FLY WITH FSI

penetrator

KIT NO. MRK. I
FLIGHT SYSTEMS, INC.
~~1313 CANNON ST~~
~~P.O. BOX 145~~
~~LOUISVILLE, COLO. 80027~~
FLY WITH F.S.I.

RECOMMEND FSI ENGINES

A4-4 D4-6
B3-4 D6-6
C4-4 E5-6

a real flying model

build a GO bird ~ not a show bird

NAR
NATIONAL ASSOCIATION OF ROCKETRY APPROVED

assembled rocket 19" long

THE PENETRATOR IS ONE OF THE FINEST FLYING MODELS IN THE F.S.I. FLEET. ASTOUNDING ALTITUDES CAN BE REACHED BY USING THE MORE POWERFUL F.S.I. ROCKET ENGINES. ASK YOUR DEALER FOR DETAILS.

additional assembly procedures

FOLLOW THIS ORDER:

① BODY TUBE — THE BODY TUBE IS MAKE UP OF 2 EQUAL LENGTHS JOINED BY A COUPLER. TAKE THAT BODY TUBE WITH THE 3 BLACK LINES ON 1 END (FINS GO ON THIS END) AND USING THE OPPOSITE END. SPREAD A 3/4" LONG LAYER OF ELMER'S GLUE INSIDE OF BODY TUBE. NOW QUICKLY INSERT ½ OF COUPLER. TAKE THE OTHER BODY TUBE AND SPREAD A LAYER OF GLUE INSIDE EITHER END. QUICKLY PRESS ONTO COUPLER UNTIL BODY TUBES ARE TOUCHING. NEXT (QUICKLY) LAY GLUED BODY TUBE ON FLAT SURFACE AND ROLL JOINED TUBES WITH PALM OF YOUR HAND. THIS WILL INSURE THAT BODY TUBES ARE STRAIGHT AND PARALLEL. LET LIE ON FLAT SURFACE UNTIL GLUE DRIES.

② THRUST RING — PLACE A HEAVY BAND OF ELMER'S GLUE ABOUT 2" INSIDE OF BODY TUBE ON END WITH 3 FIN ALIGNMENT MARKS. INSERT THRUST RING BY USING A FSI A, B, C, OR D ROCKET ENGINE. PUSH THRUST RING FORWARD UNTIL A, B, C, OR D ENGINE PROJECTS ¼" OUTSIDE BODY TUBE, FOR FSI "E" ENGINE PUSH FORWARD UNTIL ⅞" OF ENGINE PROJECTS OUTSIDE BODY TUBE. THE THRUST RING FORCES THE GLUE FORWARD AND PROVIDES FOR A STRONG BOND OF THRUST RING TO BODY TUBE. NOW EXTRACT ENGINE AND LET GLUE DRY.

③ SHOCK CORD MOUNT — SPREAD A HEAVY LAYER OF ELMER'S GLUE ALL OVER THE SIDE OPPOSITE THE SHOCK CORD KNOT AFTER TAKING UP SLACK IN CORD. CURVE SHOCK CORD MOUNT AND INSERT INTO NOSE CONE END OF BODY TUBE AND FIRMLY PRESS IN PLACE, USING FINGER, UNTIL GLUE HOLDS FIRMLY. ASSEMBLY DETAIL SHEET SHOWS PROPER POSITION IN BODY TUBE.

④ FINS — ALL 3 FINS IN YOUR KIT ARE MARKED WITH RED EDGE. THIS RED EDGE IS TO BE PLACED NEXT TO THE BODY TUBE. BEFORE GLUING INTO PROPER POSITION YOU MAY WANT TO SAND AND ROUND OFF ALL FIN EDGES, EXCEPT DO NOT SAND RED EDGE. AFTER SANDING EDGES, PLACE A SMALL AMOUNT OF ELMER'S GLUE ALONG THE RED EDGE AND IMMEDIATELY PRESS AGAINST BODY TUBE. HOLD SECURELY UNTIL GLUE SETS STRONG ENOUGH TO SUPPORT FIN. BE SURE FIN IS PARALLEL TO BODY TUBE AND RADIAL THROUGH CENTER OF BODY TUBE. REPEAT FOR THE OTHER TWO REMAINING FINS. YOUR BODY TUBE IS MARKED WITH 3 BLACK MARKS. PLACE FINS ALONG THESE LINES FOR PROPER SPACING OF 120° AND PARALLEL ALIGNMENT. AFTER TACK COAT OF GLUE DRIES HARD PLACE TWO MORE LINES OF GLUE ALONG FIN AND BODY TUBE TO BUILD UP A STRONG FILLET.

⑤ FLAME PROOF WADDING — BE SURE THAT FLAME PROOF WADDING IS USED EACH TIME ROCKET IS FIRED. PUSH WADDING ALL THE WAY DOWN TO THRUST RING AND PACK IN FIRMLY WITH A 5/8" DOWEL OR SIMILAR TOOL. USE ENOUGH WADDING TO MAKE APPROXIMATELY A 5/8" LONG PLUG. SEE ASSEMBLY DETAIL SHEET.

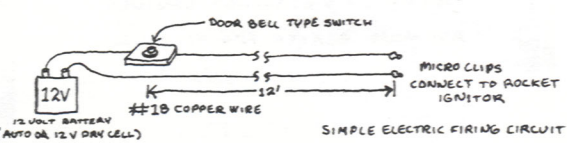
⑥ PARACHUTE — THE PARACHUTE IS MARKED IN INCHES. CUT WITH SCISSORS ALONG THE INCH LINES THAT GIVE YOU THE SIZE PARACHUTE YOU DESIRE (FOR PENETRATOR ROCKET - 14"). LAY PARACHUTE ON FLAT SURFACE AND ATTACH SHROUD LINES TO PARACHUTE USING STRIPPABLE TABS (SEE DETAIL C). CAUTION: LET NO PORTION OF TAB PROJECT BEYOND PARACHUTE AS GLUE ON TAB WILL STICK PARACHUTE TOGETHER AND INTERFERE WITH ITS OPENING. TRY NOT TO TOUCH THE GLUE SIDE OF TAB WITH FINGERS.

⑦ SHOCK CORD & PARACHUTE — COIL SHOCK CORD AROUND YOUR FINGER AND STUFF INTO BODY TUBE. NEXT FOLD PARACHUTE AS SHOWN ON ASSEMBLY DRAWING, GATHER THE PARACHUTE TOGETHER LIGHTLY, THEN WRAP SHROUD LINES GENTLY AROUND FOLDED PARACHUTE AS SHOWN IN DETAIL C. DIAMETER OF FOLDED PARACHUTE SHOULD BE SLIGHTLY SMALLER THAN INSIDE DIAMETER OF BODY TUBE. ALL DETAILS ARE SHOWN ON ASSEMBLY DETAIL SHEET. BE SURE NOSE CONE IS A GENTLE FIT INTO BODY TUBE. LIGHT SANDING MAY BE NEEDED.

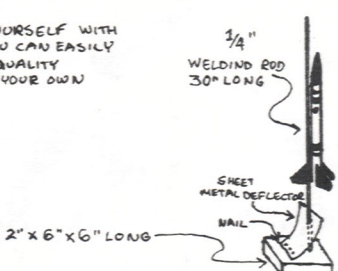
⑧ ROCKET ENGINE — WRAP A SMALL AMOUNT OF ½" WIDE MASKING TAPE AROUND THE ROCKET ENGINE AT THE POSITION SHOWN ON DETAIL A. USE ENOUGH TAPE TO SECURE A SNUG FIT INTO THE BODY TUBE AS TO REQUIRE A FIRM PUSH ON ENGINE TO PLACE IN CONTACT WITH THRUST RING. IF ENGINE DOES NOT FIT SNUGLY, IT WILL BE EJECTED INSTEAD OF PARACHUTE AND YOUR ROCKET WILL FREE FALL. INCLUDED WITH ALL FSI MODEL ROCKET ENGINES ARE DETAILS FOR LAUNCHING AND FIRING. ASK YOUR DEALER FOR THESE INSTRUCTIONS.

model rocket firing & launching equipment

TO FLY YOUR FSI ROCKET PROPERLY YOU WILL NEED TO PROVIDE YOURSELF WITH A 12 VOLT FIRING CIRCUIT AND A SIMPLE ROCKET LAUNCH PAD. YOU CAN EASILY BUILD YOUR OWN OR PURCHASE FROM YOUR DEALER FSI SUPERIOR QUALITY LAUNCHERS AND ELECTRIC IGNITION PANEL. DETAILS FOR BUILDING YOUR OWN LAUNCHER AND ELECTRIC IGNITION CIRCUIT ARE AS FOLLOWS.



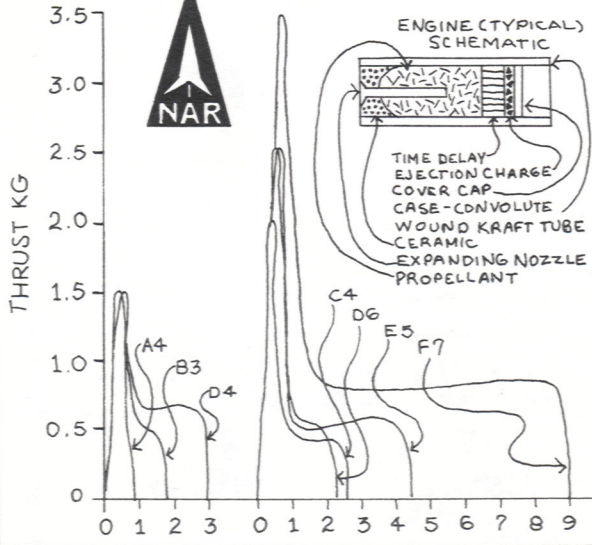
SIMPLE ELECTRIC FIRING CIRCUIT



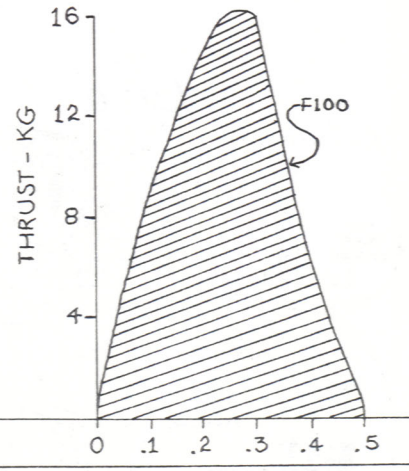
SIMPLE LAUNCH PAD

TYPICAL THRUST/TIME CURVES for MODEL ROCKET ENGINES

FLIGHT SYSTEMS, INC. ~~LOUISVILLE, COLORADO~~



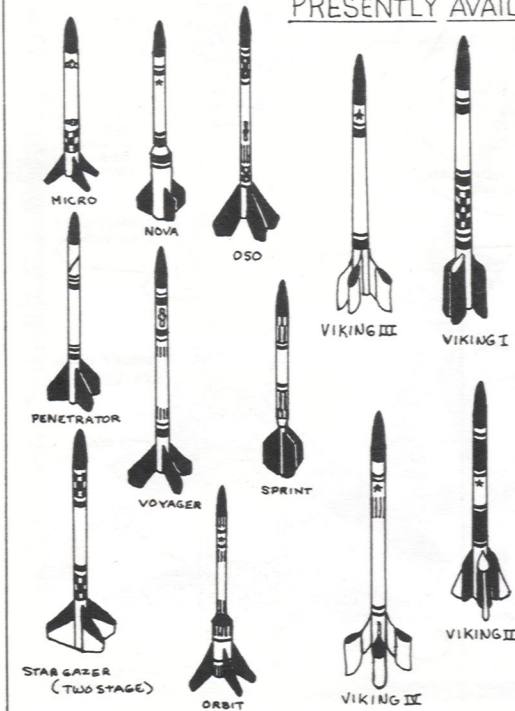
NAR CONTEST AND SAFETY CERTIFIED MODEL ROCKET ENGINES



ALL OF THE ABOVE ROCKET ENGINES ARE AVAILABLE AT MOST OF THE BETTER HOBBY SHOPS THROUGHOUT THE UNITED STATES. IF YOUR FAVORITE HOBBY STORE DOES NOT STOCK THE F.S.I. LINE, HAVE HIM WRITE US FOR OUR LATEST CATALOG AND PRICES. IF YOU DESIRE YOUR OWN CATALOG, SEND 25¢ TO FLIGHT SYSTEMS, INC. ~~Box 145, LOUISVILLE~~, COLO. 80027.

YOU HAVE JUST PURCHASED ONE OF FSI'S SUPERIOR QUALITY MODEL ROCKETS. OTHER FINE FSI KITS ARE ALSO AVAILABLE. THE FSI ROCKET FLEET IS CONSTANTLY BEING ADDED TO. SEE ALL OF THESE MODELS AT YOUR HOBBY DEALER.

PRESENTLY AVAILABLE FSI MODEL ROCKET KITS



RECOMMENDED FSI ENGINES

MICRO: A4-4, B3-4, C4-4, D4-6

PENETRATOR: A4-4, B3-4, C4-4, D4-6, D6-6, E5-6

STAR GAZER 1st stage: B3-0, C4-0, D6-0, E5-0
2nd stage: B3-6, C4-6, D6-8, D4-8, E5-6

NOVA: B3-4, C4-4, D4-6, D6-6, E5-6, F7-6

VOYAGER: D6-6, F7-6, F100-8

ORBIT: B3-4, C4-4, D4-6, D6-6, E5-6, F7-6

OSO: D6-6, F7-6, F100-8

SPRINT: C4-4, D4-6, D6-6

VIKING I: A4-4, B3-4, C4-4, D4-6, D6-6, E5-6

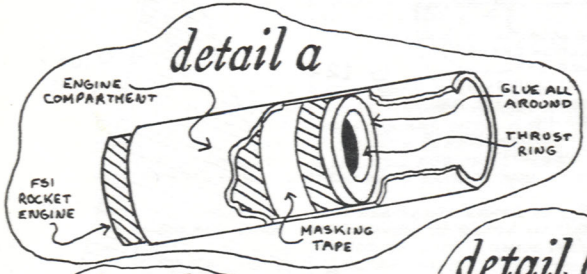
VIKING II: A4-4, B3-4, C4-4, D4-6, D6-6, E5-6

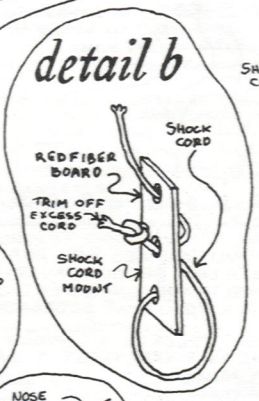
VIKING III: A4-4, B3-4, C4-4, D4-6, D6-6 E5-6

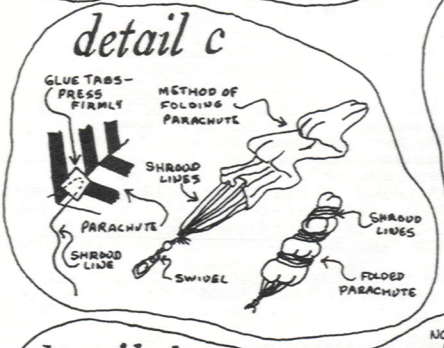
VIKING IV: F7-6, F100-8

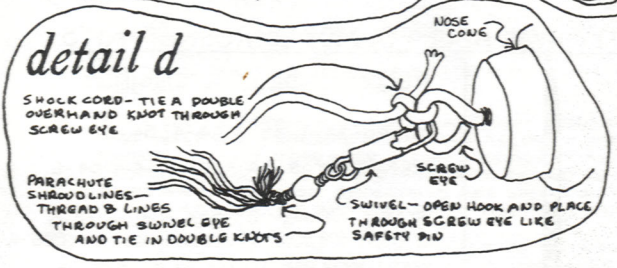
A COMPLETE LINE OF QUALITY FIRING CIRCUITS, LAUNCH GEAR, MODEL ROCKET ACCESSORIES AND INSTRUMENTS ARE ALSO AVAILABLE FROM FSI. SEE YOUR DEALER FOR DETAILS.

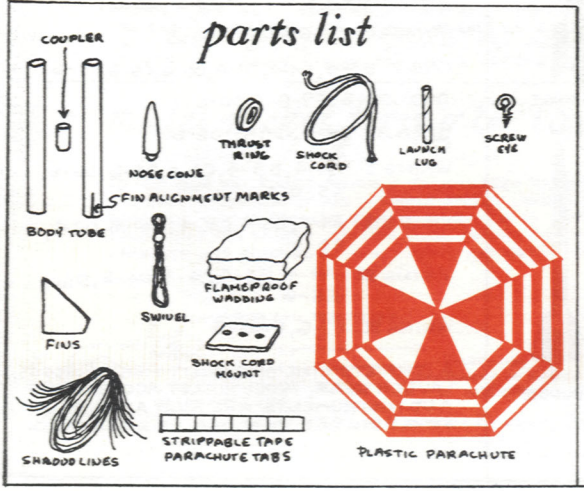
assembly details for penetrator rocket

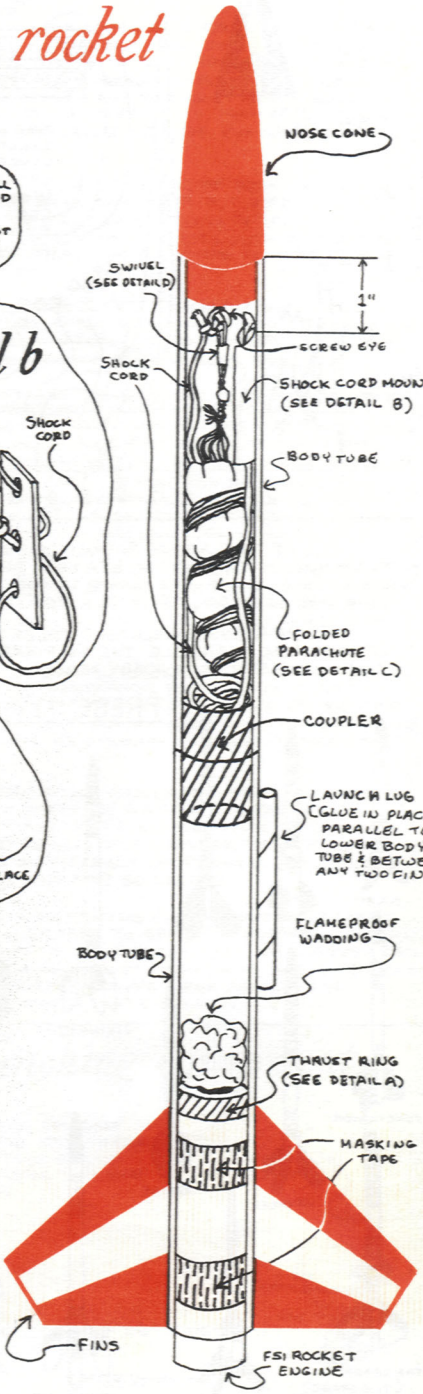












FLIGHT SYSTEMS Inc.
RAYTOWN, MISSOURI 64133

SPACEMODELING – A Hobby for ages 10 to adult

MODEL ROCKETRY

PROFESSIONALISM IN ROCKETRY

MRK-1

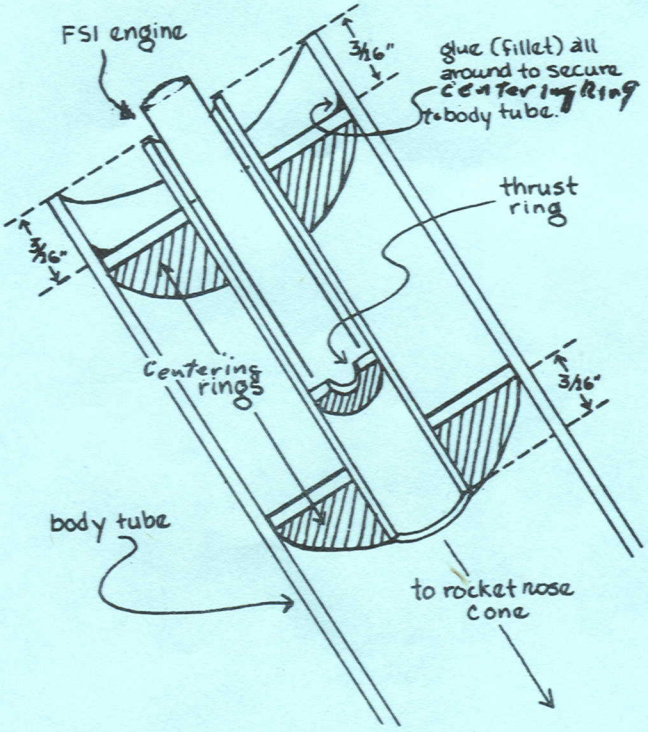
SUPPLIMENTARY INSTRUCTIONS:

In addition to the engines listed on the front of the package this rocket can be flown with Flight Systems, Inc. NEW 18mm A, B, and C engines. In order to prepare the rocket for the use of these engines you must assemble and install an 18mm engine holder as follows:

1. Glue the two centering rings (one at each end) onto the 3" X 3/4" engine holder tube. The rings should be 3/16" from the ends of the tube as shown below.

2. Install the small thrust ring inside the engine holder tube. It should be located in such a position that when a Flight Systems 18mm engine is installed the engine will protrude approximately 3/8" from the tube. To install the thrust ring place a small amount of glue inside the tube about half way down. Insert the thrust ring in one end of the tube. Using an 18mm engine casing push the thrust ring into position until the engine sticks out of the casing as shown. Remove the engine. Allow the assembled engine holder to dry.

3. Install engine holder assembly into rear of rocket so that it is flush with back of rocket. Be sure that the thrust ring is forward when installing. To install, first put a small ring of glue an inch or two up inside the rocket body tube. Next push the engine holder tube assembly into the rocket until it is flush. Work a small amount of glue into the space at the back of the rocket between the rocket body tube and the engine holder tube so that the glue covers the area between and around the centering ring just inside the rocket body.



FLIGHT SYSTEMS Inc.
9300 EAST 68th STREET
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Additional Assembly Procedures

Follow This Order:

1. BODY TUBE - The body tube is made up of 2 equal lengths joined by a coupler. Take that body tube with the 3 black lines on 1 end (fins go on this end) and using the opposite end, spread a 3/4" long layer of Elmer's glue inside of body tube. Now quickly insert 1/2 of coupler. Take the other body tube and spread a layer of glue inside either end. Quickly press onto coupler until body tubes are touching. Next (quickly) lay glued body tube on flat surface and roll joined tubes with palm of your hand. This will insure that body tubes are straight and parallel. Let lie on flat surface.

2. THRUST RING - Place a heavy band of Elmer's glue about 2" inside body tube on end with 3 fin alignment marks. Insert thrust ring by using FSI A, B, C, or D rocket engine. Push thrust ring forward until A, B, C, or D engine projects 1/4" outside body tube. For FSI "E" engine push forward until 7/8" of engine projects outside body tube. The thrust ring forces the glue forward and provides for a strong bond of thrust ring to body tube. Now extract engine and let glue dry.

3. SHOCK CORD MOUNT - Spread a heavy layer of Elmer's glue all over the side opposite the shock cord knot after taking up slack in cord. Curve shock cord mount and insert into nose cone end of body tube and firmly press into place, using finger, until glue holds firmly. Assembly detail sheet shows proper position in body tube.

4. FINS - All 3 fins in your kit are marked with a red edge. This red edge is to be placed next to the body tube. Before gluing into proper position you may want to sand and round off all fin edges except do not sand red edge. After sanding the edges, place a small amount of Elmer's glue along the red edge and immediately press against body tube. Hold securely until glue sets strong enough to support fin. Be sure fin is parallel to body tube and radial through center of body tube. Repeat for the other two remaining fins. Your body tube is marked wth 3 black marks. Place fins along these lines for proper spacing of 120 degrees and parallel alignment. After tack coat of glue dries hard place two more lines of glue along fin and body tube to build up a strong fillet.

5. FLAME PROOF WADDING - Be sure that flame proof wadding is used each time rocket is fired. Push wadding all the way down to thrust ring and pack in firmly with 5/8" dowel or similar tool. Use enough wadding to make approximately a 5/8" long plug. See assembly detail sheet.

6. PARACHUTE - The parachute is marked in inches. Cut with scissors along the inch lines that give you the size parachute you desire (for Penetrator rocket - 14"). Lay parachute on flat surface and attach shroud lines to parachute using strippable tabs (see detail C). Caution: let no portion of tab project beyond parachute as glue on tab will stick parachute together and interfere with its opening. Try not to touch the glue side of tab with fingers.

7. SHOCK CORD & PARACHUTE - Coil shock cord around your finger and stuff into body tube. Next fold parachute as shown on assembly drawing, gather the parachute together lightly, then wrap shroud lines gently around folded parachute as shown in detail C. Diameter of folded parachute should be slightly smaller than inside diameter of body tube. All details are shown on assembly detail sheet. Be sure nose cone is a gentle fit into body tube. Light sanding may be needed.

8. ROCKET ENGINE - Wrap a small amount of 1/2" wide masking tape around the rocket engine at the position shown on detail A. Use enough tape to secure a snug fit into the body tube as to require a firm push on engine to place in contact with thrust ring. If engine does not fit snugly, it will be ejected instead of parachute and your rocket will free fall. Included with all FSI model rocket engines are details for launching and firing. Ask your dealer for these instructions.

Model Rocket Firing & Launching Equipment

To fly your FSI rocket properly you will need to provide yourself with a 12 volt firing circuit and a simple rocket launch pad. You can easily build your own or purchase from your dealer FSI superior quality launchers and electric ignition panel. Details for building you rown launcher and electric ignition circuit are as follows.

Flight Systems Penetrator: Kit MRK-1

Note:

The Penetrator is described in the various FSI catalogs as being 19" in length. And, if two HRT-808 body tubes are used (each 8" long), together with the HNC-81 nose cone, the overall length is very nearly 19". Curiously, while the kit from which this parts list is derived contains two 0.903" ID tubes, each tube is in fact 9" long. FSI lists no standard 0.903" tube in this length.

The parts list below lists the parts as supplied in the kit, which is why the length for the body tubes is specified as 9". However, as specifed by the catalogs (and the kit instructions), the overall length of the model should be 19".

Parts List

Item	QTY	Description	Size	Comments
1	2	Body Tube HRT-808 (?)	9" L	JT-50C coupler stock would be a close diameter match. Long lengths are available from BMS.
2	1	Coupler SC-8	1-1/2" L	
3	1	Nose Cone HNC-81	2-7/8" L	Turned from pine. Blunt Ogive, shape similar to BNC-50K (Alpha). 3/4" shoulder.
4	1	Launch Lug	1/8"x1-1/2"L	
5	1	Fin Set FS-1		1/16" aircraft ply.
6	1	Thrust Ring TR-1	3/16" T	For 0.903" ID body tube.
7	1	Parachute P-12	16" to 10"	Select-A-Chute; 1 mil plastic.
8	1	Shroud Line Kit PC-12		8 shroud lines (20" L), 8 adhesive tape strip, swivel
9	1	Shock Cord SC-1	24" L	1/16" braided round elastic.
10	1	Shock Cord Mount SA-6	1-1/4" x 2-1/8"	Paper
11	1	Eye Screw ES-1		
12	1	Wadding FW-1		
13	1	Chrome Label CL-4		FSI Self Adhesive logo.