



ESTES INDUSTRIES
1295 H STREET
PENROSE, CO 81240 USA

EX
SERIES

FLYING MODEL ROCKET KIT #2097

MANTA™



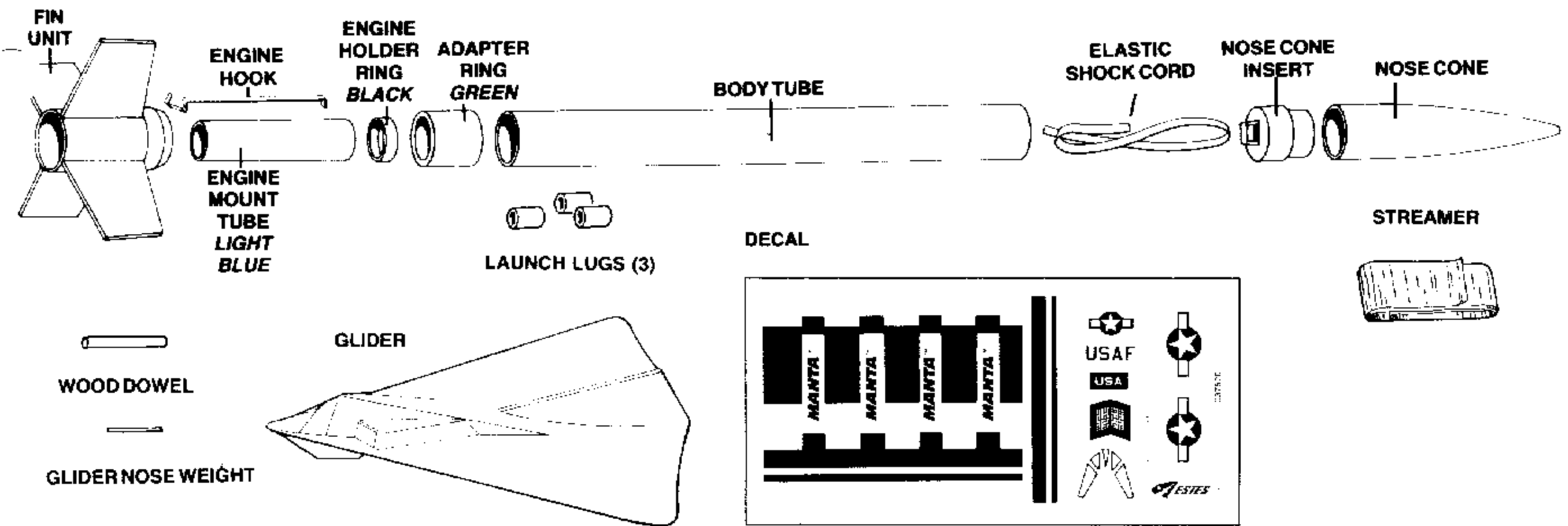
Finished 1-7-95

HOW TO USE THESE INSTRUCTIONS:

READ ALL INSTRUCTIONS BEFORE STARTING WORK ON THIS MODEL

- A. This rocket, incorporating basic model rocketry construction techniques, will help you in the continuing development of your rocketry modeling skills.
- B. **Read each step first** and visualize the procedure thoroughly in your mind before starting construction.
- C. Lay parts out on the table in front of you. (Check inside tubes for any small parts.)
- D. Use parts drawing to match all parts contained in kit.
- E. Collect all construction supplies that are not included in the kit.
- F. Shock cord mount is printed in the instructions and will be found on page 5 in the patterns section.
- G. Test fit parts before applying any glue.
- H. Sand parts as necessary for proper fit.
- I. The construction supplies required for each step are listed at the beginning of each step.
- J. Check off each step as you complete it.

PARTS DRAWING



EXTREMELY IMPORTANT: THE PARTS DRAWING IS FOR REFERENCE ONLY! DO NOT USE THIS DRAWING ALONE TO ASSEMBLE THIS MODEL.

The parts drawing is only intended to assist you in locating the parts included in this kit. Refer back to this parts drawing as you build your model step by step. This method will help you to put the parts into perspective as you progress through the construction.

CONSTRUCTION SUPPLIES

In addition to the parts included in your kit, you will need these construction supplies. Each step shows which supplies will be required.



SCISSORS



PENCIL



KNIFE



PLASTIC CEMENT



RULER



GLUE
(white or yellow)



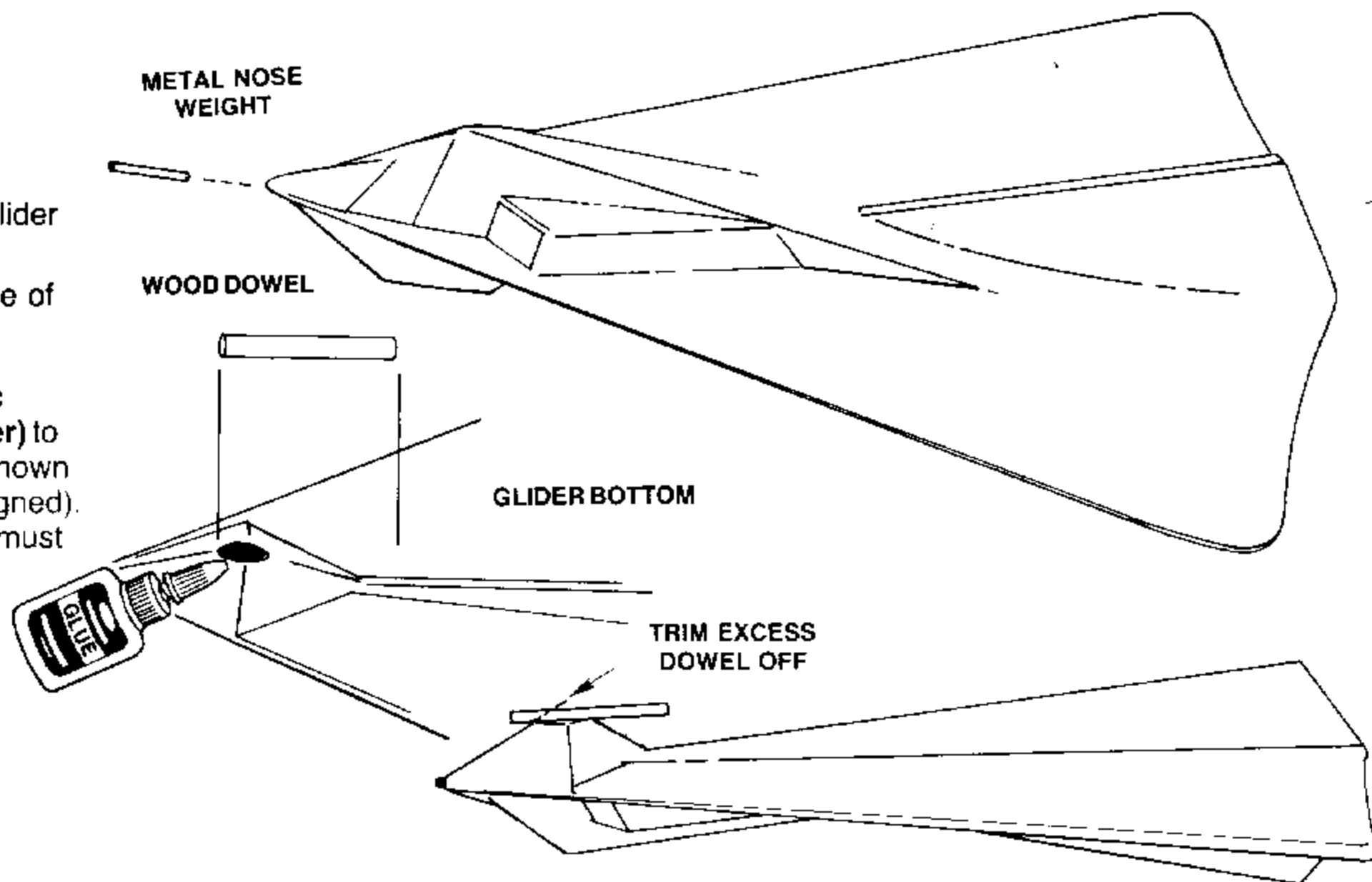
OPTIONAL:
TUBE MARKING
GUIDE
EST 2227

GLUE IS APPLIED TO SURFACES SHOWN IN RED.

1. GLIDER ASSEMBLY



- A. Locate glider, wood dowel and glider nose weight.
- B. Push glider nose weight into nose of glider as shown.
- C. Apply glue (**DO NOT use plastic cement as this will melt the glider**) to wood dowel and glue to glider as shown (make sure it is centered and aligned). Set aside and allow to dry. This must be dry before handling glider.

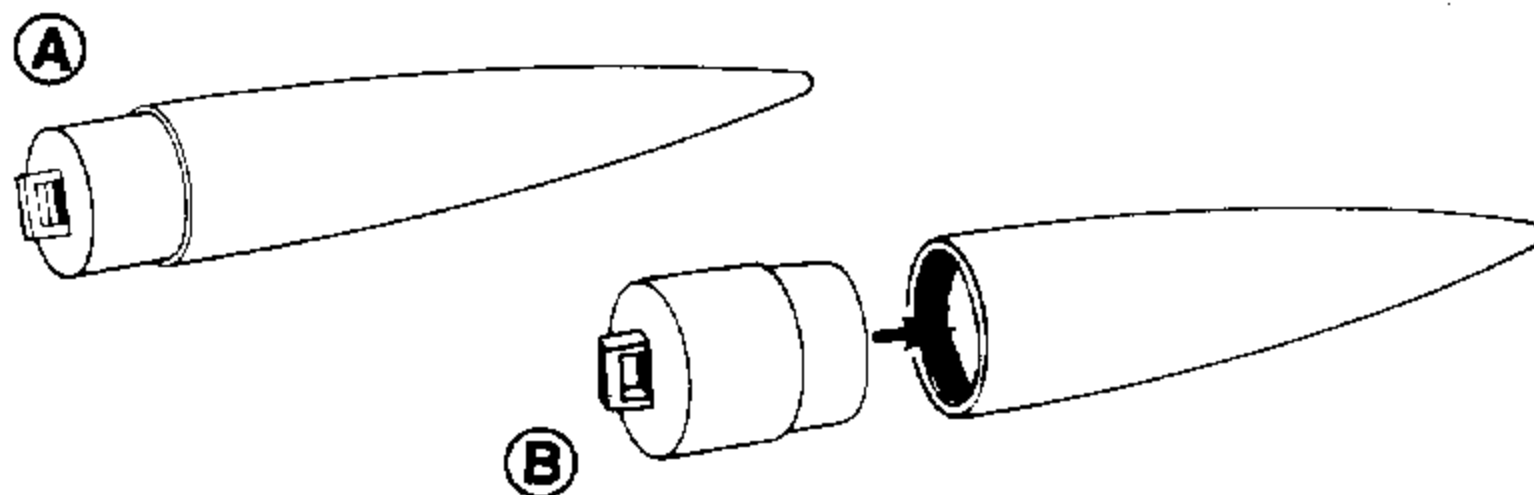


2. NOSE CONE ASSEMBLY



NOTE: This is the only step in the construction of your model rocket that requires plastic cement.

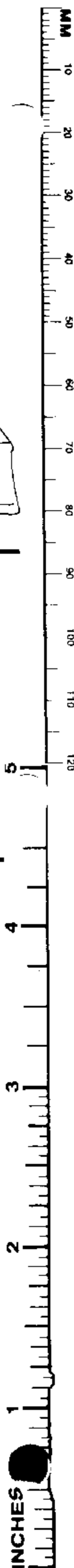
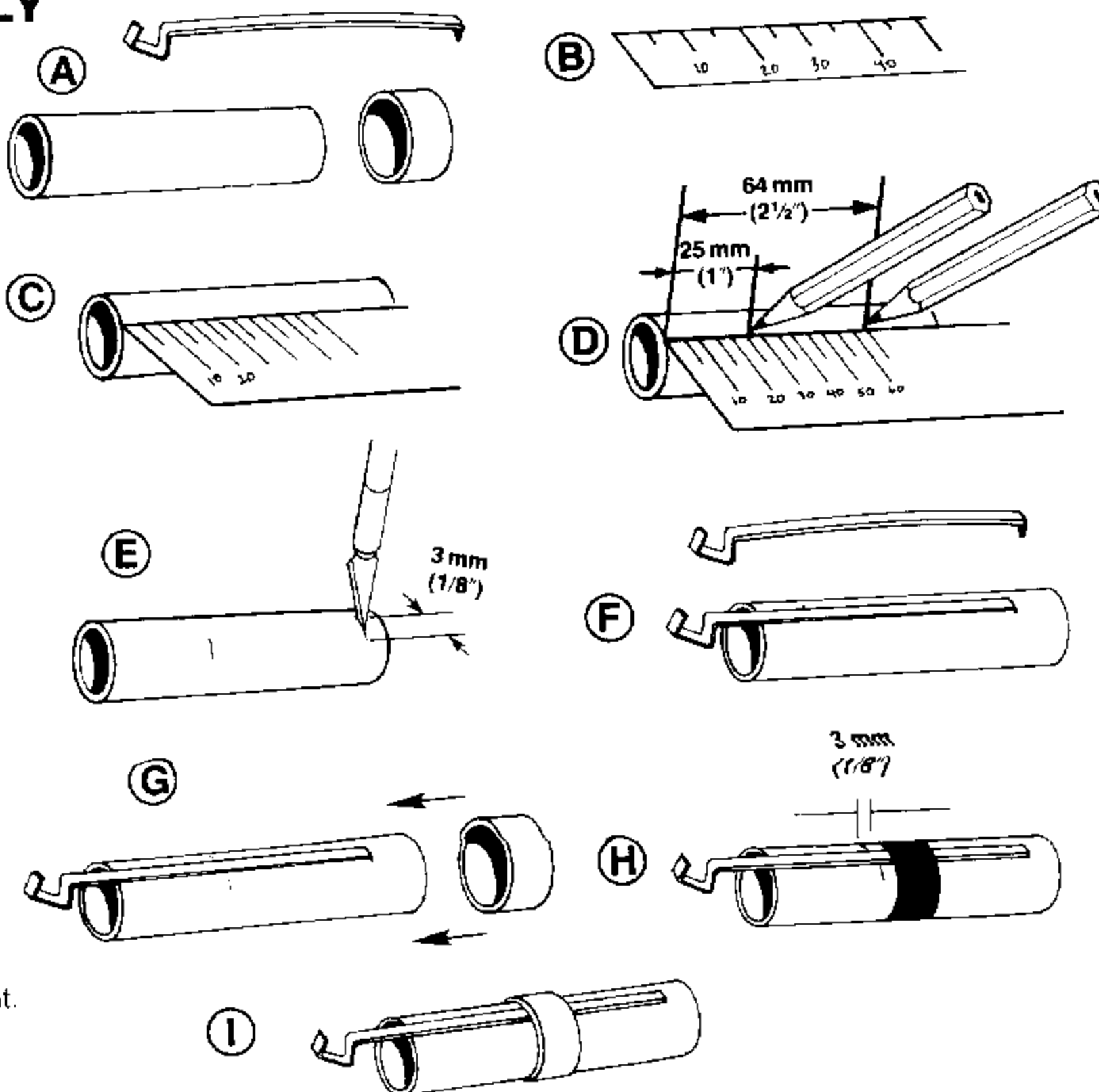
- A. Test fit the nose cone insert into the nose cone. **Do not cement at this time.** Remove the insert.
- B. Apply plastic cement as shown in the illustration and assemble the nose cone and insert piece. Allow assembly to dry.



3. ENGINE MOUNT ASSEMBLY



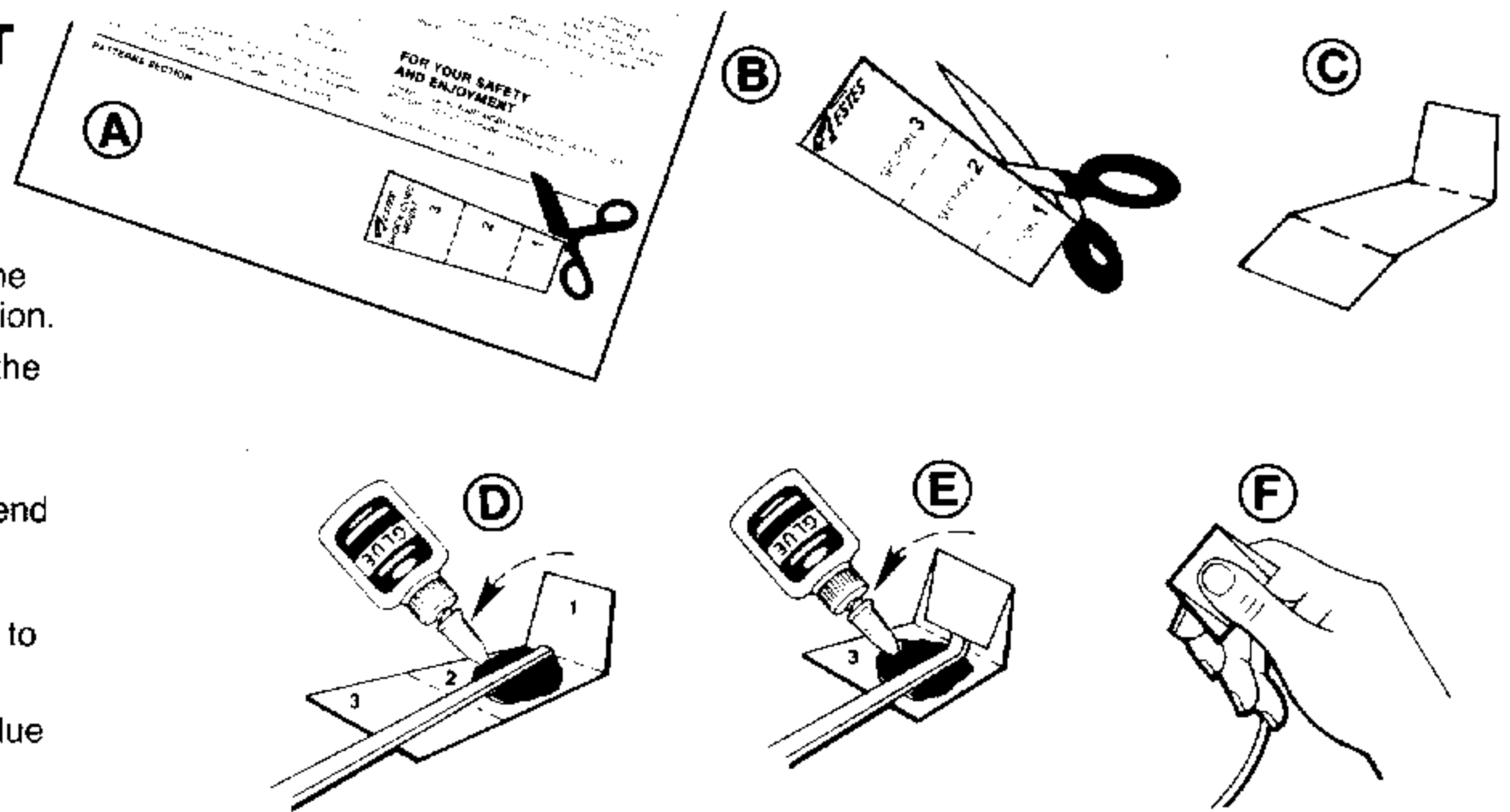
- A. For this step you will need the light blue engine mount tube, the engine hook and the black engine holder ring.
- B. Locate the ruler printed in the center crease of this instruction sheet.
- C. Lay one end of the engine mount tube on the zero mark of the ruler.
- D. Place a mark on the engine mount tube 25 mm (1") from zero. Make another mark 64 mm (2½") from zero.
- E. Cut a 3 mm (1/8") long slit at the 64 mm (2½") mark.
- F. Insert the engine hook into the slit as shown. The engine hook should extend beyond the rear of the engine tube.
- G. Test fit the black engine holder ring by sliding it on to the front of the engine tube. Slide the ring over the engine hook and up to the 25 mm (1") mark that you made in step D. Remove the ring.
- H. Apply glue around engine mount tube about 3 mm (1/8") ahead of 25 mm (1") mark and no further. Slide ring onto tube. Do not stop while sliding ring into place or the glue may grab at the wrong point.
- I. Let assembly dry.



4. SHOCK CORD MOUNT ASSEMBLY



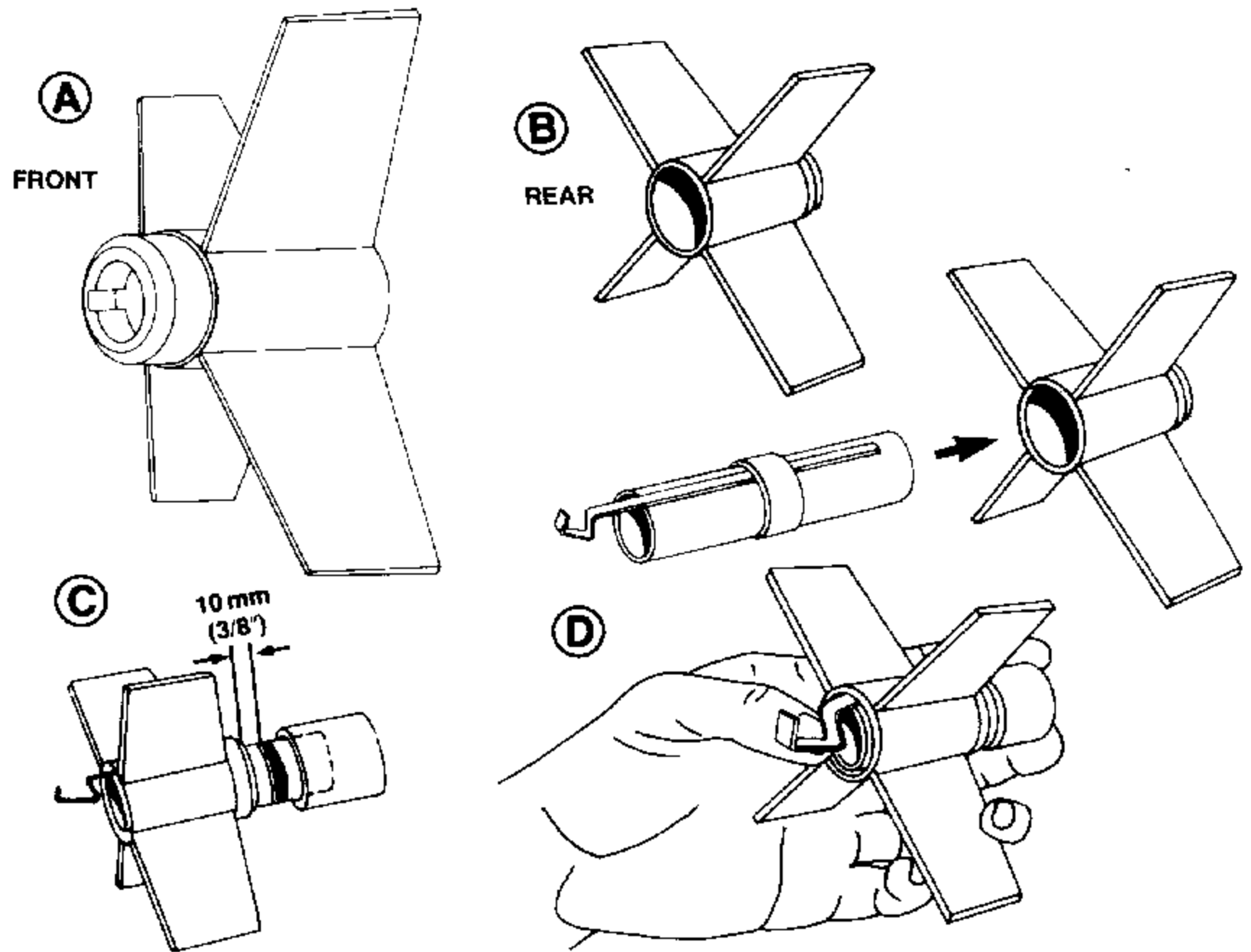
- A. Locate the shock cord mount on the bottom of page 5 in the patterns section.
- B. Cut out the shock cord mount along the solid black outline.
- C. Crease on dotted lines by folding.
- D. Spread glue on section 2 and lay end of shock cord into glue at a slight diagonal as shown.
- E. Fold section 1 forward. Apply glue to section 3. Fold forward again.
- F. Clamp firmly with your fingers until glue dries.



5. FIN UNIT ASSEMBLY



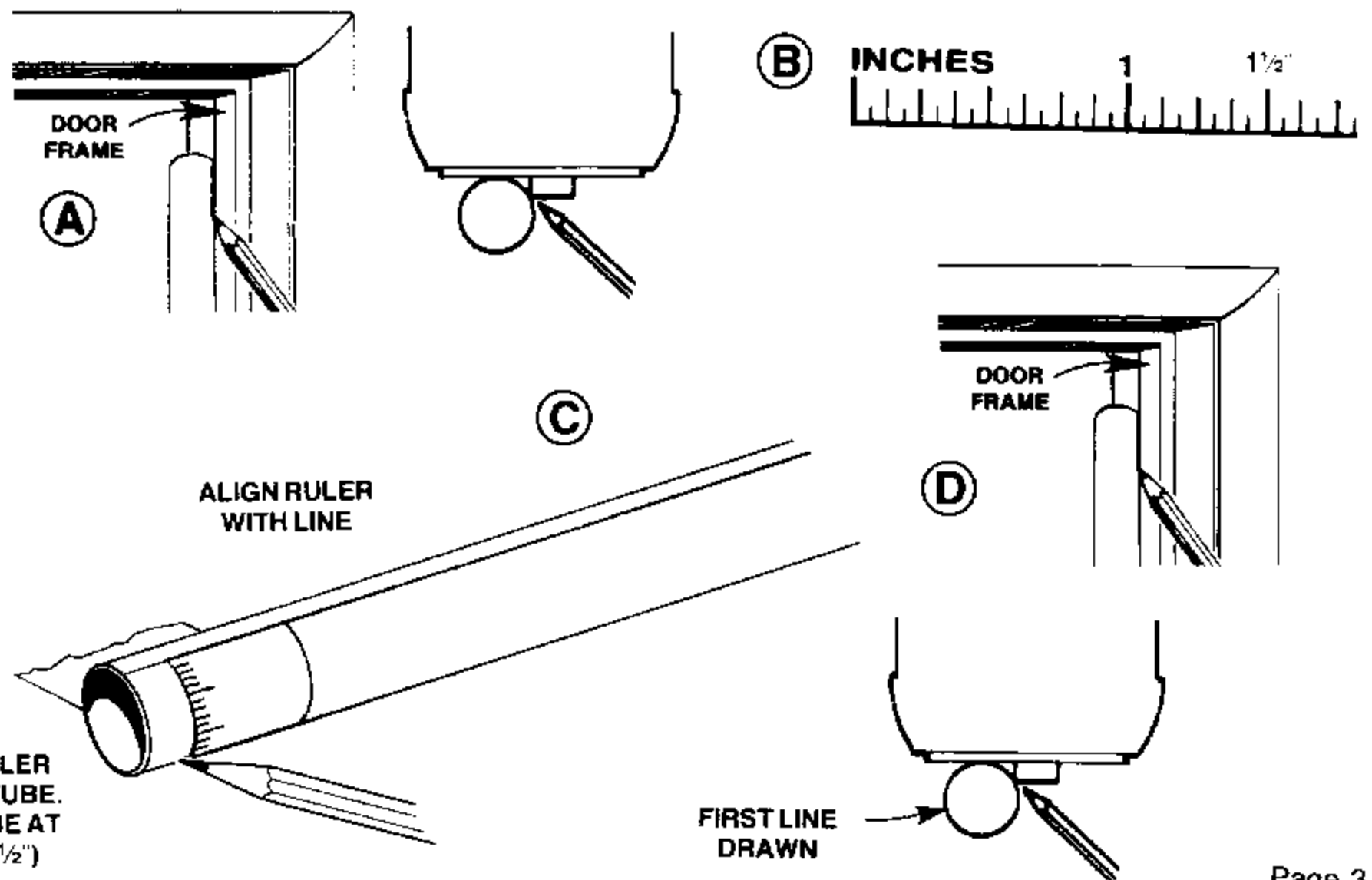
- A. Locate slot on inside of fin unit. The engine hook on the engine mount tube will fit into slot in fin unit.
- B. Slide assembly from step 3 into plastic fin unit from the rear. Engine mount tube should not protrude from rear of plastic fin unit.
- C. Measure approximately 10 mm (3/8") ahead of fin unit and apply glue around the engine tube as shown.
- D. Hold engine mount tube in place with thumb and in one continuous movement, slide green adapter ring onto engine mount until it touches the fin unit evenly all around.



6. LAUNCH LUG ALIGNMENT LINES



- A. Using a door frame as a guide*, lightly draw a straight line along entire length of body tube as shown.
- B. Locate the ruler used in step 3.
- C. Wrap ruler around tube. Place "0" on line drawn in step A. Mark other side of tube at 39 mm (1 1/2") mark of ruler.
- D. Using the door frame again, lightly draw another line at this mark along entire length of body tube.



*Instead of a door frame, you can use the optional Estes Tube Marking Guide (EST 2227)

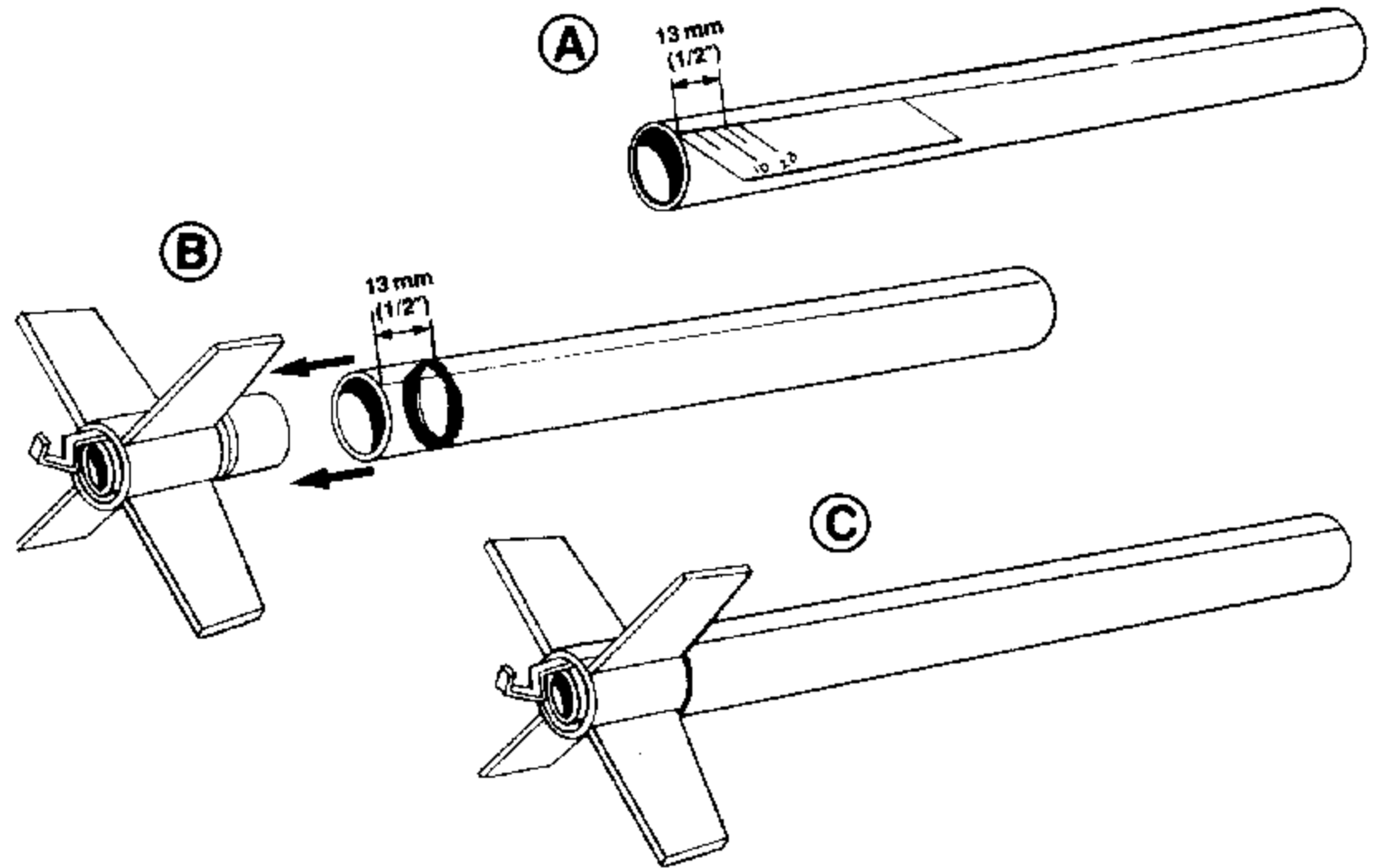
WRAP RULER AROUND TUBE. MARK TUBE AT 39 mm (1 1/2")

FIRST LINE DRAWN

7. FIN ATTACHMENT



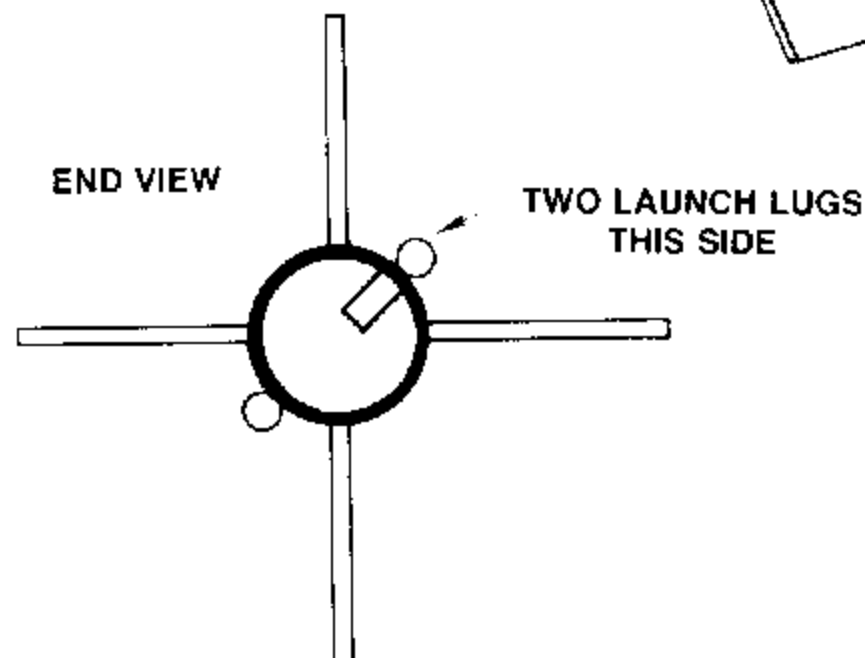
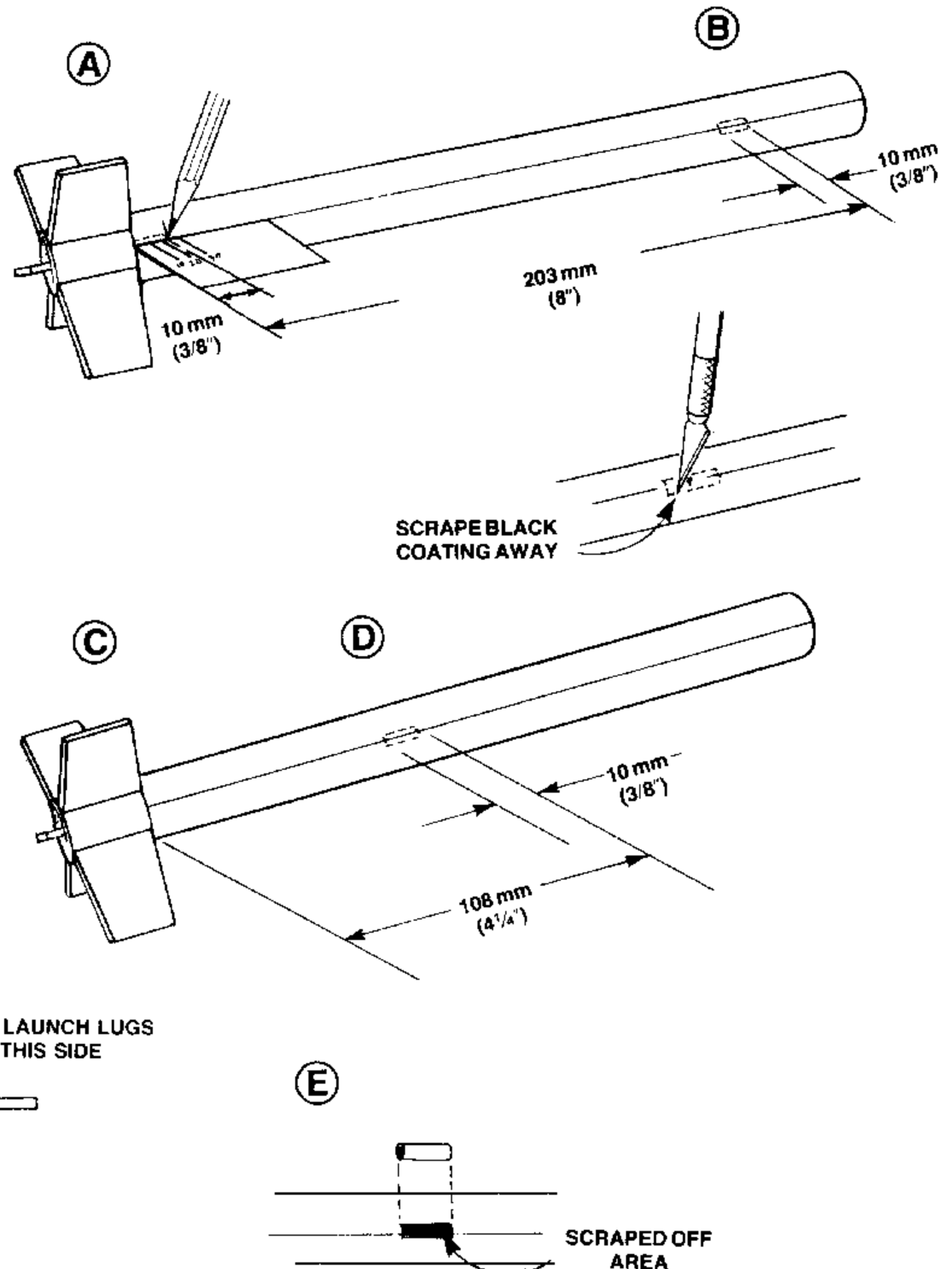
- A.** Measure approximately 13 mm (1/2") from one end of the body tube. This gives you an idea of where inside the tube you will be spreading glue for the next step.
- B.** Apply glue inside the end of body tube about 13 mm (1/2") from end. Align one of the lines on body tube with the engine hook and in one continuous motion, push the body tube over the adapter ring and plastic fin unit's shoulder until the body tube can go no further on the fin unit as shown.



8. LAUNCH LUG ATTACHMENT



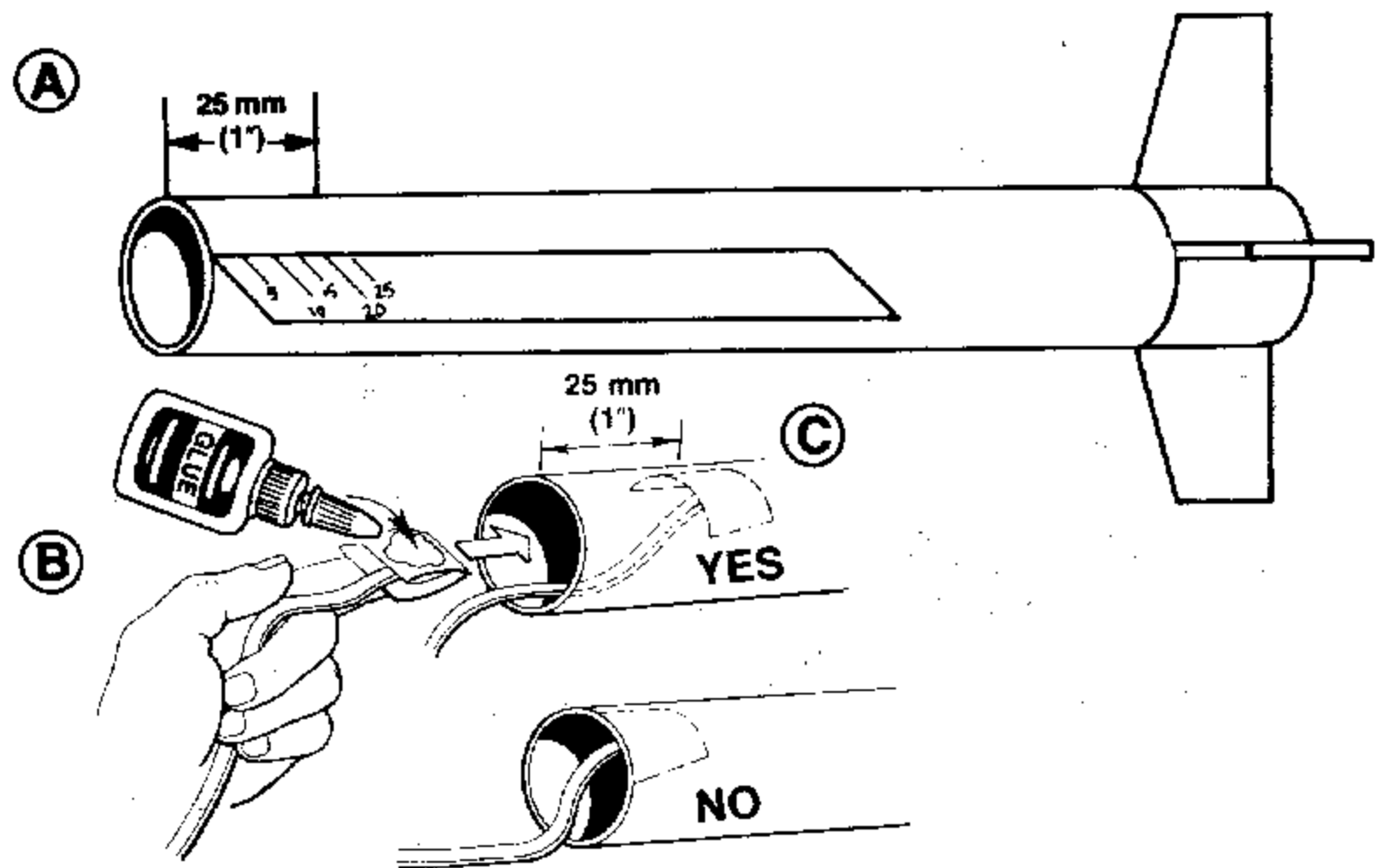
- A.** On alignment line aligned with engine hook, measure approximately 10 mm (3/8") from fin unit/body tube joint. Using your modeling knife, scrape off black coating on body tube from joint to 10 mm (3/8") mark as shown.
- B.** Measure 203 mm (8") up from fin unit/body tube joint on same alignment line. Scrape off black coating, in an area 3 mm (1/8") wide and 10 mm (3/8") long, from 203 mm (8") mark as shown.
- C.** Rotate body tube to other alignment line previously drawn in step D of launch lug alignment lines.
- D.** Measure 108 mm (4 1/4") up from fin unit/body tube joint. Again, scrape off black coating of body tube in an area 3 mm (1/8") wide by 10 mm (3/8") long.
- E.** Apply glue to each of the three launch lugs and attach them to the body tube in the scraped-off areas as shown. Sight along tube to be sure launch lugs are straight with body.
- F.** After glue is dry, erase any lines still showing on tube.



9. SHOCK CORD MOUNT ATTACHMENT



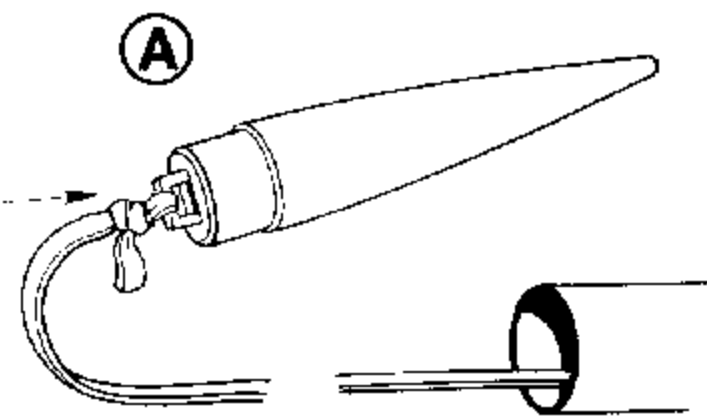
- A. Measure approximately 25 mm (1") from front end of body tube.
- B. Apply glue to shock cord mount and insert into tube.
- C. Set the mount back at least 25 mm (1") to allow for nose cone clearance and press mount firmly into glue as shown.
- D. Hold until glue sets.



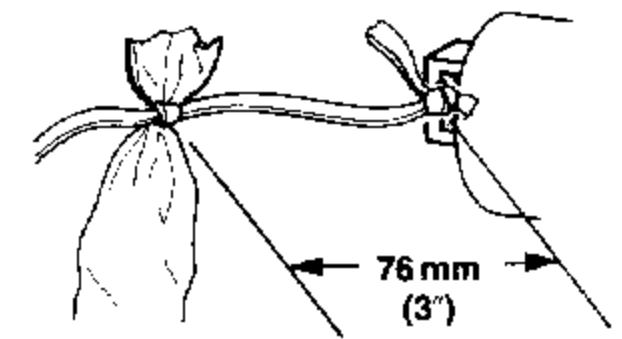
10. STREAMER AND SHOCK CORD ATTACHMENT TO NOSE CONE

- A. Tie shock cord to nose cone with a double knot.
- B. Tie one end of streamer to shock cord approximately 76 mm (3") from nose cone.

TIE SHOCK CORD TO NOSE CONE

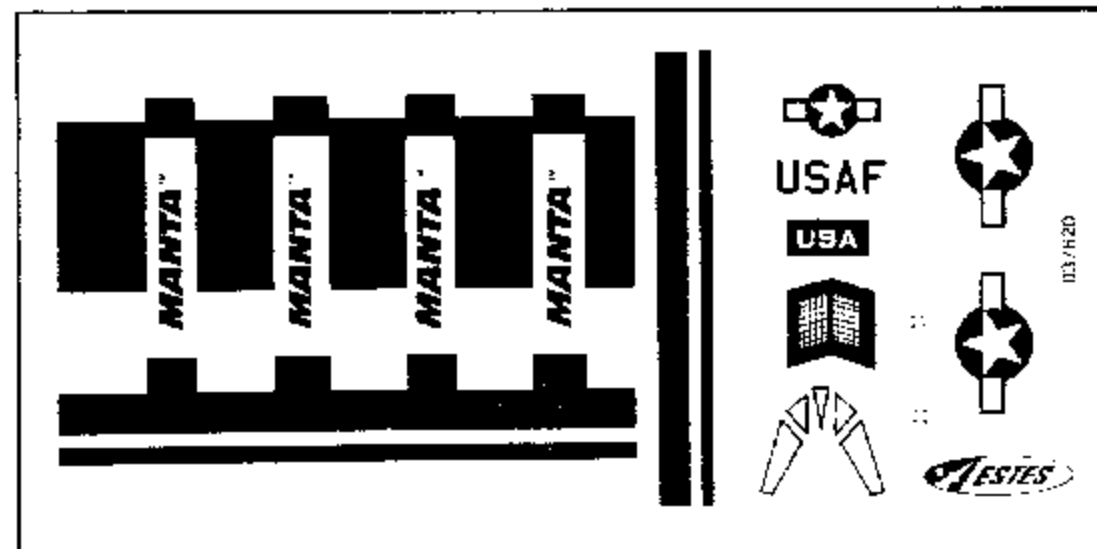


ATTACH STREAMER TO SHOCK CORD



11. FINISHING YOUR ROCKET

When all glue is completely dry, apply self-adhesive decals. Refer to the illustration on the front of the color panel on the box for decal placement.



WHAT TO EXPECT WHEN FLYING YOUR MANTA™

The Manta™ is a perfect beginner's rocket. The different engines that are suggested for this kit will give you a wide range of performances. This rocket should not be flown to great altitudes because there will be a greater chance of losing your glider. The A8-3 (recommended for the first flight) will put your rocket up to 76-91 meters (250-300 feet) and the B4-2 should give you about 180 meters (590 feet) of altitude. With a B6-2, you can expect nearly 185 meters (607 feet) of altitude. Remember to "size" your engine

for the fields you are flying in. "A" engines are ideal for baseball diamond sized fields whereas a larger engine may require an area twice the size of a football field. At apogee (the highest point of your rocket's flight), the glider will release and the streamer will eject. It is best to have a friend along when you launch this rocket so one can track the glider and one can track the rocket. Remember to fly only in light wind or no wind conditions. The wind could carry the glider away and it could be lost. Enjoy flying your Manta™.

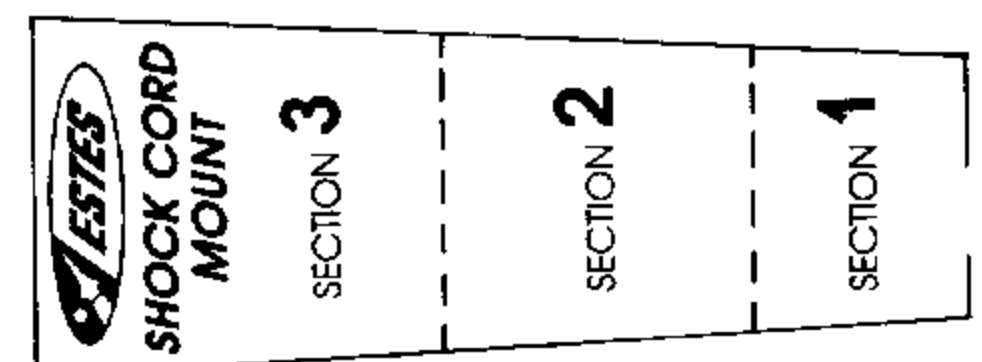
FOR YOUR SAFETY AND ENJOYMENT

Always follow the NAR* MODEL ROCKETRY SAFETY CODE while participating in any model rocketry activities.

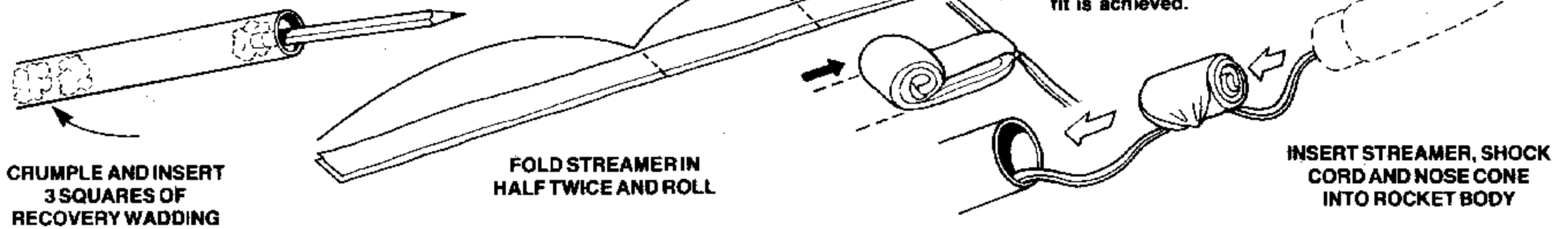
*National Association of Rocketry

If you use the Estes E2™ or Command Control™ Launch Controllers to fly your models, use the following launch steps.

- A. After attaching micro-clips, etc., insert the safety key into the controller receptacle. If the igniter clips have been attached properly to the igniter, the audio continuity indicator will beep on and off.
- B. Hold the yellow (left) arm button down. The audio indicator will produce a steady tone.
- C. Verbally count down from five to zero loud enough for the bystanders to hear. Still holding the yellow arm button down, push and hold the orange (right) button down until the rocket ignites and lifts off.

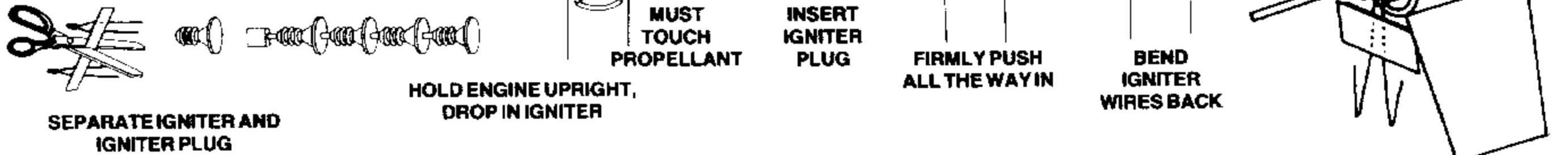


ROCKET PREFLIGHT



PREPARE ENGINE

NOTE: Igniter plugs come with rocket engines. If your engines did not come with plugs, follow the instructions that came with the engines.



LAUNCH SUPPLIES

To launch your rocket you will need the following items:

- Estes Electrical Launch Controller and Launch Pad
- Estes Recovery Wadding No. 2274
- Recommended Estes Engines: A8-3 (First Flight), B4-2, B6-2

To become familiar with your rocket's flight pattern, use an A8-3 engine for your first flight. Use only Estes products to launch this rocket.

FLYING YOUR ROCKET

Choose a large field away from power lines, tall trees, and low flying aircraft. Try to find a field at least 76 meters (250 feet) square. The larger the launch area, the better your chance of recovering your rocket. Football fields and playgrounds are great.

Launch area must be free of dry weeds and brown grass.

Launch only during calm weather with little or no wind and good visibility.

Don't leave streamer packed more than a minute or so before launch during cold weather [colder than 4° Celsius (40° Fahrenheit)].

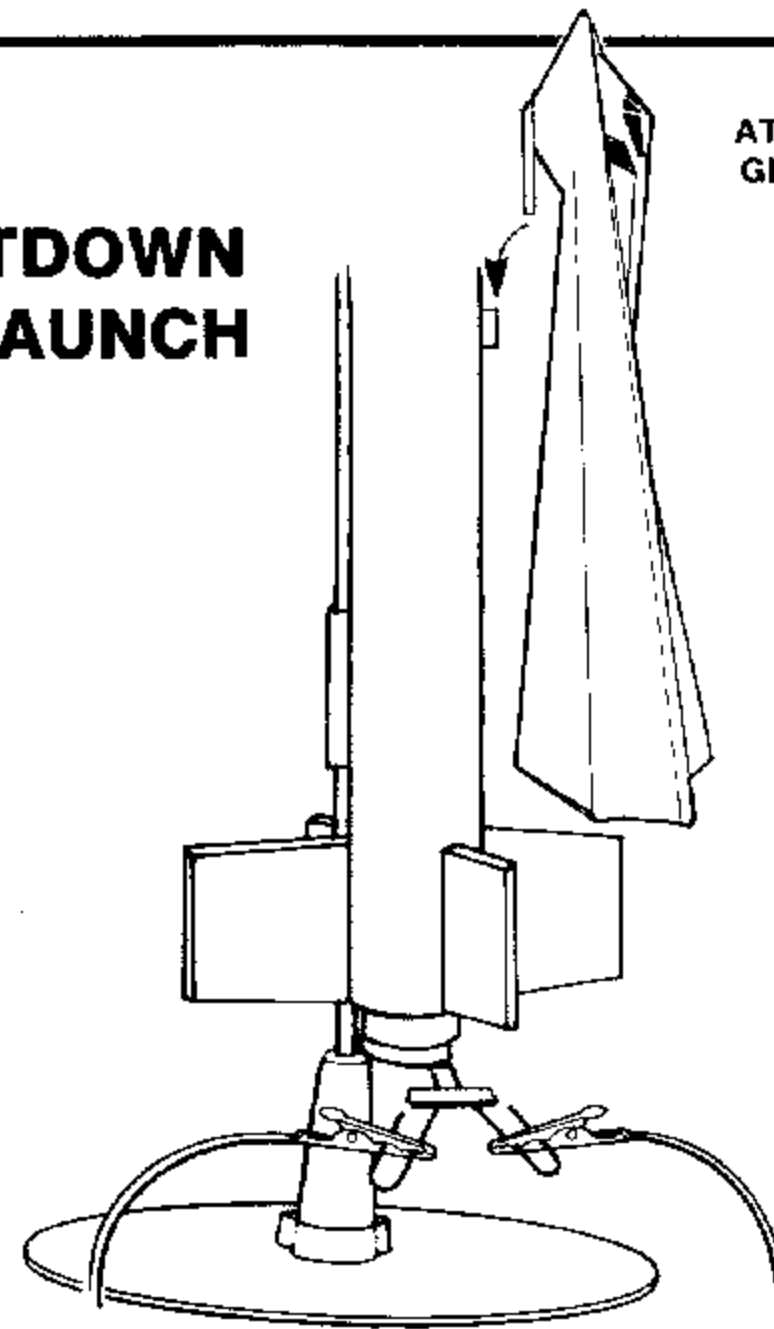
Streamer may be dusted with talcum powder to avoid sticking.

MISFIRES

If the igniter functions properly but the propellant does not ignite, keep in mind the following: An Estes igniter will function properly even if the coated tip is chipped. However, if the coated tip is not in direct contact with the engine propellant, it will only heat and not ignite the engine.

When an ignition failure occurs, remove the safety key from the launch control system and wait one minute before approaching the rocket. Remove the expended igniter from the engine and install a new one. Be certain the coated tip is in direct contact with the engine propellant, then reinstall the igniter plug as illustrated above. Repeat the countdown and launch procedure.

COUNTDOWN AND LAUNCH



SAFETY KEY MUST NOT BE IN LAUNCH CONTROLLER WHEN ATTACHING MICRO-CLIPS TO ENGINE IGNITERS

MICRO-CLIPS NOT TOUCH BLAST DEFLECTOR OR EACH OTHER

- ⑩ BE CERTAIN SAFETY KEY IS NOT IN LAUNCH CONTROLLER.
- ⑨ Remove safety cap and slide launch lug over launch rod to place rocket on launch pad. Hook glider on the launch lug. Make sure it is attached straight and parallel to the booster rocket. Make sure the rocket slides freely on the launch rod.
- ⑧ Attach micro-clips 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.
- ⑦ Move back from your rocket as far as launch wire will permit (at least 5 meters - 15 feet).
- ⑥ INSERT SAFETY KEY to arm the launch controller.

Give audible countdown 5...4...3...2...1

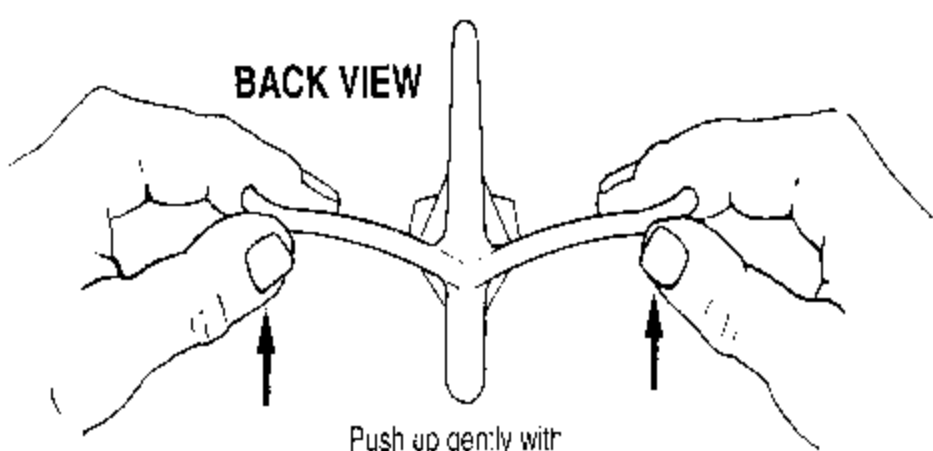
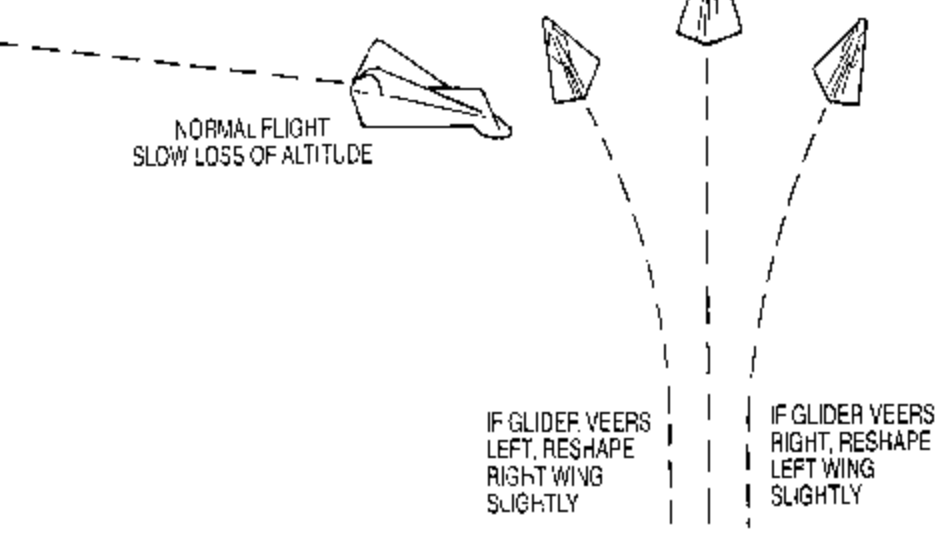
LAUNCH!!

PUSH AND HOLD LAUNCH BUTTON UNTIL ENGINE IGNITES

REMOVE SAFETY KEY FROM LAUNCH CONTROLLER. KEEP SAFETY KEY WITH YOU OR REPLACE SAFETY KEY AND SAFETY CAP ON LAUNCH ROD.

IMPORTANT: BEFORE EACH LAUNCH, ADJUST YOUR GLIDER'S FLIGHT TRIM

Hand toss your glider to check its flight path.



Push up gently with thumbs on tips of glider to reshape back of wing

Then hand toss and continue to adjust until flight path is straight and gentle, with a slow loss of altitude.

