ESTES
A SUBSIDIARY OF DAMON

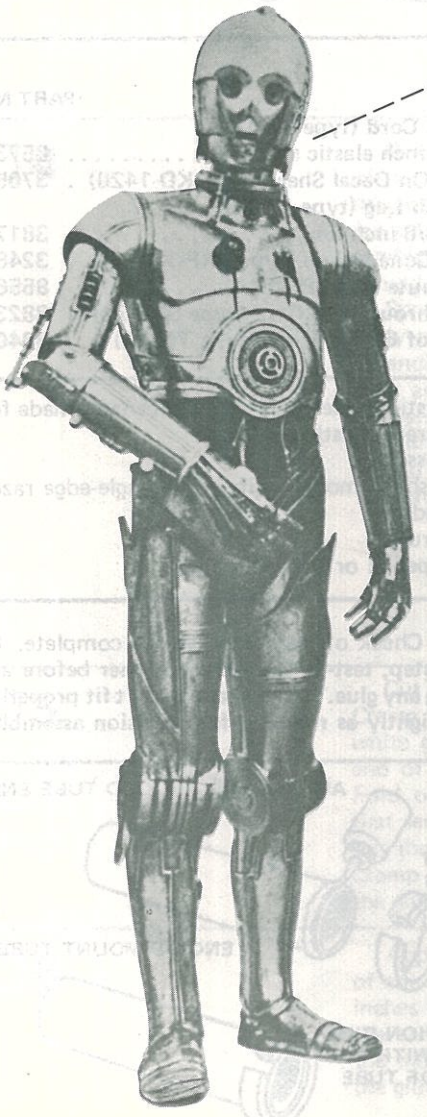
#1420

STAR WARS T.M.

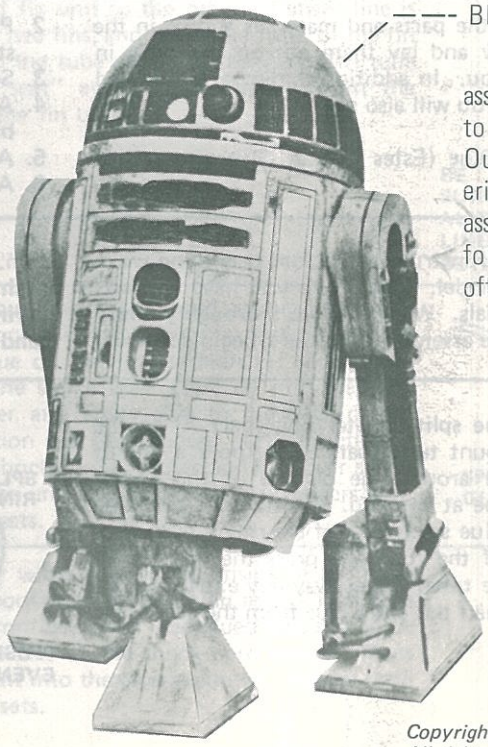
Proton Torpedo

Flying Model Rocketry Outfit

Model Rocketry is recommended for ages 10 to adult. Adult supervision is suggested for those under 12 years of age when flying model rockets.



My counterpart here, R2-D2, requests that I welcome you to the exciting world of STAR WARS Model Rocketry. Your Proton Torpedo is a flying model of the missile used by Luke Skywalker and the rebel forces to destroy the Imperial Death Star battle station. Your Proton Torpedo Rocketry Outfit is designed to give you many enjoyable launchings and to provide you with the necessary equipment to launch other Estes rocket kits as well as rocket designs of your very own. Oh my, you humans do have all the fun!

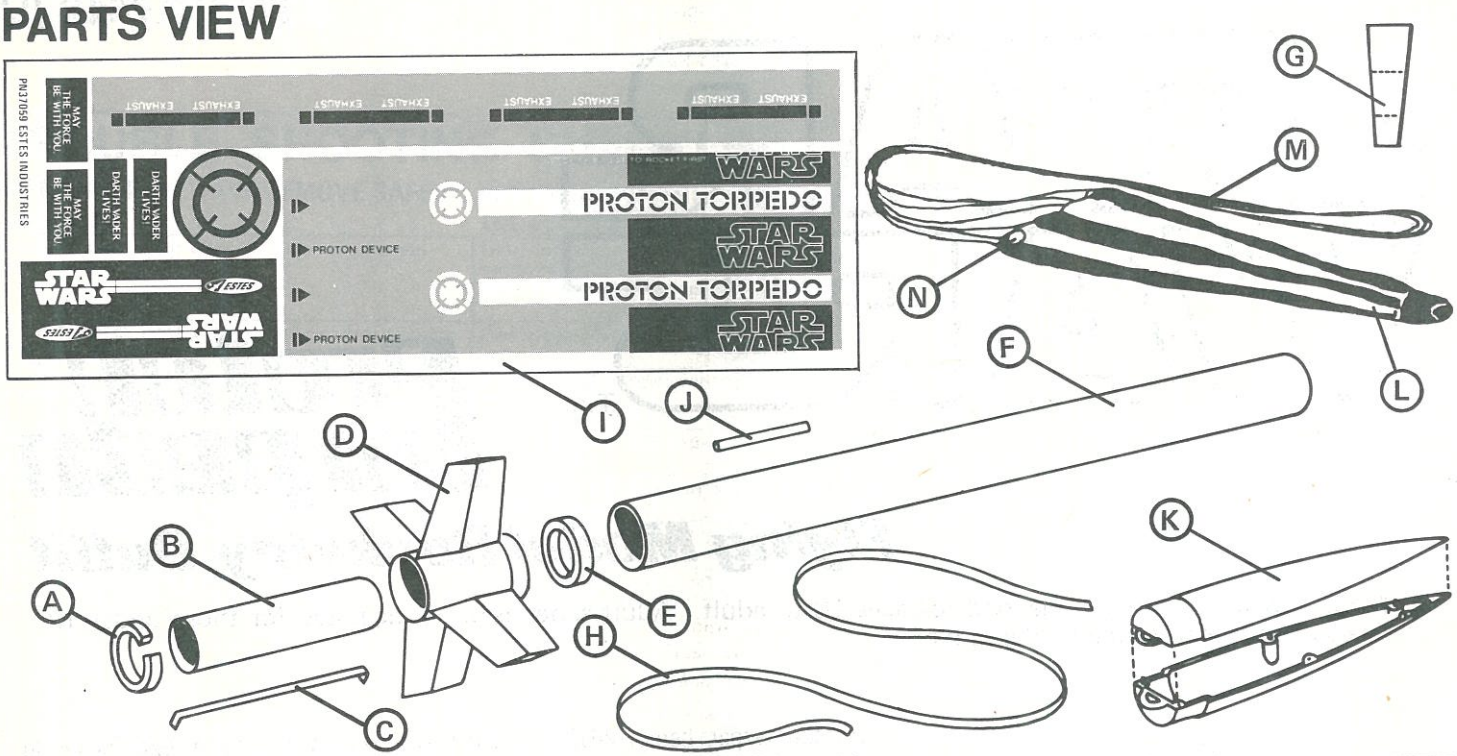


—— BLEEP - BLEEP - BEEP BEEP!

Translated: IMPORTANT! Read the assembly instructions carefully before beginning to put together your Proton Torpedo Rocketry Outfit. Make sure you have all parts and materials before you start construction. As you assemble your rocket and launch equipment follow the instructions in exact order. Check off each step as you complete it.

And may the Force be with you!

PROTON TORPEDO PARTS VIEW



PARTS LIST

			PART NO.
A)	1	Split Adapter Ring (type AR-2050S)	80425
B)	1	Engine Mount Tube (type BT-20J) 2-3/4 inches long	30326
C)	1	Engine Hook (type EH-2)	35025
D)	1	Plastic Fin Unit (type PRP-1G)	32486
E)	1	Adapter Ring (type AR-2050)	30164
F)	1	Body Tube (type WBT-50W) 9-1/2 inches long	30373
G)	1	Shock Cord Mount (type SCM-50)	84444
H)	1	Shock Cord (type SC-1) 18 inch elastic strip	85730
I)	1	Stick-On Decal Sheet (type KD-1420)	37059
J)	1	Launch Lug (type LL-2B) 2-3/8 inch long	38178
K)	2	Nose Cone Halves (type PRP-1H)	32487
L)	1	Parachute (type PK-12A)	85564
M)	1	72" Shroud Line Cord (type SLT-72)	38237
N)	1	Strip of 6 Tape Discs (type TD-3F)	38406

TOOLS AND MATERIALS

Locate the parts and materials shown in the Parts View and lay them out on the table in front of you. In addition to the parts included in the kit you will also need:

1. White Glue (Estes Rocket Glue, Elmers, or similar).
2. Plastic Model Cement (Use cement made for styrene plastic models.).
3. Scissors.
4. A sharp model knife, or a single-edge razor blade.
5. A ruler.
6. A pencil or ball point pen.

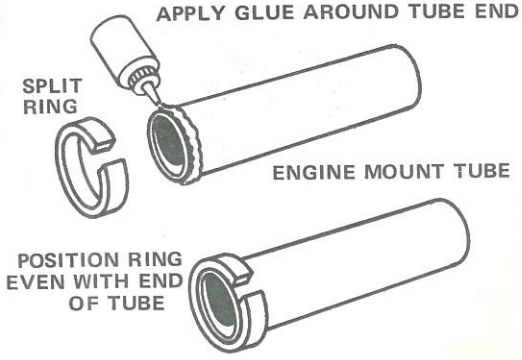
IMPORTANT ASSEMBLY TIPS

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. **In each step, test-fit the parts together before applying any glue. If some part doesn't fit properly, sand lightly as required for precision assembly.**

ROCKET ASSEMBLY

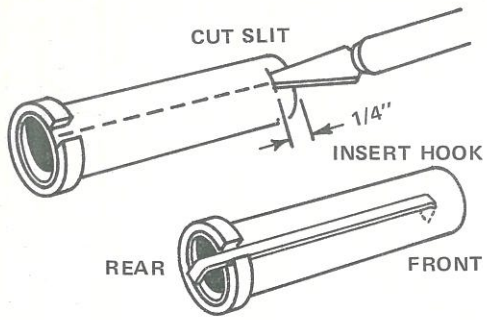
☐ 1

Glue the split adapter ring (part A) to the engine mount tube (part B). Apply a line of white glue around the outside of the engine mount tube at one end. Position the split ring over the glue so the end of the ring is even with the end of the tube and press the ring snugly around the tube. Wipe away any extra glue. Be sure to clean the extra glue from the gap in the ring.



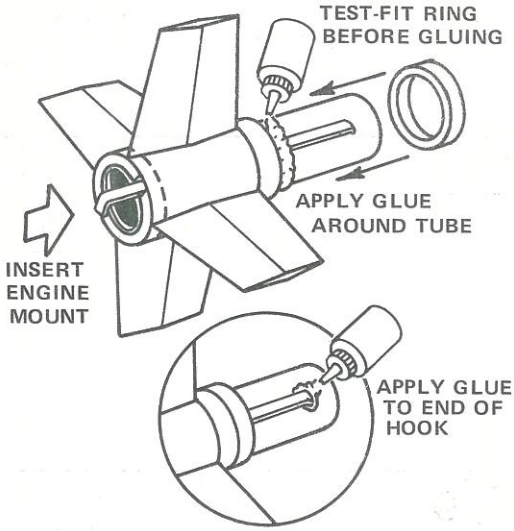
☐ 2

Mark the engine mount tube 1/4 inch from the end opposite the ring and on a straight line from the gap in the split ring. Use a sharp knife to cut a 1/8 inch long slit in the tube at the mark as shown. Make sure the slit is in line with the gap. Push one end of the engine hook (part C) into the slit and position the hook so it runs through the gap in the ring.



☐ 3

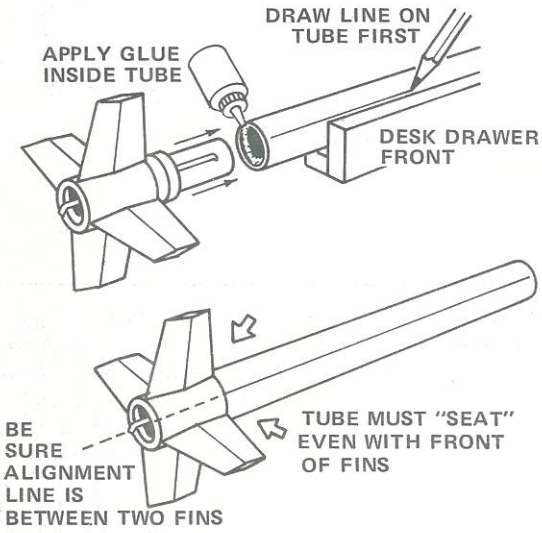
Slide the assembly from step 2 into the plastic fin unit (part D) from the rear. The split adapter ring should fit completely into the fin unit. Test-fit the other adapter ring (part E) onto the engine mount tube and over the engine hook. If necessary, sand the inside of the ring until it slides smoothly over the tube and hook. Apply a line of white glue around the engine tube 1/4 inch ahead of the front of the fin unit. Slide the ring onto the engine tube, over the hook, and back tightly against the fin unit. Do not pause while installing the ring or the glue may "grab" with the ring in the wrong place. Apply a drop of white glue to seal the front of the hook in the slit.



☐ 4

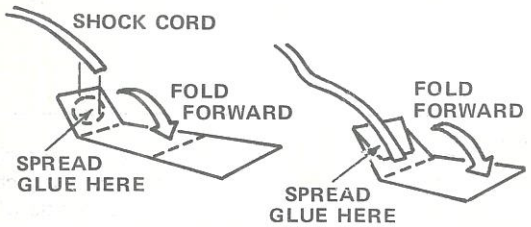
Draw a straight line along the entire length of the body tube (part F). The edge of a desk drawer or a door frame makes a suitable guide for drawing the line. Test fit the fin unit assembly in the body tube end. The adapter ring should fit smoothly into the tube.

Spread white glue around the inside of either body tube end. The glue should cover an area extending 1/2 inch into the tube. Line up the tube and fin unit so the tube alignment line is between two fins, and insert the front of the fin unit into the tube end with the glue. The tube should "seat" evenly and tightly against the fins on the fin unit.



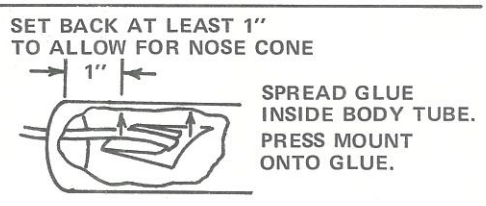
☐ 5

Cut out the shock cord mount (part G). Crease it on the dotted lines by folding. Spread white glue on the first section (1) and lay the end of the shock cord (part H) 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.



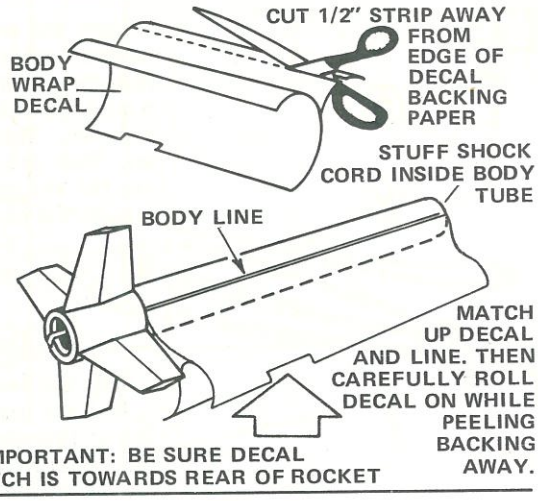
☐ 6

Apply white glue to the inside of the front of the body tube to cover an area 1 inch to 2 inches from the end. The glued area should be the same size as the shock cord mount. Press the mount into the glue as shown. Hold it until the glue sets.



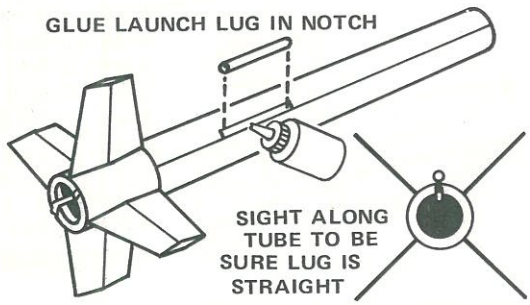
☐ 7

Cut out the large body wrap decal from the decal sheet (part I). Cut just outside the pre-cut lines on the sheet. Peel away and discard the excess decal paper from around the body wrap. Peel the backing sheet from the long straight edge of the decal and cut off a strip 1/2 inch wide from the backing sheet. Starting at the rear of the body tube, place the decal edge carefully against the alignment line and smooth into place. **Be sure that the pre-cut notch in the decal is towards the rear of the rocket.** Slowly peel away the backing sheet and wrap the decal around the body tube, smoothing out any bubbles or wrinkles as you go.



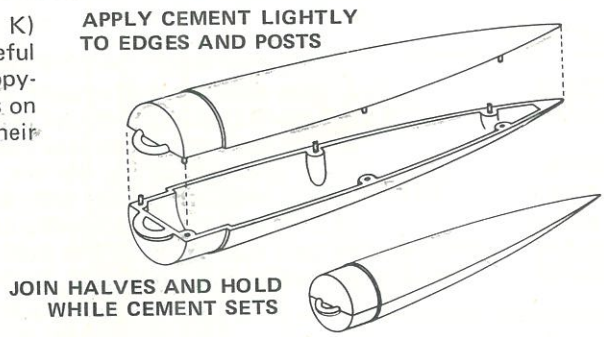
☐ 8

Glue the launch lug (part J) to the body tube in the bare slot left by the notch in the decal. (Use white glue.) Sight along the tube to be sure the launch lug is straight on the body.



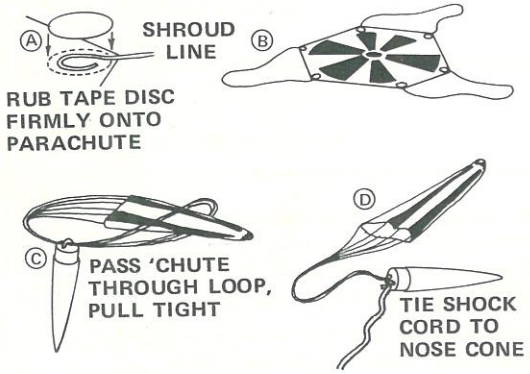
☐ 9

Cement the two nose cone halves (part K) together using plastic model cement. Be careful to not use too much or you will have a sloppy-looping joint. Make sure the alignment pins on the inside of the cone fit completely into their matching holes.



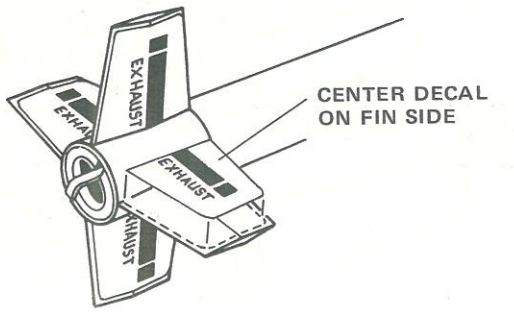
☐ 10

Cut out the parachute (part L) on its edge lines. Cut three 24 inch lengths of shroud line (part M). Attach line ends to the top of the parachute with tape discs (part N) as shown. Pass the parachute through the ring at the rear of the nose cone. Pass the parachute through the loop ends and draw lines tight against the ring. Set the knot with a drop of white glue. Tie the free end of the shock cord to the ring.

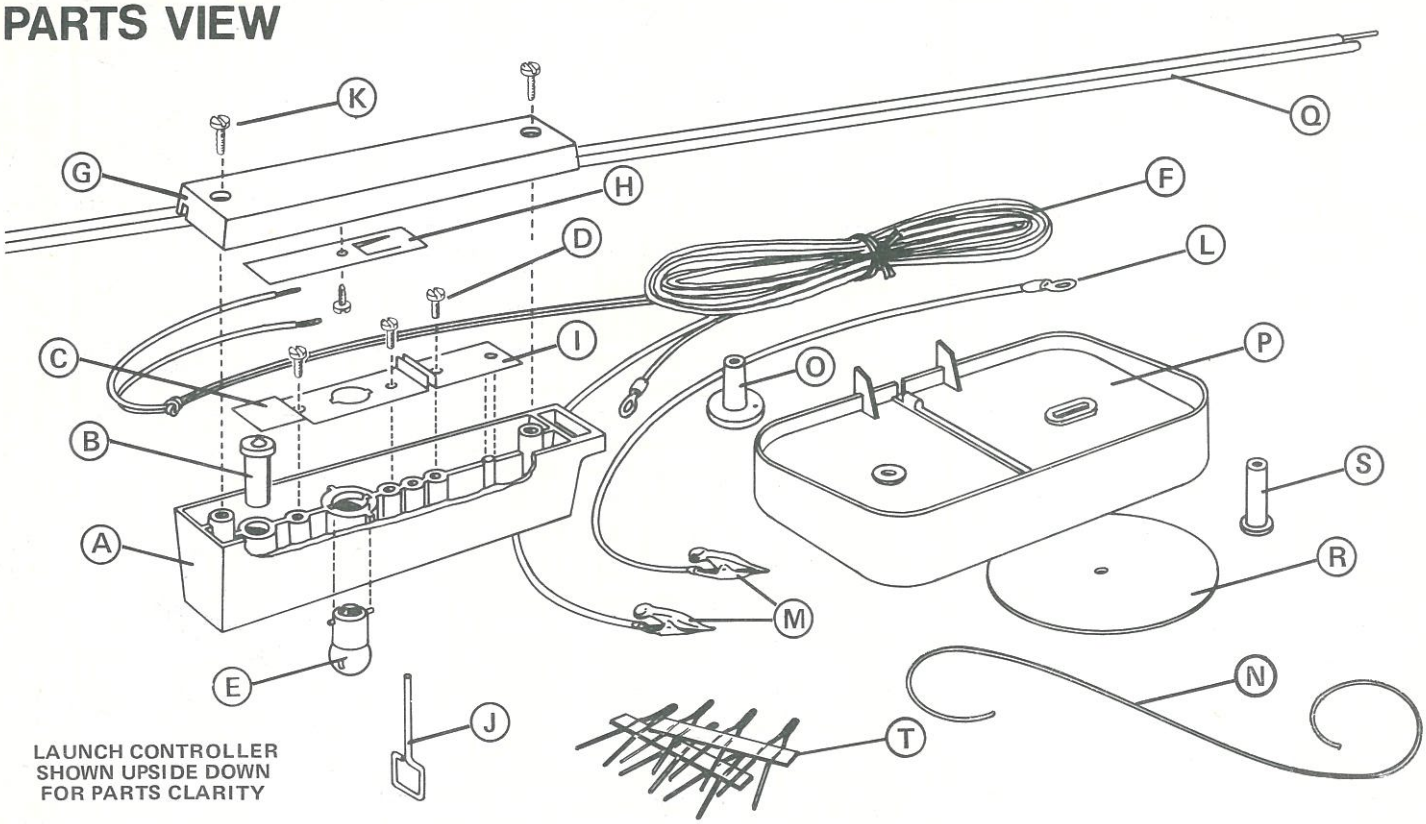


☐ 11

Apply the fin decals. The fin decals are arranged in matched pairs on the decal sheet, one for each side of a fin. Peel the decals from the backing sheet, center them carefully on the fins and press them firmly into place. Save the remaining decals for the launch control system.



LAUNCH SYSTEM PARTS VIEW



LAUNCH CONTROLLER SHOWN UPSIDE DOWN FOR PARTS CLARITY

PARTS LIST

			PART NO.
A)	1	Launch Controller Top (type PRP-1B)	32484
B)	1	Launch Button (type PRP-1A)	32485
C)	1	Bulb Contact Strip (type FSS-4D)	38065
D)	4	Short Screws (type ST-4019) 3/16" long	45125
E)	1	Arming Check Light Bulb (type AL-12)	38021
F)	1	12 foot Launch Wire (type LW-24KB)	85835
G)	1	Launch Controller Bottom (type PRP-1C)	32483
H)	1	Lower Contact Strip (type FSS-4E)	38066
I)	1	Key Contact Strip (type FSS-4F)	38067
J)	1	Safety Interlock Key (type FSK-10)	38101
K)	2	Long Screws (type ST-4050) 1/2" long	45126
L)	2	Terminal Lugs (type TL-1)	38151
M)	2	Micro-Clips (type MC-1)	38121
N)	1	Safety Key Cord (type SC-4B) 9" long	85750
O)	1	Rod Safety Cap (type PRP-1F)	32488
P)	1	Launch Pad Base (type PRP-1D)	32482
Q)	1	2-Piece Launch Rod (type RLR-1)	02234
R)	1	Blast Deflector (type BD-3)	38034
S)	1	Rocket Support Stand-Off (type PRP-1E)	32489
T)	6	Estes Solar Igniter (type NWI-2)	85550
*U)	1	Recovery Wadding Packet (type RP-1C)	85715
*V)	1	Engine Flight Pack	01725

*Included in rocketry outfit, but not illustrated.

TOOLS AND MATERIALS

Locate the parts and materials shown in the Parts View and lay them out on the table in front of you. To assemble the launch system you will need the following tools and materials:

1. Small, or medium size screwdriver.
2. Pliers.
3. Scissors.
4. Ruler.
5. Sharp model knife.
6. Masking tape, 1/2 inch wide.
7. A 6 volt or a 12 volt heavy-duty lantern battery. (See "Battery Power".)

BATTERY POWER

For your safety, all model rocket engines are ignited electrically. Your Proton Torpedo Launch System is designed to use either a 6 volt (NEDA type 918) or a 12 volt (NEDA type 926) heavy-duty lantern battery. Either 6 or 12 volt lantern batteries are suitable for use with Estes Solar Igniters. (Solar igniters are supplied with this outfit.) For use with standard Estes Astron Igniters, a 12 volt lantern battery is recommended.

The recommended batteries are:

6 Volt		12 Volt	
Eveready	#731	Eveready	#732
Ray-O-Vac	#918	Ray-O-Vac	#926
Burgess	#TW-1	Burgess	#TW-2
RCA	#VS317	RCA	#VS342

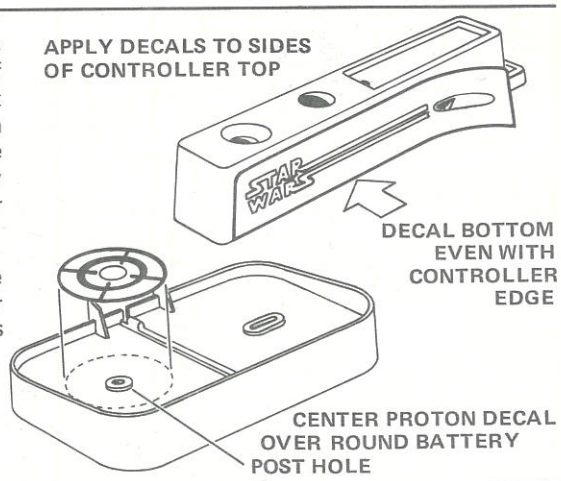
Use only a 6 volt or 12 volt lantern battery with screw-on terminal knobs.

LAUNCHER ASSEMBLY

☐1

Apply the STAR WARS decals to the sides of the controller top (part A). Remove one of the decals from the backing sheet and center it on one side of the controller. Align the bottom edge of the decal with the bottom edge of the controller, and press firmly into place. Apply the remaining STAR WARS decal to the other side of the controller in the same manner.

Apply the round Proton symbol decal to the launch pad base (part P). Center the decal over the round battery post hole as shown, and press into place.

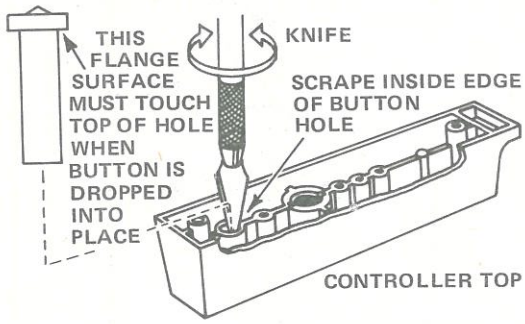


☐2

Drop the launch button (part B) into its hole in the controller top (part A) as shown. It should drop, by itself, until the button flange rests on the top of the hole. The button must be able to move freely in the hole.

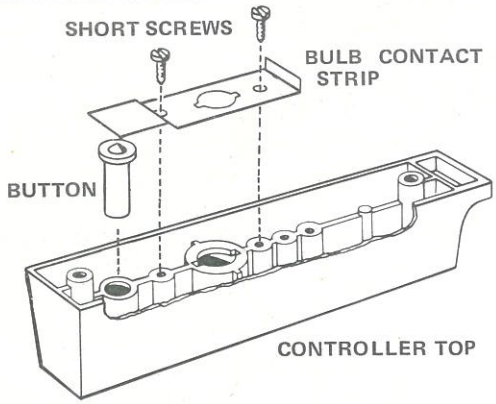
IMPORTANT

If you have to push on the button at all, remove any excess plastic from the inside rim of the launch button hole. Rotate the blade of a sharp knife as shown to clean the hole. Continue to scrape the inside of the rim until the button drops freely into place.



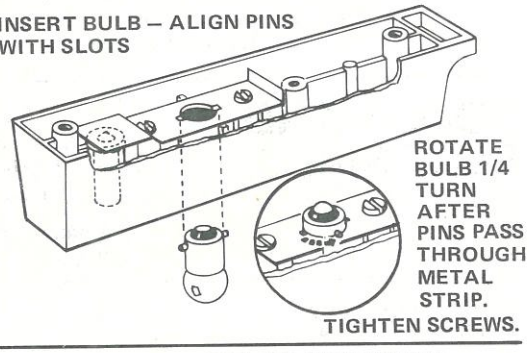
☐3

Insert the launch button into place in the controller top. Position the metal "bulb contact strip" (part C) in the controller top as shown. Start two short screws (part D) into the holes to hold the strip - - - but do not tighten these screws yet.



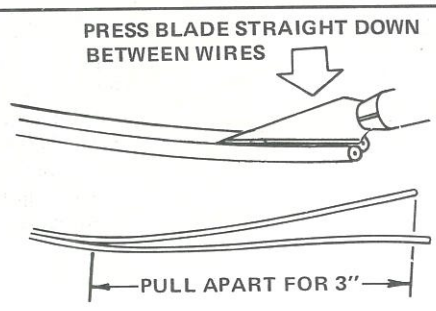
☐4

Push the arming light bulb (part E) into its hole (base end first) in the controller top. Align it so the small pins on the bulb will line up with the slots in the controller and in the metal strip. When the pins have been pushed through the metal strip, give the bulb a one-quarter turn to keep it from falling out. With the bulb in place, tighten the two screws holding the metal strip. Tighten the screws for a firm fit, but do not overtighten.



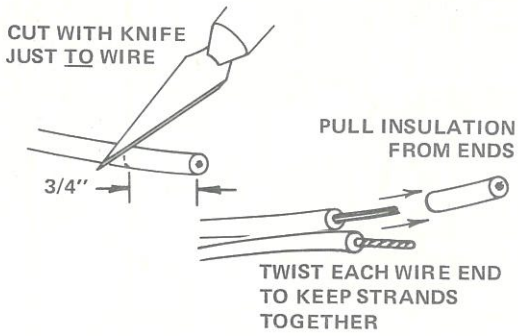
☐5

Separate the two halves of the launch wire (part F) for a distance of about 3 inches at one end. To do this, lay the wire end flat on a table. Push a knife blade down between the two plastic insulation sections at the end. Work carefully to avoid damaging the wire. Pull the two wires gently apart to separate them. (If this is done correctly, both wires will still be completely covered with insulation when this step is completed.)



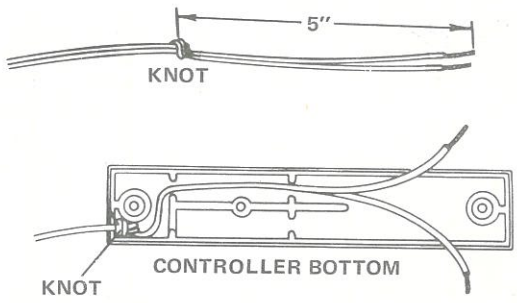
☐ 6

Strip (remove) 3/4 inches of plastic insulation from each of the separate ends of the wire. To strip insulation, lightly cut into the plastic 3/4 inch from the wire end. Rotate (roll) the wire as you slice to cut just through the insulation all around. Do not cut all the way to the wire. Now pull firmly on the very end of the insulation to pull it off from your knife cut. Twist the stripped end to keep the many little individual wires together. Repeat with the other stripped end.



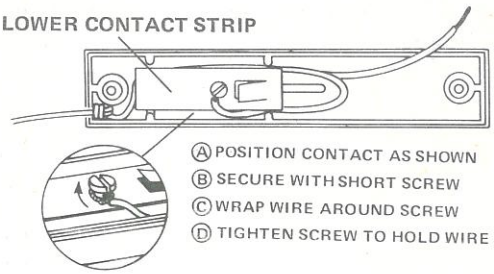
☐ 7

Tie a knot in the wire about 5 inches from the stripped ends. Lay the wire into the controller bottom (part G), routing it around the plastic center rib as shown.



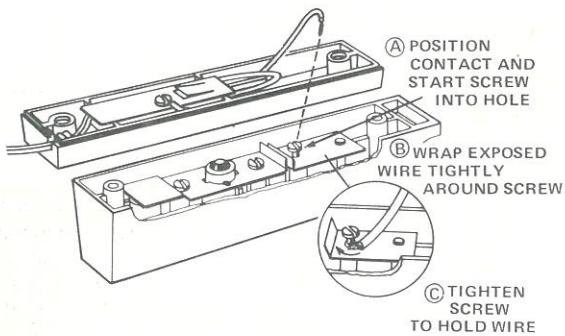
☐ 8

Position the metal "lower contact strip" (part H) in the controller bottom. The raised cut-out in the strip should be towards the center of the controller. Start a short screw into the hole, but don't screw it in more than halfway. Wrap one bare wire end (either wire end) tightly around the screw in a clockwise direction and tighten the screw.



☐ 9

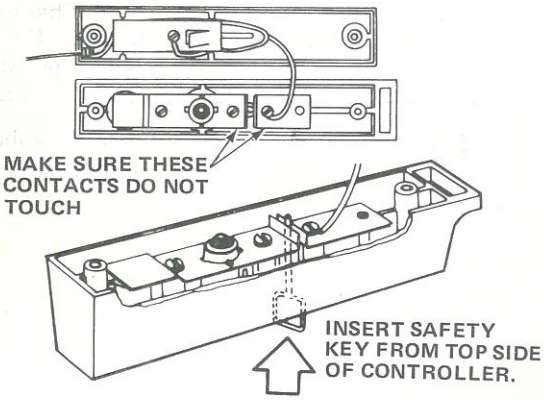
Position the metal "key contact strip" (part I) in the controller top. Start the remaining short screw into the hole, but don't screw it in more than halfway. Loop the remaining exposed wire end tightly around the screw (in a clockwise direction). Tighten the screw to hold wire and contact firmly in place.



☐ 10

Check now to be sure the safety key (part J) will operate correctly. Look closely to make sure the two metal contact strips in the controller top do not touch. Then insert the key from the top side of the controller and make sure it touches both contact strips.

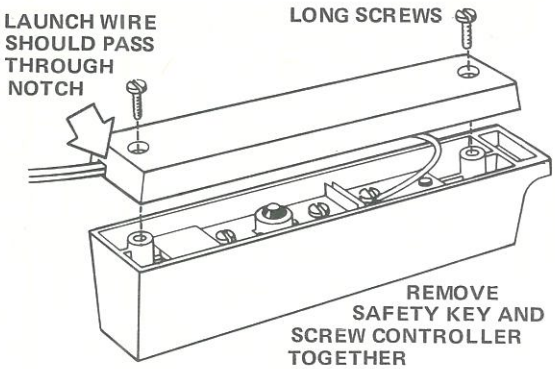
If it doesn't touch both, check all other parts of the assembly for correct fit. If everything else checks out OK, then carefully bend the contacts until they will both touch the key but not each other.



IMPORTANT: KEY SHAFT MUST TOUCH BOTH CONTACT STRIPS.

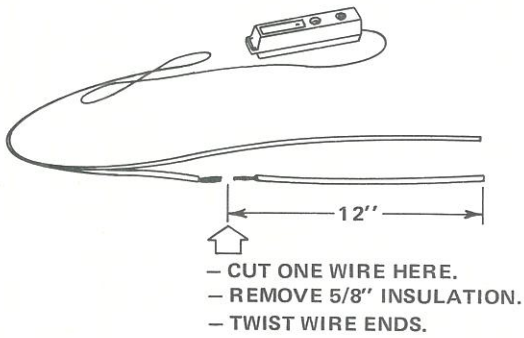
☐ 11

Place the controller bottom over the controller top. (Remove the safety key if still in place.) Make sure the wires lie neatly beside the contact strips and are out of the way of the bulb contact and the controller sides. Insert the two long screws (part K) to hold the two controller halves together. Tighten the screws for a firm fit, but do not force the screws in too tightly.



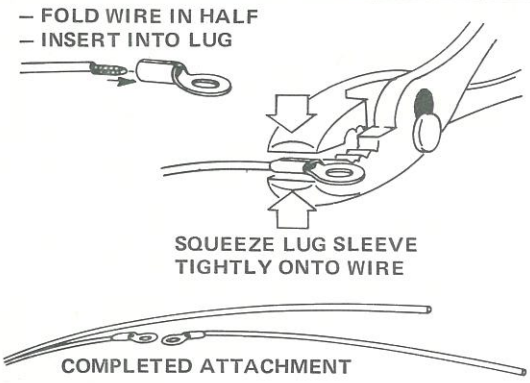
☐ 12

Separate the two halves of the wire at the end opposite the controller for a distance of 15 inches. Cut one of these two wires 12 inches from its end. Strip 5/8 inch of insulation from both wire ends at the 12 inch cut. Twist each bare wire end to hold the strands together.



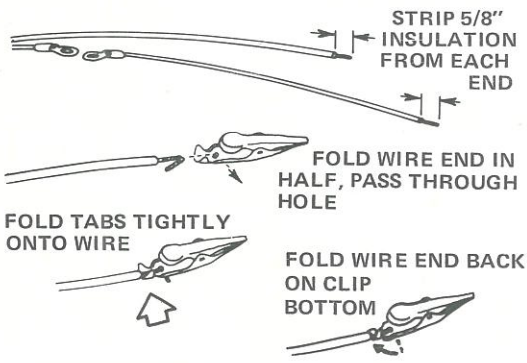
☐ 13

Fold a bare wire end (from step 12) in half. Push the bare wire into the sleeve on a terminal lug (part L) and squeeze the sleeve down tightly on the wire with a pair of pliers. Pull gently on the wire to make sure the lug is securely attached. Repeat with the other bare wire and remaining terminal lug. (For best results and most permanent connection, solder the wires to the terminal lugs.)



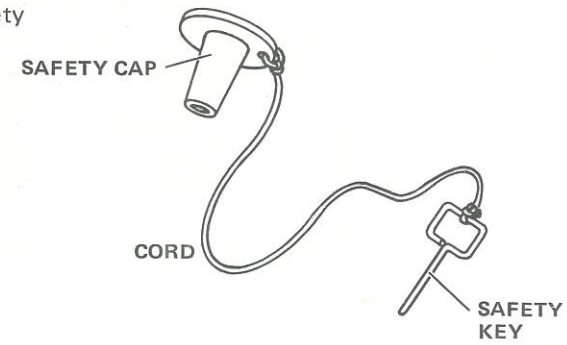
☐ 14

Attach a micro-clip (part M) to the two remaining wire ends. To attach a micro-clip, first strip off (remove) 5/8 inch of plastic insulation from each wire end. Twist the bare wire ends, then fold in half. Push the folded wire end down through the small hole in the bottom of the clip. Lay the wire down so the plastic insulation is just behind the tabs. Use a pliers to fold the tabs, one-at-a-time, down tightly on the bare wire. Fold the end of the wire which sticks out through the small hole back along the bottom of the clip. (For best results and most permanent connection, solder the wires to the micro-clips.)



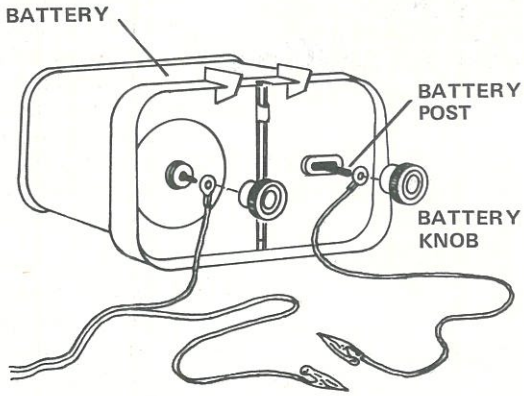
☐ 15

Tie the white cord (part N) to the rod safety cap (part O) and the safety key as shown.



☐ 16

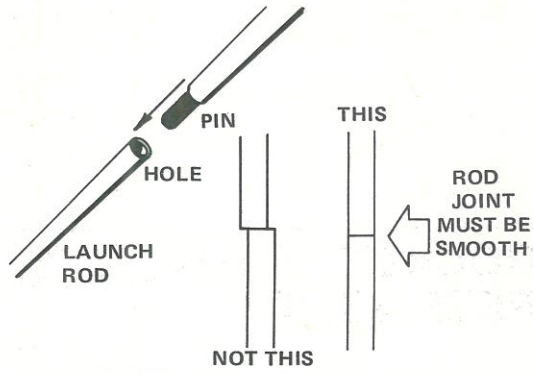
Place the launch pad base (part P) on the end of your 6 volt or 12 volt lantern battery. Notice that the battery terminal posts will fit through the holes in the pad base only when the battery is turned the correct way in the base. Place the terminal lugs over the battery posts as shown and screw on the knobs which came with your battery.



☐ 17

Remove packing tape from the launch rod ends (part Q). Join the rod sections by inserting the pin on one rod section into the hole in the end of the other rod section. Tap the assembled rod lightly on a concrete floor to firmly join the sections.

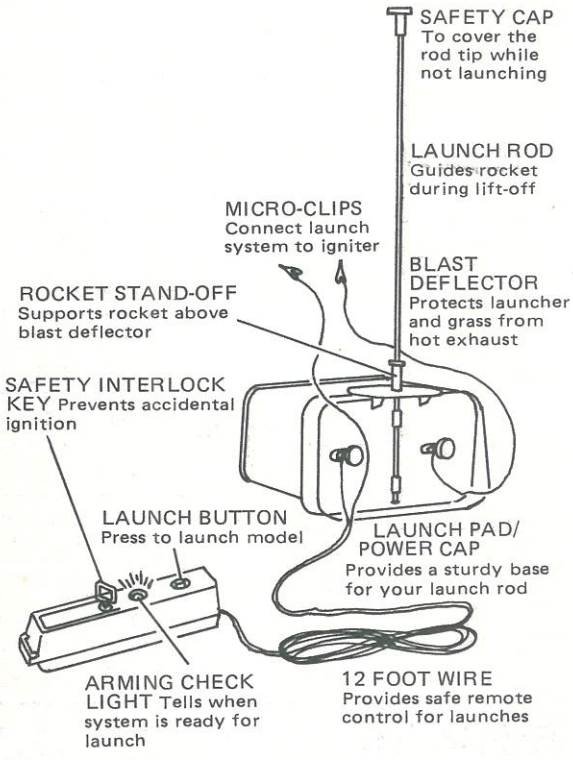
Check to be sure the rod halves match smoothly at the joint. Rotate one rod if necessary for a smooth joint.



☐ 18

Mount the launch rod on the launch pad base. Slide either rod end through both loops on the pad base. Slide the metal blast deflector (part R) down the launch rod so it rests on the supports on the pad. Slip the rocket stand-off (part S) onto the rod as shown. Install the safety cap on the end of the launch rod.

IMPORTANT: ALWAYS CAP THE LAUNCH ROD END WHEN NOT LAUNCHING ROCKETS!

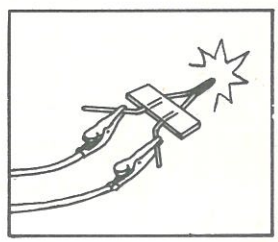


TESTING THE SYSTEM

Take your launch system 'out of doors' to perform a "systems check". Extra Estes Solar Igniters (part T) are supplied in this rocketry outfit for use in testing and as spares. Cut the tape between the igniters to separate them.

1. REMOVE SAFETY KEY FROM CONTROLLER.
2. Connect the micro-clips to the wires on the igniter. Position clips next to igniter-tape as shown. SUPPORT CLIPS AND IGNITER SO THEY DO NOT TOUCH ANYTHING! (DO NOT hold the igniter in your hand when attaching the micro-clips or when performing the "systems check".)
3. Insert safety key firmly into launch controller. The arming light bulb should now glow. Press the launch button. The igniter should flash! (At the same time, the arming light should go out.)

If the system does not function correctly, check the battery and the wiring until you find the problem and correct it. Refer also to the Trouble Shooting Checklist on page 12.



FLYING YOUR ROCKET

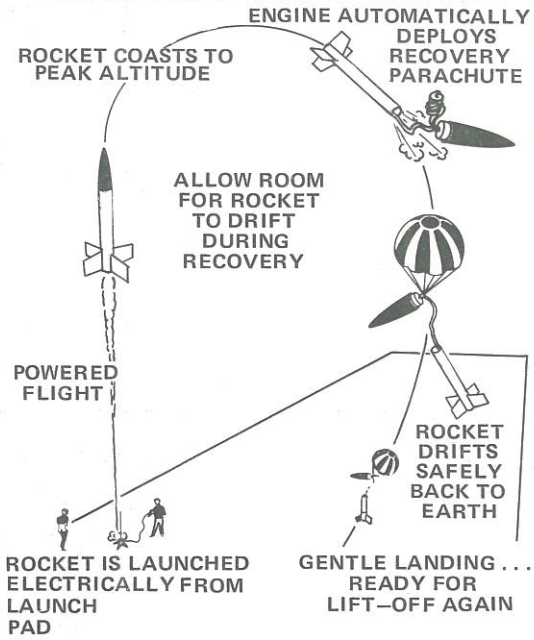
IMPORTANT: READ THIS BEFORE YOUR FIRST LAUNCH.

Choose a large field away from power lines, tall buildings, tall trees and low flying aircraft. For your first flight try to find a field at least 250 feet square. In choosing a launch area, the larger the better. Football fields and playgrounds are often fine. Remember, the larger the launch area, the better your chance of recovering your rocket.

Wind is the biggest problem for model rocketeers. If you want to get your model back, launch in light breezes or, when possible, in calm weather. Never launch near a thunder storm. Remember too, that plastic parachutes become stiff in cold weather and will not open easily. If launching below 40° Fahrenheit (about 4° Celsius), use extra care in preparing your model, especially the recovery system.

Engine Type	Minimum Flying Field Dimension in Feet
1/2A6-2	50'X50'
A8-3 A8-5	100'X100'
B4-4 B6-4	200'X200'
C6-5	400'X400'

TYPICAL MODEL ROCKET FLIGHT PATH



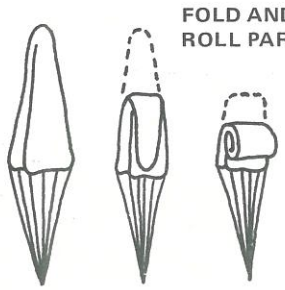
ROCKET PREFLIGHT

T-14 Pack four squares of loosely crumpled flameproof recovery wadding (part U) into the rocket body.

> Use four recovery wadding squares for each flight.

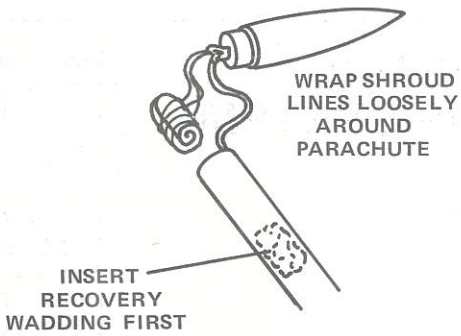
T-13 Fold the parachute into a slim triangular shape as shown. Fold the "triangle" in half lengthwise, then roll as shown. Wrap the shroud lines around the 'chute and insert it into the rocket body. If 'chute is too large, unfold it and repack until it slides easily into rocket. A fit that is too tight may prevent parachute from ejecting properly.

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



T-12 Pack shock cord and remaining shroud lines neatly into rocket body. Slide nose cone into place.

> Nose cone should separate easily from rocket body tube, but not be extremely loose. If it is too tight, sand inside of body tube end and shoulder of nose cone with fine sandpaper. If nose cone is too loose, add a wrapping of transparent tape or masking tape to the shoulder of the nose cone.



ROCKET COUNTDOWN

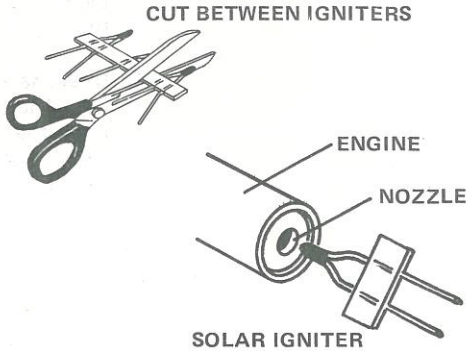
Be sure to follow the *HIAA-NAR Model Rocketry Safety Code when carrying out all your model rocket activities.

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

T-11 Select an engine and install an igniter. (Use the "A" engine for your first flight.)

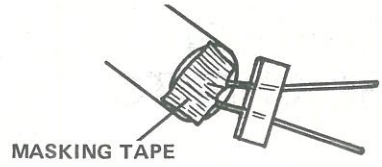
[11A] Cut tape to separate igniters. Do not remove tape from individual igniters.

[11B] Insert coated end of igniter into engine nozzle as far as possible. (Igniter must touch end of propellant in nozzle.)

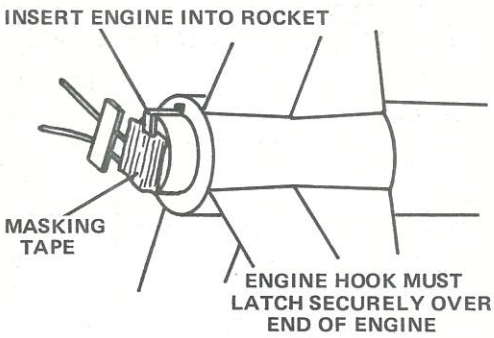


[11C] Bend igniter wires flat to the bottom of the engine while keeping igniter firmly to bottom of engine nozzle.

[11D] Tape igniter in place with a short strip of ordinary masking tape. Spring ends of igniter about 1" apart as shown. Do not disturb tape on igniter.



T-10 IMPORTANT: Remove safety key from launch controller. Insert engine into rocket.



T-9 Remove rod safety cap. Place rocket on launch pad. Slide the rocket's launch lug over the end of the launch rod and lower the rocket to the plastic stand-off. Make sure the rocket slides freely on launch rod.

T-8 Attach micro-clips to igniter ends. (For maximum ignition reliability, attach clips as close to engine nozzle or igniter tape as possible.) CLIPS MUST NOT TOUCH EACH OTHER OR METAL BLAST DEFLECTOR. Be sure micro-clip wires will not snag on rocket fins.

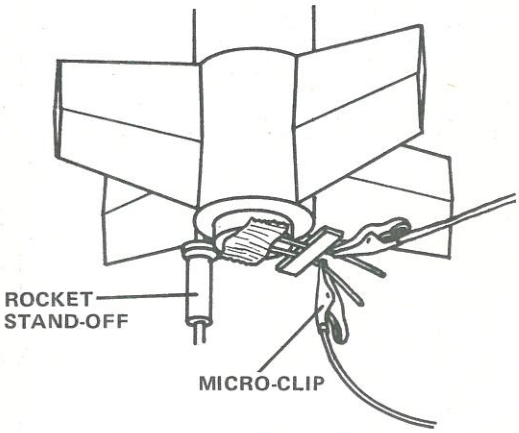
T-7 Alert all personnel that rocket is ready for launch. Check for low flying aircraft and make sure there is no dry grass or other burnable material near the launch pad.

T-6 Arm the launch controller - - INSERT SAFETY KEY - - Start final countdown.

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

Press launch button and hold until Proton Torpedo lifts off - - and may the Force be with you!

Release launch button as soon as rocket leaves launch pad. Remove safety key and install safety cap on the launch rod.



MISFIRE PROCEDURE

If engine does not ignite, wait one minute before approaching rocket. Remove safety key from controller, disconnect micro-clips, and slide rocket off the launch rod. Clean igniter residue from nozzle with toothpick or similar object. Discard old igniter and repeat Rocket Countdown.

RECOVERY PROCEDURE

After each flight, remove the used engine by springing the engine hook back and pulling on the end of the engine. Inspect the model to be sure that everything is in order and you're ready to prepare the rocket for another flight.

Clean the flat jaws of the micro-clips frequently to insure good contact with igniter. (An emery board, nail file, or sandpaper works well.)

STAR WARS/MODEL ROCKETRY SAFETY CODE

This Solid Propellant Model Rocketry Safety Code Is Approved by The National Association of Rocketry and the Hobby Industry Association of America.

1. **Construction** — My model rockets will be made of lightweight materials such as paper, wood, plastic and rubber, without any metal as structural parts.
2. **Engines** — I will use only preloaded factory made model rocket engines in the manner recommended by the manufacturer. I will not change in any way nor attempt to reload these engines.
3. **Recovery** — I will always use a recovery system in my model rockets that will return them safely to the ground so that they may be flown again.
4. **Weight Limits** — My model rocket will weigh no more than 453 grams (16 ozs.) at liftoff, and the engines will contain no more than 113 grams (4 ozs.) of propellant.
5. **Stability** — I will check the stability of my model rockets before their first flight, except when launching models of already proven stability.
6. **Launching System** — The system I use to launch my model rockets must be remotely controlled and electrically operated, and will contain a switch that will return to "off" when released. I will remain at least 10 feet away from any rocket that is being launched.
7. **Launch Safety** — I will not let anyone approach a model rocket on a launcher until I have made sure that either the safety interlock key has been removed or the battery has been disconnected from my launcher.
8. **Flying Conditions** — I will not launch my model rocket in high winds, near buildings, power lines, tall trees, low flying aircraft, or under any conditions which might be dangerous to people or property.
9. **Launch Area** — My model rockets will always be launched from a cleared area, free of any easy to burn materials, and I will only use non-flammable recovery wadding in my rockets.
10. **Jet Deflector** — My launcher will have a jet deflector device to prevent the engine exhaust from hitting the ground directly.
11. **Launch Rod** — To prevent accidental eye injury I will always place the launcher so the end of the rod is above eye level or cap the end of the rod with my hand when approaching it. I will never place my head or body over the launching rod. When my launcher is not in use I will always store it so that the launch rod is not in an upright position.
12. **Power Lines** — I will never attempt to recover my rocket from a power line or other dangerous places.
13. **Launch Targets & Angle** — I will not launch rockets so their flight path will carry them against targets on the ground, and will never use an explosive warhead nor a payload that is intended to be flammable. My launching device will always be pointed within 30 degrees of vertical.
14. **Pre-Launch Test** — When conducting research activities with unproven designs or methods, I will, when possible, determine their reliability through pre-launch tests. I will conduct launchings of unproven designs in complete isolation from persons not participating in the actual launching.

RELAUNCH COMPONENTS

You will need the following items for additional launches of your Proton Torpedo:

* The Estes model rocket engines recommended for use with this rocket are the 1/2A6-2, A8-3, A8-5, B4-4, B6-4 and C6-5.
* We recommended the easy-to-use Estes Solar Igniters (order no. 2301).
* Estes Flameproof Recovery Wadding (order no. 2274).
* All these products are available from your local Estes hobby retailer.

TROUBLE SHOOTING CHECKLIST

IMPORTANT: ALWAYS REMOVE SAFETY KEY FROM CONTROLLER BEFORE APPROACHING LAUNCH PAD.

PROBLEM	USUALLY CAUSED BY	CORRECTION
Arming check light does not glow at all when key is inserted.	Dead battery. Bad micro-clip or terminal lug connections. Bad connections inside controller. Bulb burned out. Damaged igniter.	Check battery. Clean micro-clips. Check terminal lugs. Check all wiring against assembly instructions. Replace bulb with #53 12 volt bulb only. Try fresh igniter.
Arming check light glows weakly and/or flickers slightly. Igniter does not flash.	Bad connections - probably micro-clips.	Clean and reattach micro-clips. Check terminal lugs. Check all other connections.
Arming check light glows, but igniter does not flash at all.	Micro-clips or igniter wires are touching each other.	Make sure micro-clips do not touch each other, or launch rod, or blast deflector. Check wiring in controller.
Igniter flashes as soon as clips are connected ot it, even with safety key out.	Short circuit in controller.	Rewire controller carefully, following assembly instructions.
Igniter flashes when safety key is inserted without pressing launch button.	Controller contact strips bent; loose wire pieces inside controller.	Straighten controller contact strips. Clean out inside of controller.
Arming check light glows when key is not in place.	Safety key contacts are touching.	Bend contacts so a connection can be made only by the safety key.
Launch button depressed, but engine does not ignite.	Safety key not completely inserted.	Push key firmly into controller until it stops.
	One or both micro-clips pulled loose from igniter ends.	Attach micro-clips securely to igniter ends.
	Micro-clips touching each other.	Move micro-clips apart.
	Both micro-clips touching metal blast deflector.	Move micro-clips away from blast deflector.
	Poor contact between micro-clips and igniter ends.	Clean flat contact surfaces on micro-clips as described in "Recovery Procedure".
	Broken or damaged igniter.	Replace with fresh igniter and repeat "Rocket Countdown".
	Weak or dead battery.	Replace with fresh 6 volt or 12 volt lantern battery.
	Dirt or foreign material between battery posts and terminal lugs.	Clean battery posts and terminal lugs.
Igniter burned, but did not ignite engine.	Igniter pulled away from engine nozzle.	Replace with fresh igniter and repeat "Rocket Countdown".
Parachute is scorched or melted by hot ejection gases.	Not enough recovery wadding used.	Refer to "Rocket Preflight" instructions for correct number of wadding squares to be used for each flight.
Parachute does not eject completely from rocket body during flight.	Too much recovery wadding used or packed too tightly into rocket body.	Use correct number of wadding squares as directed in "Rocket Preflight" instructions.
		Pack wadding more loosely into rocket body.
	Shroud lines or shock cord caught between nose cone and rocket body when inserting nose cone.	Repack parachute, shroud lines, and shock cord carefully into rocket body.
Nose cone fails to separate from rocket during flight.	Nose cone fit into body is too tight.	Nose cone should separate easily from rocket body, but not be extremely loose. If fit is too tight, sand inside of body end and shoulder of nose cone with fine sandpaper.

ENGINE INFORMATION

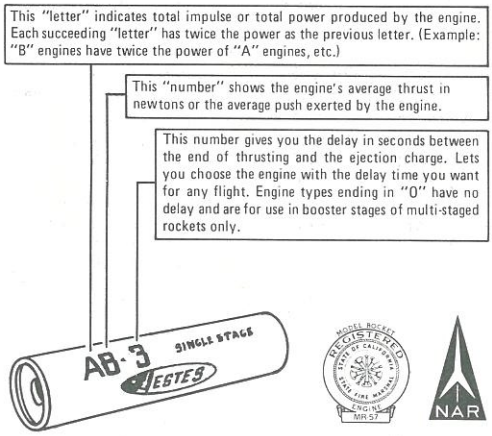
STORAGE:
Store engines in a cool, dry place. Never expose to temperatures greater than 150° Fahrenheit.

NOTE: Due to use, storage, and other conditions beyond our control, no warranty is either made or implied as to the performance or reliability of these engines.

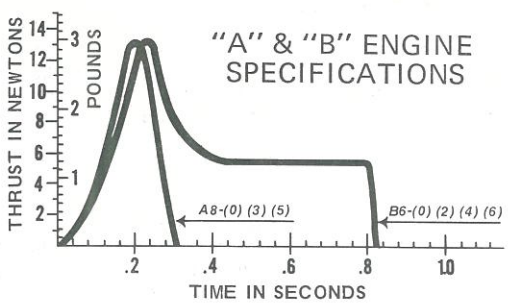
FIRST AID:
For minor burns use first-aid burn ointment. For severe burns consult a physician. In case propellant is swallowed, induce vomiting and call a physician.

IN CASE OF FIRE:
Extinguish fires near or among model rocket engines in a normal manner.

DISPOSAL:
Damaged, defective, or unwanted engines should be destroyed by soaking in water.



All Estes Model Rocket Engines are "SAFETY AND CONTEST CERTIFIED" by the National Association of Rocketry and comply with the codes of the National Fire Protection Association.



Engine Type	Total Impulse*		Average Thrust +		Propellant Weight + Oz.
	Pound seconds	Newton seconds	Pounds	Newtons	
A	0.56	2.50	1.76	7.81	0.134
B	1.12	5.00	1.35	6.02	0.194

*(Figures shown are maximum)
+(Figures shown are nominal)

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