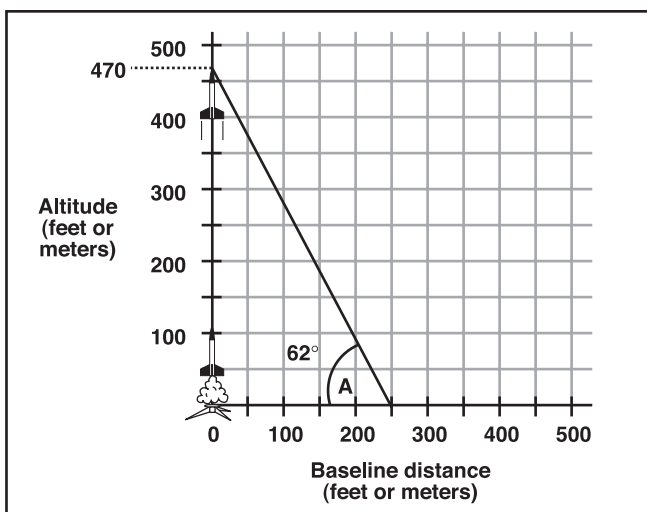
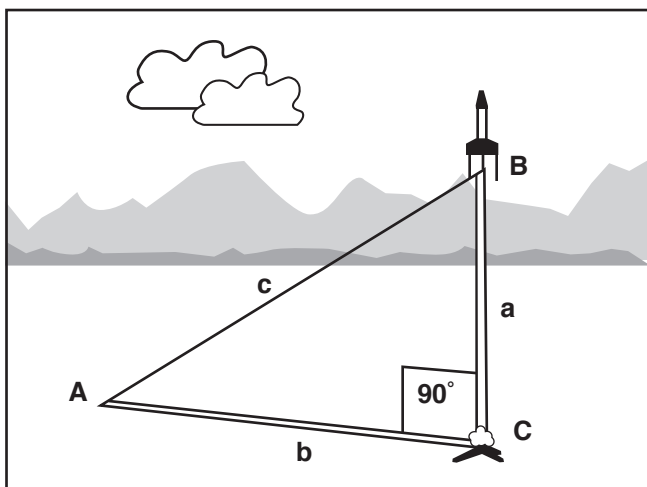


## SINGLE STATION TRACKING

1. In single station altitude tracking, make sure that the line from the tracking station to the launcher (Baseline Distance) is perpendicular to the direction of wind flow.
2. The angle of flight is assumed to be vertical.
3. The Altitrak™ Altitude Finder is locked at the rocket's maximum altitude (apogee), the elevation angle read, and the tangent of the angle found.
4. The tangent is multiplied times the Baseline Distance, giving the rocket's altitude.
5. To solve graphically, plot the Baseline Distance on the horizontal axis.
6. Using the same scale, mark the vertical axis for altitude.
7. Plot the elevation angle at the Baseline Distance and extend the line of sight to the vertical axis.
8. Read the rocket's altitude off the vertical scale at the point of intersection.

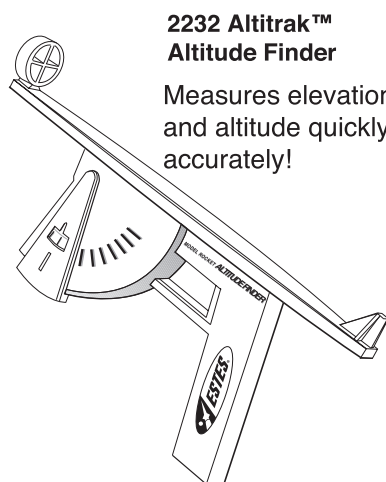
$$\text{Altitude} = b \times \tan \angle A$$



## SINES AND TANGENTS

∠	sin	tan	∠	sin	tan	∠	sin	tan
1	.02	.02	28	.47	.53	55	.82	1.43
2	.03	.03	29	.48	.55	56	.83	1.48
3	.05	.05	30	.50	.58	57	.84	1.54
4	.07	.07	31	.52	.60	58	.85	1.60
5	.09	.09	32	.53	.62	59	.86	1.66
6	.10	.11	33	.54	.65	60	.87	1.73
7	.12	.12	34	.56	.67	61	.87	1.80
8	.14	.14	35	.57	.70	62	.88	1.88
9	.16	.16	36	.59	.73	63	.89	1.96
10	.17	.18	37	.60	.75	64	.90	2.05
11	.19	.19	38	.62	.75	65	.91	2.14
12	.21	.21	39	.63	.81	66	.91	2.25
13	.22	.23	40	.64	.84	67	.92	2.36
14	.24	.25	41	.66	.87	68	.93	2.48
15	.26	.27	42	.67	.90	69	.93	2.61
16	.28	.29	43	.68	.93	70	.94	2.75
17	.29	.31	44	.69	.97	71	.95	2.90
18	.31	.32	45	.71	1.00	72	.95	3.08
19	.33	.34	46	.72	1.04	73	.96	3.27
20	.34	.36	47	.73	1.07	74	.96	3.49
21	.36	.38	48	.74	1.11	75	.97	3.73
22	.37	.40	49	.75	1.15	76	.97	4.01
23	.39	.42	50	.77	1.19	77	.97	4.33
24	.41	.45	51	.78	1.23	78	.98	4.70
25	.42	.47	52	.79	1.28	79	.98	5.14
26	.44	.49	53	.80	1.33	80	.98	5.67
27	.45	.51	54	.81	1.38			

For angles of 81° through 89°, the sine is .99, the sine of 90° is 1.00. Tangents over 80° are not given, as no sensible data reduction is possible for angles that great.



**2232 Altitrak™  
Altitude Finder**

Measures elevation angle and altitude quickly and accurately!



**2246 Altimeter™  
Altitude Finder**

Measures altitude when installed in model rocket!



estesrockets.com

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Penrose, CO 81240-9698

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PN 084829 (7-18)



# TECH-PAK™

## Scratch Build Rocket Kit

Designed for Industrial

Technology Classes

- Make your own body tube
- Flies over 1000 feet (305 m)!

Length: 15.1 in. (38.4 cm)

Diameter: 0.98 in. (25 mm)

Weight: 1.0 oz. (28.1 g)

Recommended Engines:

A8 - 3 (first flight),

1/2 A6 - 2, B4 - 4,

B6 - 4, B6 - 6,

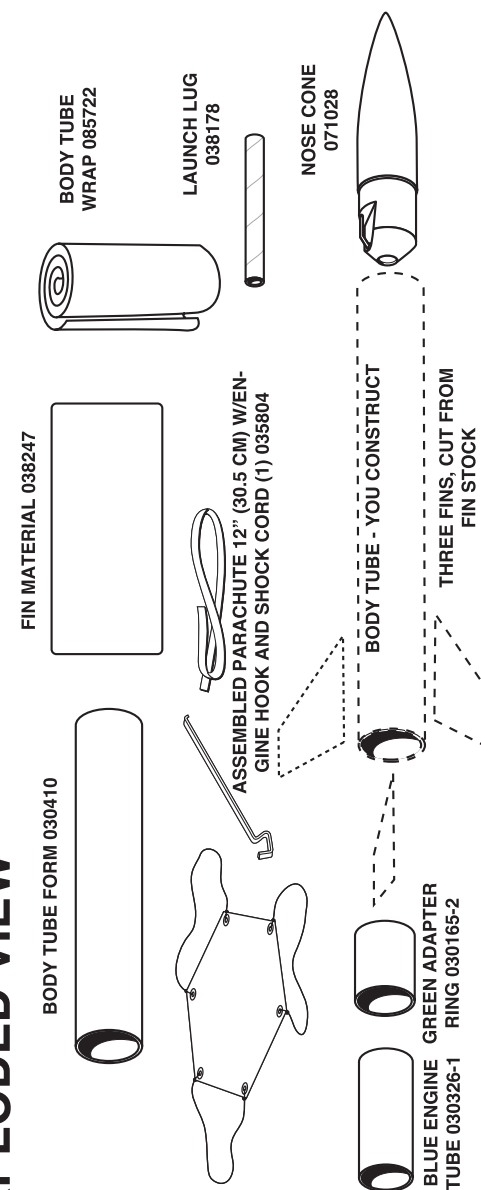
C6 - 5, C6 - 7



**READ ALL INSTRUCTIONS BEFORE STARTING WORK ON THIS ROCKET.** (Make a copy if you want to keep instruction)

- Read each step first and visualize the procedure thoroughly in your mind before starting construction.
- Lay the parts out on the table in front of you. (Check inside tubes for any small parts.)
- Use exploded view to match all parts contained in kit.
- Collect all construction supplies that are included in this kit.
- Test fit parts before applying any glue.
- Sand parts as necessary for proper fit.
- The construction supplies required for each step are listed at the beginning of each step.
- Check off each step as you complete it.

## EXPLODED VIEW



**EXTREMELY IMPORTANT: THE EXPLODED VIEW IS FOR REFERENCE ONLY! DO NOT USE THIS DRAWING TO ASSEMBLE THIS ROCKET.**

The exploded view is only intended to assist you in locating the parts included in this kit. Refer back to this exploded view 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.

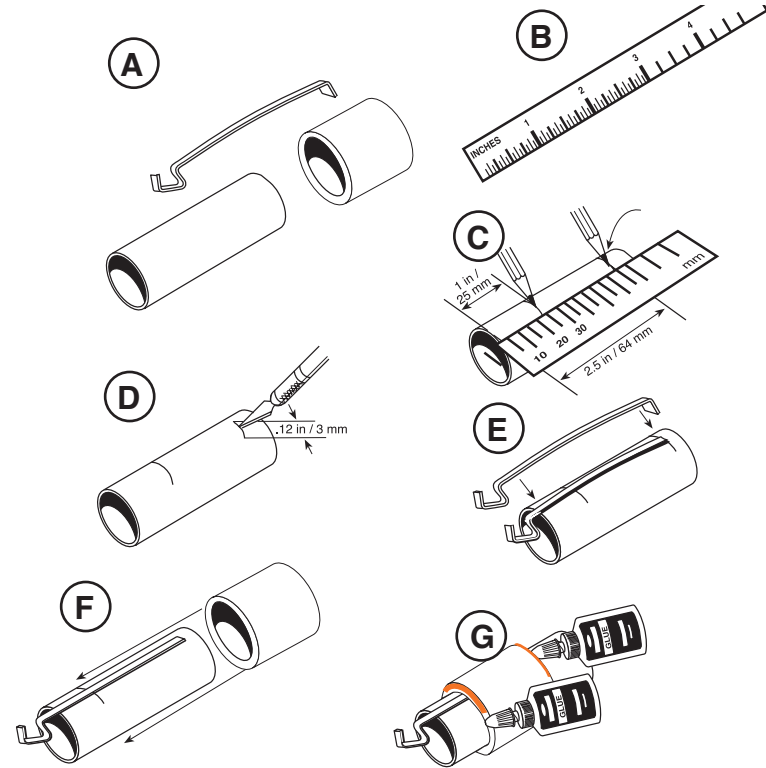


**GLUE IS APPLIED TO SURFACES SHOWN IN ORANGE.**

### 1. ASSEMBLE ENGINE MOUNT



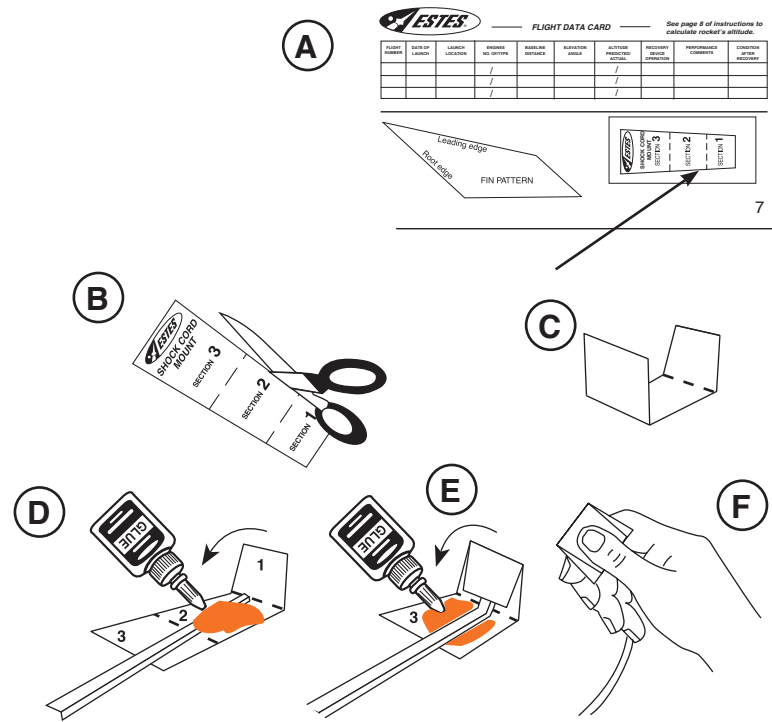
- You will need the light blue engine tube, engine hook and the green adapter ring.
- Locate the ruler printed on page 8.
- Take your pencil and place a mark on the engine tube 1" (25 mm) from one end. Make another mark a 2 1/2" (64 mm).
- Cut a 1/8" (3 mm) wide slit as shown at the 2 1/2" (64 mm) mark only.
- Insert the engine hook into the slit as shown. The engine hook should extend beyond the rear of the engine tube.
- Test fit the green adapter ring by sliding onto the front of the light blue engine tube. Slide the ring over the engine hook and up to the 1" (25 mm) mark you made in step C.
- Once the ring is in place, apply glue to both sides of the ring. Set assembly aside and allow to dry.



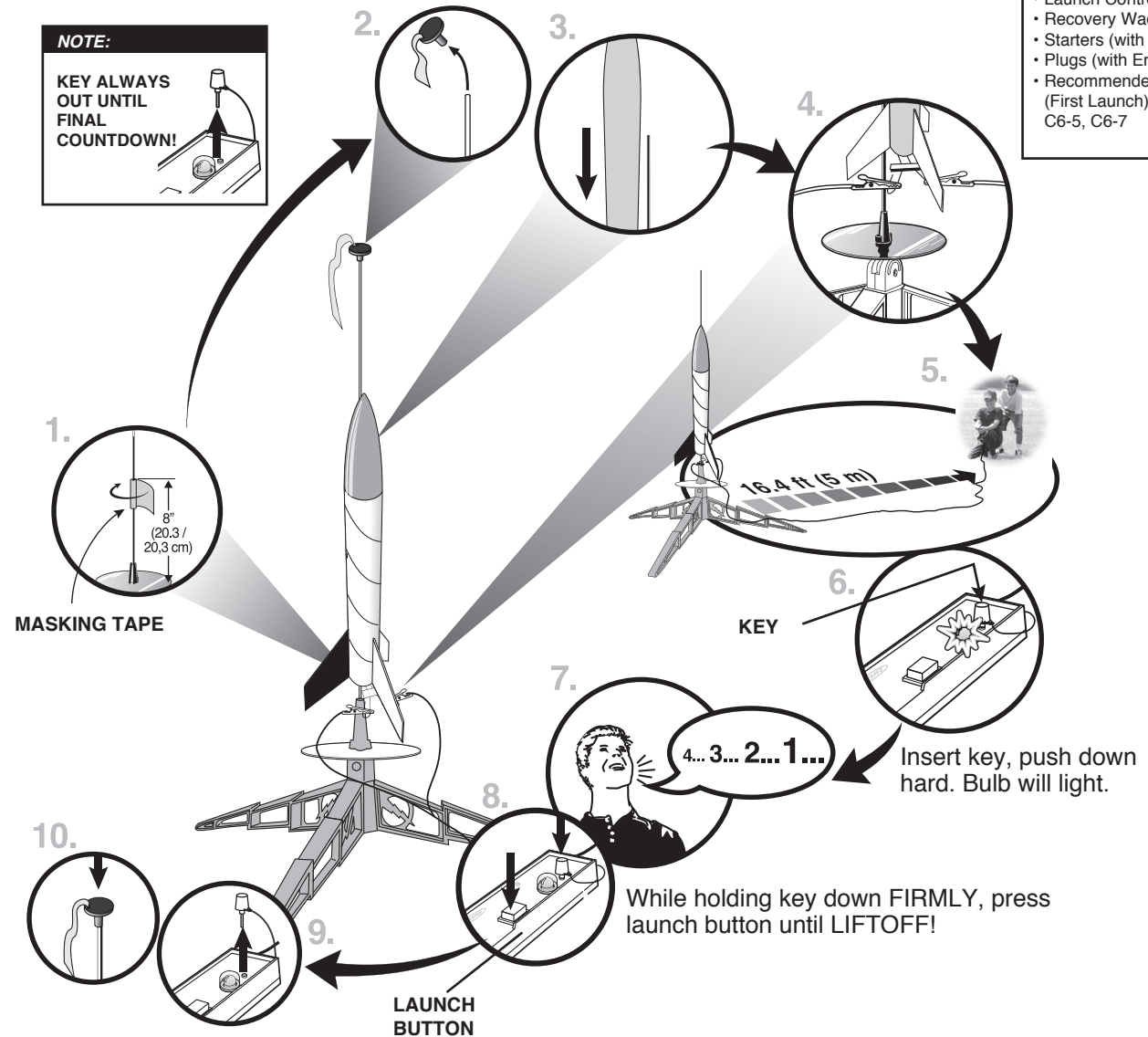
### 2. ASSEMBLE SHOCK CORD MOUNT



- Locate the shock cord mount at the bottom of page 7.
- Cut out the shock cord mount along the solid black outline.
- Crease on dotted lines by folding.
- Spread glue on section 2 and lay end of shock cord into glue at a slight diagonal as shown.
- Fold section 1 forward. Apply glue to section 3. Fold forward again.
- Clamp firmly with your fingers to squeeze out trapped air and excess glue. Let dry.



## COUNTDOWN AND LAUNCH



### LAUNCH SUPPLIES (Sold Separately)

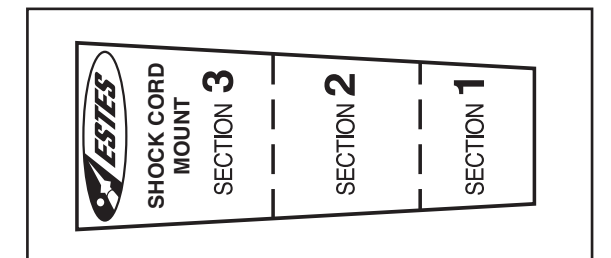
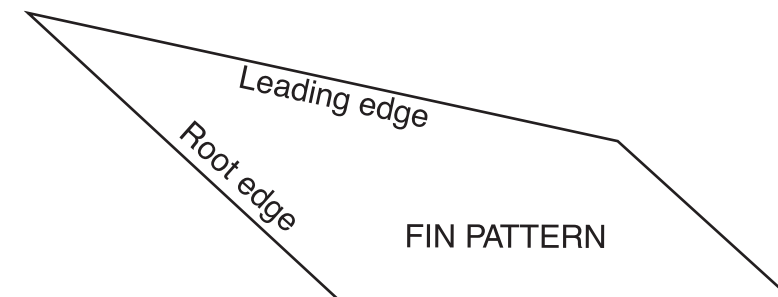
- Launch Pad
- Launch Controller
- Recovery Wadding
- Starters (with Engines)
- Plugs (with Engines)
- Recommended Estes® Engine: A8-3 (First Launch), 1/2A6-2, B4-4, B6-4, B6-6, C6-5, C6-7



### FLIGHT DATA CARD

See page 8 of instructions to calculate rocket's altitude.

FLIGHT NUMBER	DATE OF LAUNCH	LAUNCH LOCATION	ENGINES NO. OF / TYPE	BASELINE DISTANCE	ELEVATION ANGLE	ALTITUDE PREDICTED / ACTUAL	RECOVERY DEVICE OPERATION	PERFORMANCE COMMENTS	CONDITION AFTER RECOVERY
			/			/			
			/			/			
			/			/			



(Make a copy if you want to keep instructions)

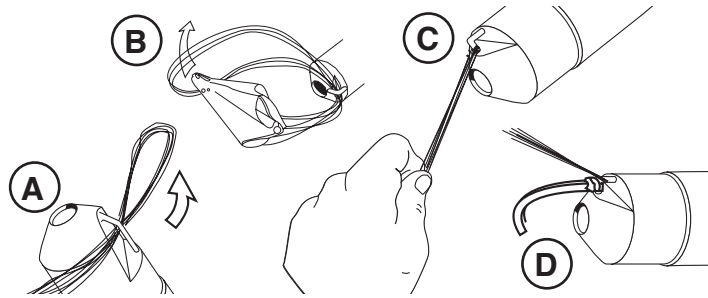


## 11. ATTACH PARACHUTE AND SHOCK CORD TO NOSE CONE



**NOTE:** The plastic loop on the nose cone may need to be cleaned out with a hobby knife. Do not cut off eyelet.

- A.  Thread shroud lines through eyelet on nose cone.
- B.  Pass parachute back through loop of shroud lines as shown.
- C.  Pull lines tight.
- B.  Tie free end of shock cord to nose cone. Use a double knot.



## PREPARE FLIGHT RECOVERY

**A** SPIKE. **B** FOLD PARACHUTE. **C** FOLD. **D** ROLL. **E** WRAP SHROUD LINES LOOSELY AROUND PARACHUTE. INSERT SHOCK CORD THEN PARACHUTE INTO ROCKET.

CRUMPLE AND INSERT 3 SQUARES OF RECOVERY WADDING.

Recovery device should slide easily into body tube. If too tight, unfold and repack.

**NOTE:** Parachute may be dusted with talcum powder to prevent sticking.

INSTALL NOSE CONE.

**NOTE:** Only Estes® Recovery Wadding recommended.

## PREPARE ENGINE

**A** USE ONE EACH. **B** HOLD ENGINE UPRIGHT, DROP IN STARTER. **C** INSERT PLUG. **D** FIRMLY PUSH ALL THE WAY IN. **E** BEND STARTER WIRES BACK. **F** INSERT ENGINE INTO ROCKET.

STARTER MUST TOUCH PROPELLANT.

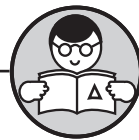
## WHAT TO EXPECT WHEN FLYING YOUR TECH-PAK™ ROCKET

The aerodynamically sleek Tech-Pak™ with swept fins and parachute recovery is perfect for launching any time. With an Estes® A8-3, the Tech-Pak™ will soar to nearly 300 ft (91 m). With an Estes® C6-7, the Tech-Pak™ altitude will almost quadruple! Don't launch this with a "C" engine on a breezy day or it will drift away.

Watch for the brightly colored parachute as it's ejected at apogee (the highest point in the rocket's flight). The parachute will also help you find the rocket once it has landed.

## PRECAUTIONS

NAR Safety Code



## PRE-LAUNCH CHECK

For safety, never launch a damaged rocket. Check the rocket's body, nose cone and fins. Also, check the engine mount, recovery system and launch lug(s). Repair any damage before launching the rocket.

## FLYING YOUR ROCKET

Choose a large field (500 ft [152 m] square) free of dry weeds and brown grass. The larger the launch area, the better your chance of recovering your rocket. Football fields and playgrounds are great. Launch only with little or no wind and good visibility. Always follow the National Association of Rocketry (NAR) SAFETY CODE.

## MISFIRES

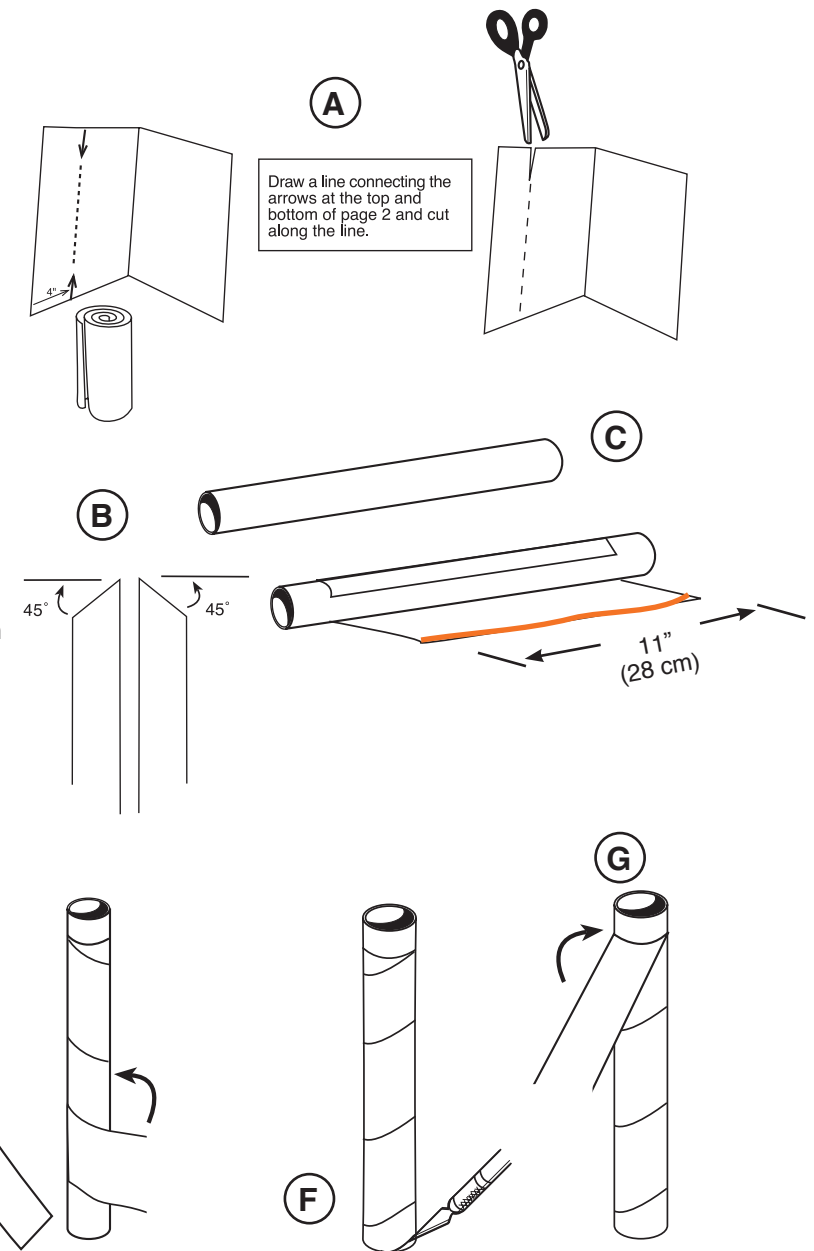
TAKE THE KEY OUT OF THE CONTROLLER. WAIT ONE MINUTE BEFORE GOING NEAR THE ROCKET! Disconnect the starter clips and remove the engine. Take the plug and starter out of the engine. If the starter has burned, it worked but did not ignite the engine because it was not touching the propellant inside the engine. Put a new starter all the way inside the engine without bending it. Push the plug in place. Repeat the steps under Countdown and Launch.



## 3. CONSTRUCT BODY TUBE



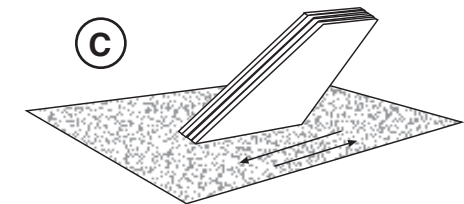
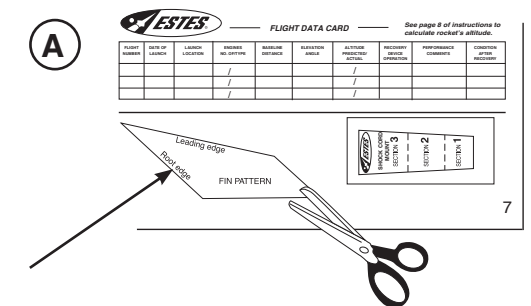
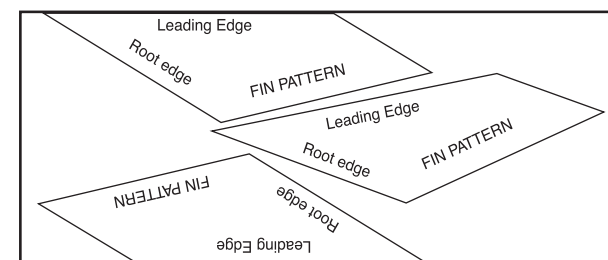
- A.  You will need the body tube wrap, body tube form and a 4" x 11" (10.2 x 28 cm) piece of paper cut from page 2 of the instructions. **(Make a copy if you want to keep instructions)**
- B.  Divide the body tube wrap into two equal lengths and cut one end of each piece at opposing 45° angles as shown.
- C.  Tightly wrap the 4" x 11" (10.2 x 28 cm) paper around the body tube form. Apply a thin bead of glue as shown. Continue wrapping and seal.
- \* Be careful not to glue the paper wrap to the body tube form. Remove excess glue immediately.
- D.  Slide the paper wrap to one end of the body tube form.
- E.  Moisten the gummed side of one body wrap with a damp sponge. Apply over the paper wrap as shown with a spiraling pattern. **Do not glue to the body tube form.**
- F.  Trim excess paper off the bottom end.
- G.  Repeat steps E and F, but **winding in the opposite direction**. Let dry.



## 4. PREPARE FINs



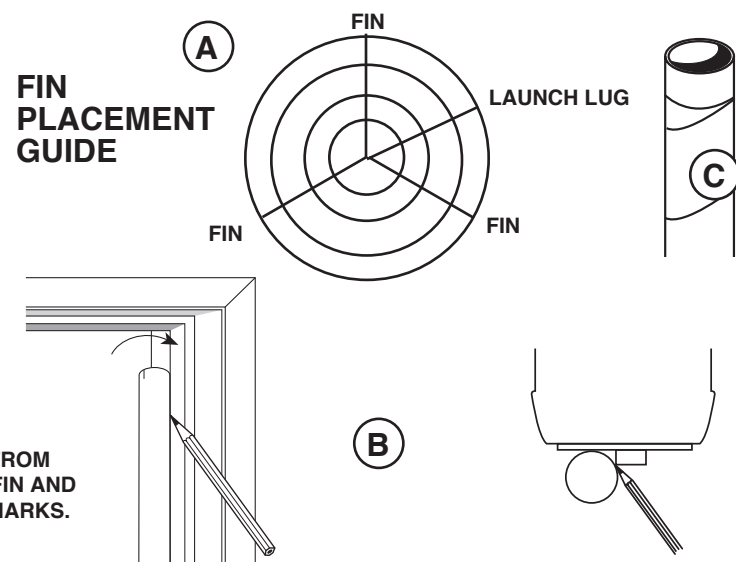
- A.  Cut out the fin pattern on page 7.
- B.  Trace the pattern onto the fin material to make three fins. Cut the fins out.
- C.  Stack all three fins together and lightly sand the root edges smooth.



## 5. MARK TUBE



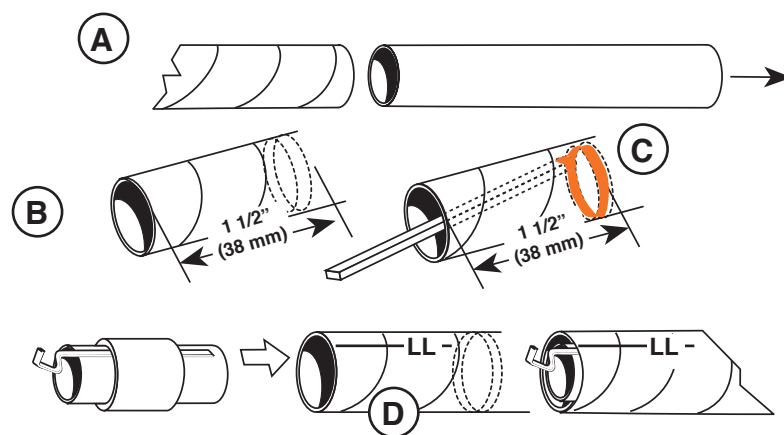
- Center the body tube on the Fin Placement Guide and mark the location for the three fins and launch lug on the body tube. Label the launch lug mark with "LL".
- Using a door frame as a straight edge, draw 4 straight lines; 3" (76 mm) long for each fin mark and 6" (152 mm) long for the launch lug mark.



## 6. INSTALL ENGINE MOUNT



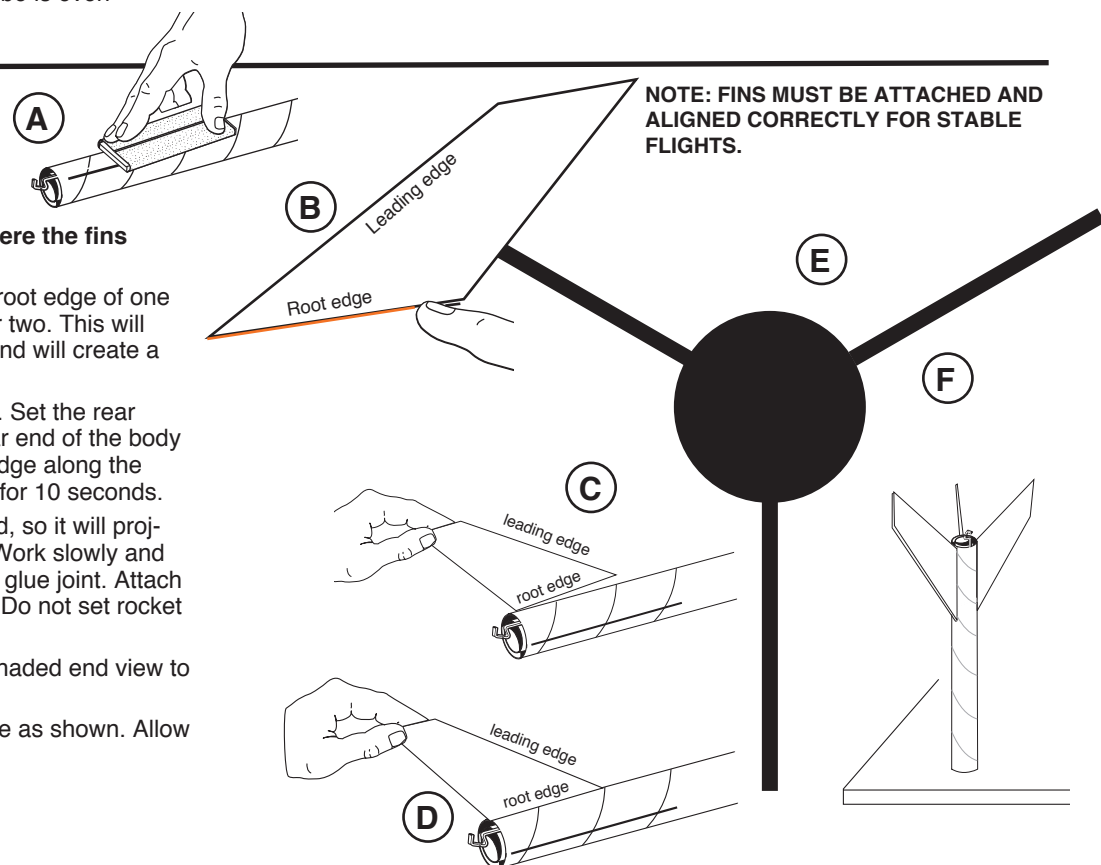
- Slide the body tube form out of the body tube.
- Measure and mark approximately 1 1/2" (38 mm) from the fin marked end of the body tube. This gives you an idea of where inside the tube you will be spreading glue.
- Using a scrap piece of fin material, spread a thick ring of glue around the inside of the tube at approximately 1 1/2" (38 mm) from the end.
- With the engine hook aligned with the launch lug line mark, push the front of the engine lug mount assembly into the end of the body tube until the engine tube is even with the end of the body tube.



## 7. ATTACH FINS



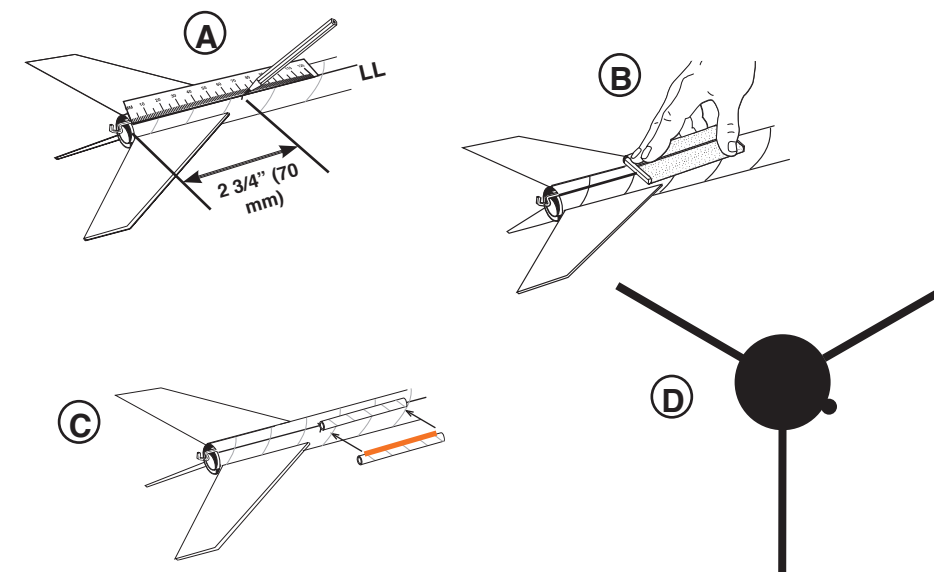
- Sand the body tube lightly where the fins need to be placed.
- Apply a thin layer of glue to the root edge of one fin. Allow it to dry for a minute or two. This will make it easier to attach the fin and will create a stronger bond.
- Apply more glue to the same fin. Set the rear edge of the fin even with the rear end of the body tube and gently press the root edge along the body tube fin line. Hold in place for 10 seconds.
- Carefully adjust the fin, if needed, so it will project straight up from body tube. Work slowly and carefully so as not to disturb the glue joint. Attach remaining fins in same manner. Do not set rocket on fins while glue is wet.
- After all fins are attached, use shaded end view to check proper fin spacing.
- Important:** Stand rocket on table as shown. Allow fins to dry.



## 8. LAUNCH LUG ATTACHMENT



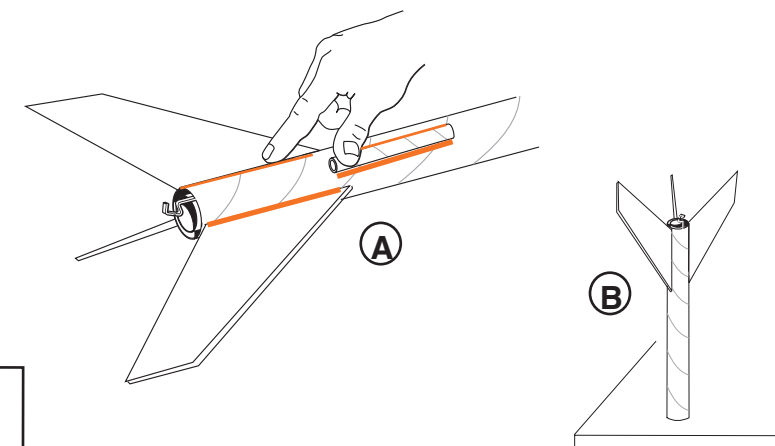
- Measure 2 3/4" (70 mm) from rear of body tube and place a mark on the launch lug (LL) reference line. Use this mark as a starting point to attach the launch lug.
- Sand the body tube lightly where the launch lug will be placed.
- Apply glue to the launch lug and attach it to the body tube.
- Make sure the launch lug is aligned parallel to the body tube as shown in the end view. Allow to dry.



## 9. GLUE REINFORCEMENT DETAIL



- Reinforce each fin/body tube joint and each side of launch lug with glue as shown. Use your finger to help smooth the glue fillet.
- Stand rocket on table as shown. Wipe away any excess glue that may run down the side of the body tube. Allow to dry.



**NOTE:** Glue joint reinforcements or fillets are important because they help blend the fins, launch lugs or other components into the body tube. This blending improves the looks of your model, allows smoother air flow over your rocket during flight and strengthens the attachment points.

## 10. SHOCK CORD MOUNT ATTACHMENT



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

