
4 BOOSTER ASSEMBLY



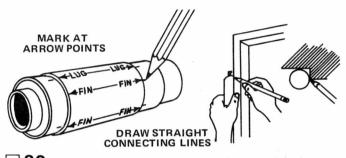
30 Mark the 2-1/4" long booster engine mount tube (part V) at 1/4" and 1/2" from one end. Apply a line of glue around the tube between the marks and slide an adapter ring (part W) on over the glue so it is centered between the marks. This end will be the rear of the mount. Glue the remaining ring on so it is even with the front of the engine mount tube.



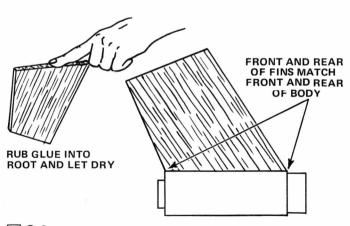
31 Mark the stage coupler (part X) at its middle (half-way from each end.) Apply glue around the last 1/4" in one end of the booster body tube (part Y). Immediately slide the coupler in until the mark is even with the end of the tube. Let the unit set a minute, then wipe off any excess glue.



■ 32 When the glue on the booster engine mount is dry, apply a line of glue around the inside of the booster body about 1-1/2" from the rear (the end away from the stage coupler). Check the illustration to be sure which end of the booster engine mount is the front. Slide the engine mount, front end first, into the body until the back of the rear adapter ring is even with the end of the tube. Apply a line of glue around the joint between the rear ring and the body.



33 Wrap the body tube marking guide around the booster body. Mark the tube at each fin arrow point. Draw a straight connection line from one end of the body to the other so the line passes through the matching marks.



igsqcup 34 Sand and install the booster fins in the same way as you did the upper stage fins (steps 8 and 9). Make sure the fins are straight, then let the glue dry.

□ 35 When the fin joints have dried, apply glue reinforcements to each fin/body joint. Support the model on its side (but don't set it on its fins) while the reinforcements dry. Check step 12 for complete instructions.

36 Sand and seal the booster fins using the same method as for the main stage (step 13). Follow with two or three coats of white spray enamel. Let dry, and apply decals as shown in step 15.

Multi-staging is the easy way to improve your model's peak altitude performance. The first stage lifts the model off the launch pad and boosts it to a fairly good speed. When the first stage engine runs out of fuel, it automatically ignites the upper stage engine. The upper stage (also called a sustainer) keeps up and adds to the velocity given by the booster, propelling the model to an extra-high altitude. Estes Technical Report TR-2 (Cat. No. 84722) gives more information on multi-stage construction and operation.

Because the first (booster) stage adds weight to the rear of the model, extra large fins are needed on the booster to make the rocket aerodynamically stable (so it flies straight in the direction it's launched). These large fins also serve as the booster's recovery device. The booster stage by itself is not stable, and will tumble in the air. The fins give extra-high aerodynamic drag as it tumbles. The result is that the booster falls slowly, much like a falling leaf.

When flying the model as a two stage rocket, follow the Multi-Stage Countdown (list #4). Special care in aligning, joining and mounting the engines is important to make sure the rocket "stages" correctly.

LAUNCHING COMPONENTS

To launch your rocket you will need the following items:

Single Stage Flights An Estes model rocket launching system. Flameproof recovery wadding RECOVER Multi-Stage Flights: MADDING Launch system and wadding.

(Estes Cat. No. 2274).

Estes 1/2A6-2, A8-3, B4-4, B6-4, B14-5, or C6-5 model rocket engines. Use an A8-3 engine for the first flight.

Masking tape and transparent tape.

Estes 1/2A6-0, A8-0, B6-0, or C6-0 booster engines and 1/2A6-4, A8-5, B4-6, B6-6, or C6-7 upper stage engines. Use an A8-0 and an A8-5 for the first multi-stage flight.

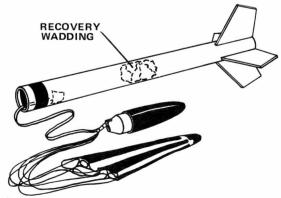
Be sure to follow the HIAA-NAR* Model Rocketry Safety Code when carrying out your model rocketry activities.

> *HIAA-NAR ---- Hobby Industry Association of America National Association of Rocketry

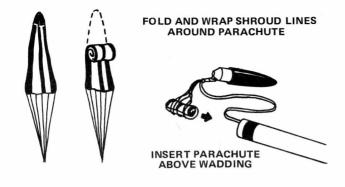








T-14 Pack four squares of loosely crumpled recovery wadding into the body tube from the front.



T-13 Fold the parachute into a triagular shape. Roll the 'chute tightly as shown and wrap the shroud lines around it. If 'chute is too large, unroll it and repack until it slides easily into rocket. A fit that is too tight may prevent the parachute from ejecting properly.

NOTE: DO NOT pack parachute until you are actually ready to launch. For maximum parachute reliability, lightly dust the 'chute with ordinary talcum powder before each flight, especially in cold weather.

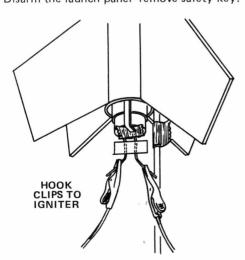
T-12 Pack parachute, shroud lines, and shock cord neatly into the body tube. Slide nose cone into place. Nose cone should separate easily from rocket body tube, but should not be extremely loose. If it is too tight, sand the inside of the body tube and the nose cone shoulder with extra fine sand-paper. If the nose cone is too loose, add a wrapping of transparent tape or masking tape to the shoulder of the nose cone.

T-11 Select an engine and install an igniter as directed in the engine instructions. The engines recommended for use with this rocket as a single stage sport model are the 1/2A6-2, A8-3, B4-4, B6-4, B14-5, and C6-5 engines made by Estes.

Use an A8-3 engine for your first flight.

T-10 Insert the engine into the rocket engine mount. The engine hook must latch securely over the end of the engine.

T-9 Disarm the launch panel--remove safety key.



T-8 Slide the launch rod through the rocket's launch lugs and place the rocket on the launching pad. Make sure the rocket slides freely on the launch rod. Clean the micro-clips and attach them to the igniter leads. Arrange the clips so they do not touch each other or the metal blast deflector.

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.

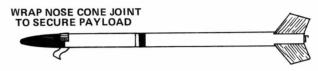
-5-4-3-2-1-LAUNCH!!

MISFIRE PROCEDURE

Occasionally the igniter will heat and burn into two pieces without igniting the engine. This is almost always caused by a failure to install it correctly. Disarm the launch panel, remove the model, clean the igniter residue from the nozzle, and install a new igniter. Follow the launching procedure again.

PAYLOAD LAUNCH COUNTDOWN

T-13 Pack recovery wadding and parachute into the body tube with the shroud lines and shock cord above the 'chute. Slide the payload section into place.



T-12 Remove the nose cone from the payload body tube. Load the payload into the payload section. Put the nose cone back on, checking to be sure it fits tightly. If the nose cone is loose, a wrap of tape around the nose cone/payload tube joint will hold it.

T-11 Select an engine and install an igniter as directed in the engine instructions. With payloads weighing under 1/2 ounce, use 1/2A6-2, A8-3, B6-4, or C6-5 engines. For heavier payloads, use A8-3, B6-2, B6-4, C6-3, or C6-5 engines.

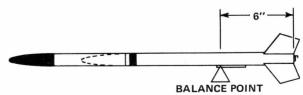
T-10 Insert the engine into the rocket engine mount. The engine hook must latch securely over the end of the engine.

T-9 Complete your launch preparations by following steps T-9 through "Launch" from the Basic Countdown.

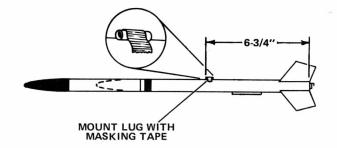
6 GLIDER LAUNCH COUNTDOWN

T-14 Pack recovery wadding and parachute into the body tube with the shroud lines and shock cord above the 'chute. Slide the payload section or nose cone into place.

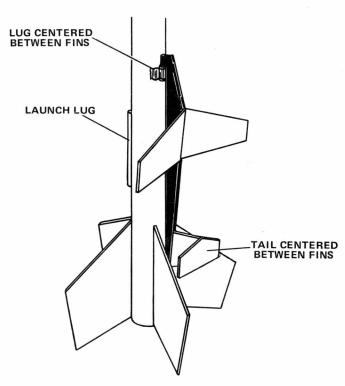
T-13 Select an engine and install an igniter as directed in the engine instructions. The engines recommended for launching the model with the parasite glider are the A8-3, B6-4 and C6-5 made by Estes. For most small to medium-sized flying fields the A8-3 engine is recommended. Insert the engine into the rocket engine mount and latch the hook securely over the end of the engine.



T-12 Check the model's balance point. It should balance at least 6" ahead of the main body tube rear. Add weight to the payload section or nose cone if necessary for proper balance. The model is normally balanced correctly for parasite launches when flown with A8-3 engines.



T-11 Attach glider lug (part U) to the main body on the side opposite the launch lug. The glider support lug should be centered between fins with the front of the lug 6-3/4" from the rear of the rocket body. Use masking tape to attach the lug.

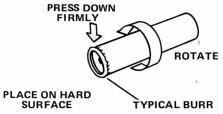


T-10 Hook the glider on the support lug. Make sure the glider hangs freely with its tail between two fins. Check to be sure the glider can come loose without binding against the lug.

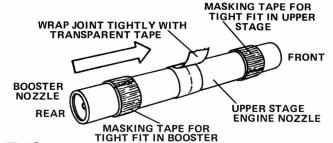
T-9 Complete your launch preparations by following steps T-9 through "Launch" from the Basic Countdown.

4 MULTI-STAGE COUNTDOWN

T-15 Pack recovery wadding and parachute into the body tube with the shroud lines and shock cord above the 'chute. Slide the payload section into place.

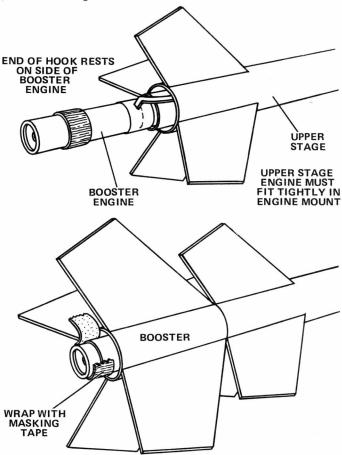


T-14 Select an upper stage engine and a booster engine. Remove any burrs from the ends of the engines by holding them against a smooth surface and turning as shown.



T-13 Position the engines with the nozzle of the upper stage engine against the top end of the booster engine. Wrap a layer of transparent tape tightly around the joint as shown at right. Check to be sure the nozzle of the upper stage engine is against the top of the booster engine.

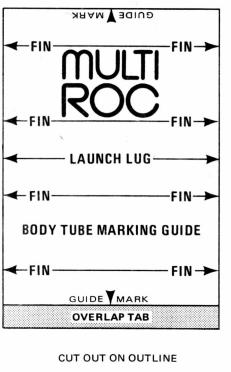
T-12 Wrap masking tape around the top of the upper stage engine so it makes a tight friction fit in the engine mount tube. Spring the engine hook back and insert the upper stage end of the engine unit into the upper stage engine mount. Push the engines forward until the upper stage engine stops against the front of the engine hook.



T-11 Slide the booster into place on the engine unit from the botton. Slide it over the engine hook and position it so the stage coupler fits all the way into the upper stage. Turn the booster so the upper and lower stage fins are in line. Secure the booster by wrapping a layer of masking tape around the end of the engine mount tube and the engine. Press the tape down tightly.

T-10 Install an igniter in the booster engine as directed in the engine instructions.

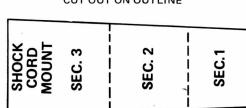
T-9 Complete your launch preparations by following steps T-9 through "Launch" from the Basic Countdown.

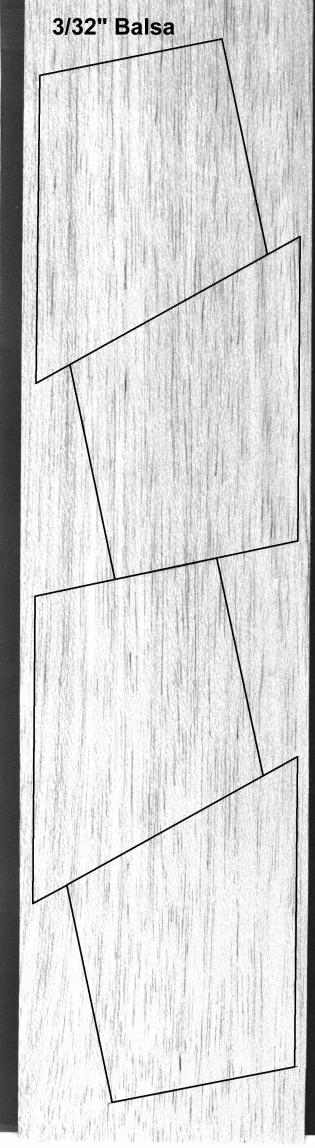


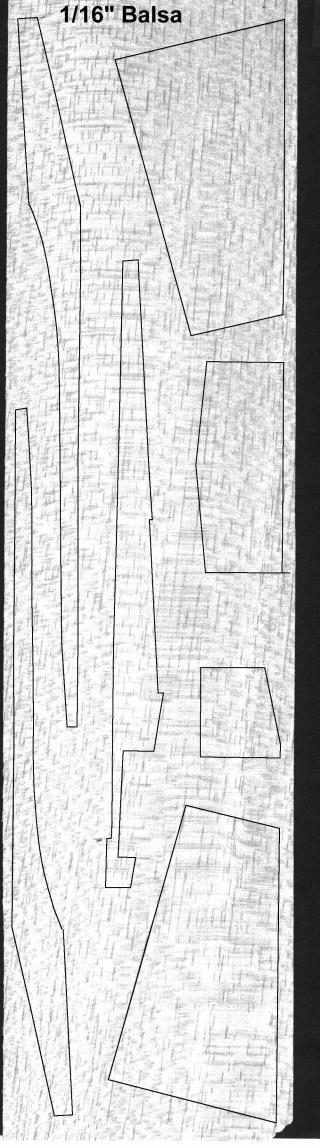
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FLYING MODEL ROCKET

