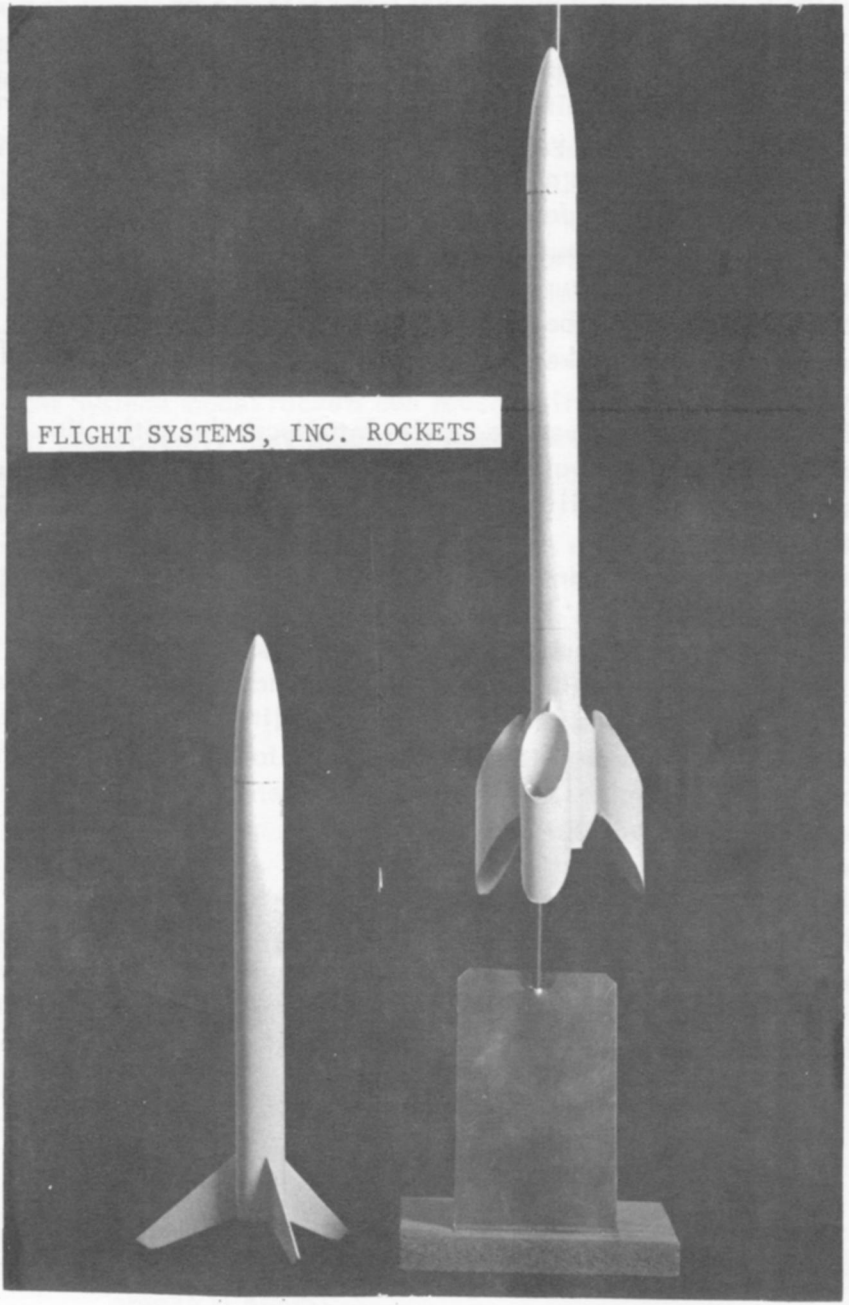
REESE INDUSTRIES

ROCKET DIVISION



9300 EAST 68th STREET
RAYTOWN, MISSOURI
64133

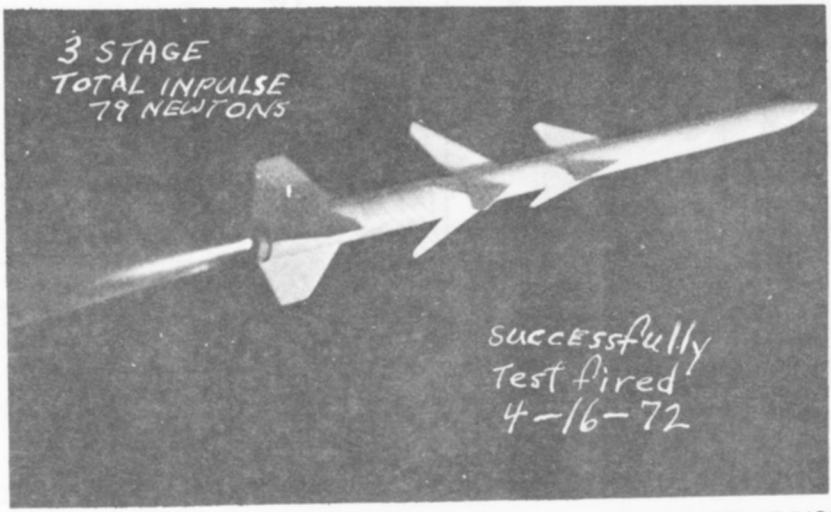
MODEL ROCKET SAFETY CODE
Solid Propellant

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 pre-loaded 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 oz.) 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 15 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 building, 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 TARGET & 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.

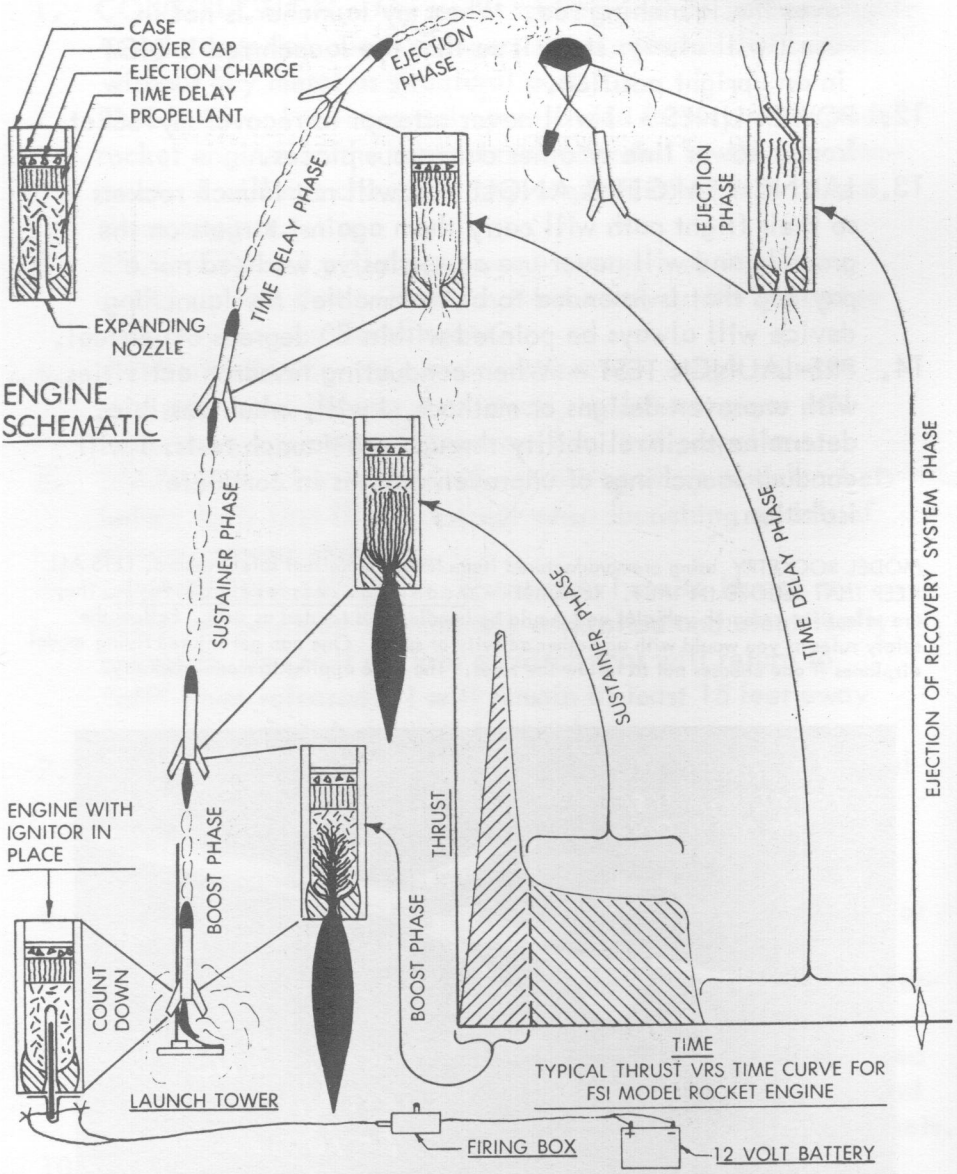
MODEL ROCKETRY using premanufactured items has an excellent safety record. LETS ALL KEEP THAT RECORD IN TACT. REMEMBER - Model Rockets are not toys. They are scientific research vehicles and should be handled and treated as such. Follow the safety rules as you would with any other activity or sport. One can get injured flying model airplanes if one chooses not to follow the rules. The same applies to model rocketry.



HIGH ALTITUDE COMPETITION MODEL SHOWN ABOVE USES 3(staged) F.S.I. ENGINES CAPABLE OF PRODUCING 79 NEWTONS OF IMPULSE. BUILT COMPLETELY FROM F.S.I. PARTS LISTED ON PAGE 31.

INTERNAL BALLISTICS — EXTERNAL BALLISTICS

RELATIONSHIP OF ENGINE BURNING PHASES TO FLIGHT AERODYNAMICS



BALLISTICS

INTERNAL BALLISTICS - is the science dealing with the thermochemistry of combustion of the propellant in the engine and the accompanying physical phenomena of gas production and expulsion to produce thrust. Simply stated, it is the combustion of the propellant to produce a gas which then undergoes a change in enthalpy through the rocket nozzle to produce thrust.

EXTERNAL BALLISTICS - is the science dealing with the flight of the rocket after it leaves the launcher. As the engine is usually still thrusting at this time, we have the forces of engine thrust and the aerodynamic forces on the rocket body to consider.

MODEL ROCKET FLIGHTS

COUNT DOWN The Model Rocket has been preflight checked and placed on the launch tower. The rocket engine ignitor has been placed in the core of the rocket engine. Wires from the firing box are connected to the engine ignitor and the battery. All systems are now go. The countdown is begun and the firing button is pressed when countdown reaches zero. The rocket engine ignites. Action on the thrust-time curve start at the lower left hand corner.

BOOST PHASE - The propellant is now burning away from the engine core where it was ignited by the electric ignitor. In a well designed rocket engine, burning takes place only on the surface of the propellant. As the propellant burns out and away from the core, the burning area increases producing an increase in the volume of gas produced. This gas is ejected through the engine nozzle to produce thrust. Burning area continues to increase until all the propellant around the initial core is burned to the engine wall. This produces the high peaked thrust shown on the thrust-time curve.

Initial high thrust is necessary for stable rocket flights. The rocket must leave the launcher with sufficient velocity for aerodynamic control. This is achieved by the fins on the Model Rocket passing through the air at high speed. This keeps the model pointed in an upward direction.

SUSTAINER PHASE - By now the propellant around the core has burned out to the core wall. The area of burning is now across the inside diameter of the engine case. Less gas for thrust is being produced. This is shown on the thrust-time curve by the lower thrust plateau.

During this portion of the flight, sufficient thrust must be produced by the rocket engine to keep the model rocket accelerating upward. Otherwise the model will loose aerodynamic control and pitch over and head back to earth.

TIME DELAY PHASE - All the propellant in the engine is now consumed and the time delay material is ignited. No thrust is produced by the time delay material as shown on the thrust-time curve.

The Model Rocket is now coasting on the momentum which was stored in the system during the boost and sustainer phase of engine thrust. A well designed Model Rocket system should continue to coast to an altitude which is equal to twice engine burn out altitude. Gravity and aerodynamic friction on the Model Rocket begin to slow it down until the apogee of flight is reached.

EJECTION PHASE - When the Model Rocket is in the apogee of its flight, the time delay material burns through into the ejection charge. The ejection charge produces a large quanity of gas. This gas pushes the cover cap out of the engine and everything in the tube ahead.is ejected. The ejected parachute unfolds and lowers the model rocket gently and safely to the ground. Many more flights can be made with the same model.

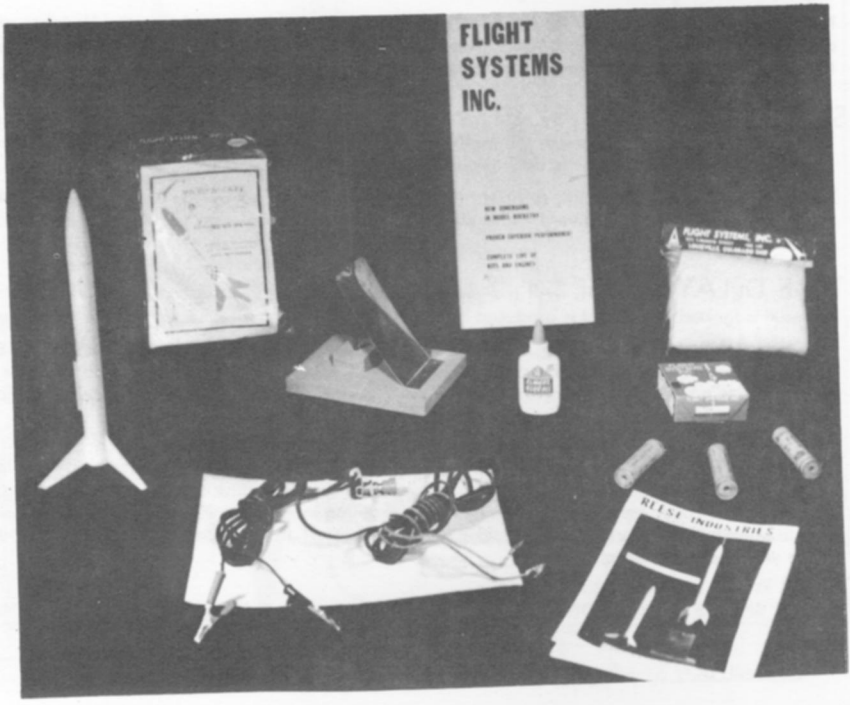
STARTER PACKAGE

Includes everything you need to build and launch your first model rocket. Fascinating, educational, scientific, hobby and sport.

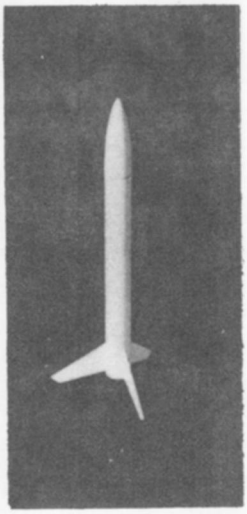
Includes:
- 1 Micro Rocket Kit
- 1 btl. White Glue
- 3 Assorted Rocket Engines
  - A4-4 B3-4 C4-4
- 1 Launch Stand
- 1 Electric Ignition System
- 1 Catalog and Technical Manual
- 1 Pkg. Flame Proof Wadding

Value
$10.40

Kit. No. SP-I --- $7.85



FLIGHT SYSTEMS, INC.



MICRO MRK-VIII

A high performance kit designed by rocket engineers to introduce the newcomer to the thrills and excitement of model rocketry. Easy to follow instructions. Build, ready to launch in 15 minutes. This bird performs with the best. Altitudes to 3000'+

SPECIFICATIONS: Length ----- 11.5"
Body Dia.-- 0.903"
+Takeoff weight without engine ---- 1.6 oz.(30 gr.)

Recommended F.S.I. Engines: *A4-4, D4-6
B3-4, E5-6

Kit No. MRK-VIII ----- $ 1.75

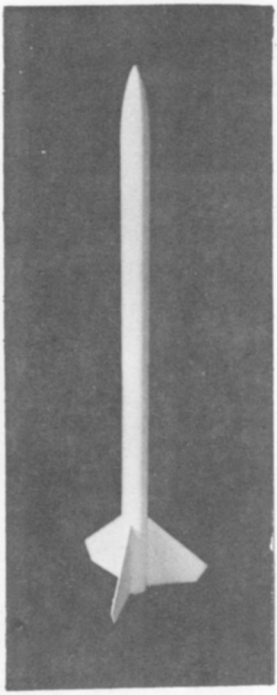
PENETRATOR MRK-I

One of the finest flying rockets in the F.S.I. fleet. Streamlined aerodynamic shape cuts drag to a minimum. Altitudes in excess of 4000 feet can be reached using the powerful F.S.I. Rocket Engines.

SPECIFICATIONS: Length ----- 19.0"
Body Dia.--- 0.903"
+Takeoff weight without engine:----- 1.45 oz.(41gr.)

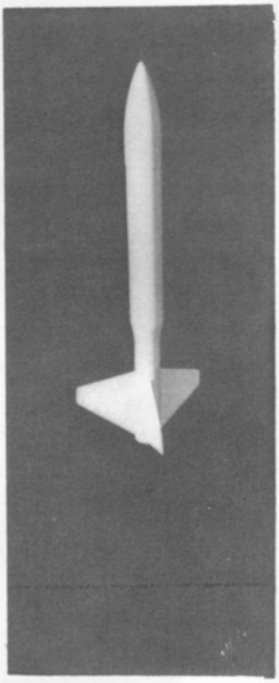
Recommended F.S.I. Engines: *A4-4, B3-4, C4-4, D4-6, D6-6, D18-6, E5-6

Kit No. MRK-I --- $ 2.25



+ All takeoff weights approximate.
* Suggested for lower altitude flights to facilitate recovery

SPRINT MRK-VII

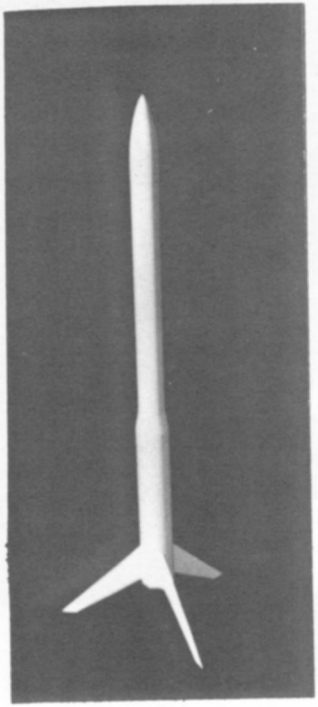


A competition model, the Sprint features a large upper body tube with a reverse transition to a smaller lower body tube. A large streamer or parachute can be packed in the upper body for long duration flights. The effect of base drag can be compared with that of a model like the Nova Kit.

SPECIFICATIONS: Length ------- 15"
Body Dia. above transition 1.130"
Body Dia. below transition 0.903"
+Takeoff weight without engine: ---- 1.94 oz(55 gr.)

Recommended F.S.I. Engines: * B3-4 D6-4
C4-4 D6-6
C4-6 D18-4
Kit No. MRK-VII -- $2.50 D4-4 D18-6
E5-6

ORBIT MRK-VI

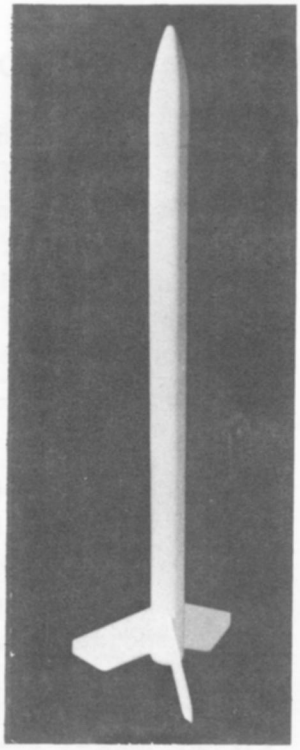


This rocket designed to make maximum use of the F.S.I. long thrusting (9 sec.) F7-6 Rocket Engine, will reach altitudes beyond ground visibility. A highly stable bird; a real crowd pleaser even when flown with smaller engines.

SPECIFICATIONS: Length ------- 20"
Body Dia. above transition 0.903"
Body Dia. below transition 1.130"
+Takeoff weight without engine: --1.91 oz.(54gr)

Recommended F.S.I. Engines: *B3-4 C4-4
D4-6 D6-6
DI8-4 DI8-6
Kit No. MRK-VI --$2.75 E5-6 F7-6
FI00-8

VOYAGER MRK-IV

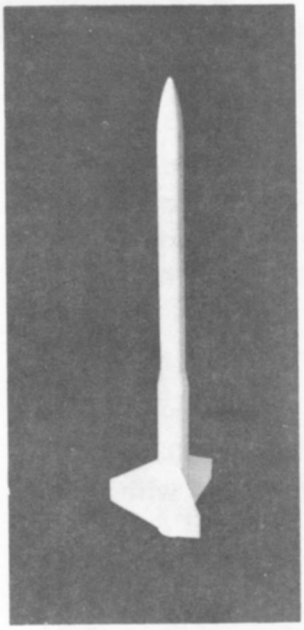


The Voyager with its separate recoverable payload capsule is the high altitude scientific experimental vehicle of the F.S.I. Fleet. Experiments placed in the capsule are returned safely to earth with the capsule which is ejected and recovered separately from the main body of the rocket. To use Flight Systems D, or E engines - order Conversion Kit C-20.

SPECIFICATIONS: Length -----22.5"
Body Dia.---1.130"
+Takeoff weight without engine: 3.32 oz.(94 gr)

Recommended F.S.I. Engines: * D4-6 E5-6
D6-6 F7-6
D18-4 F100-8
D18-6

Kit No. MRK-IV --$3.00



NOVA MRK-III

Nova is a kit designed to test your building skill and give you experience with aerodynamic flow across a transition section. A sophisticated model surging to altitudes above 3500' with larger F.S.I. Engines. As with all F.S.I. Models, features include rugged birch plywood fins to withstand the shock of many landings.

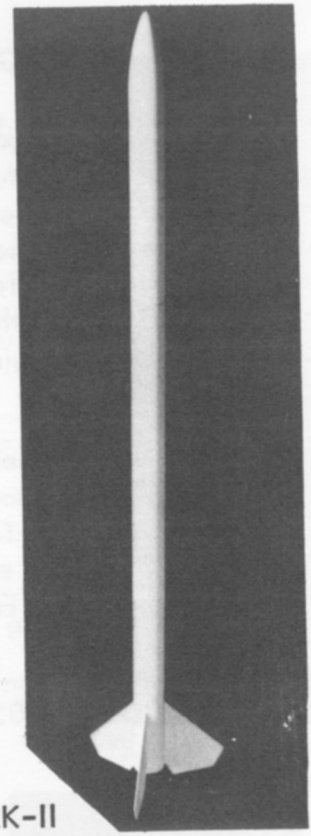
SPECIFICATIONS: Length ----- 18"
Body Dia. above transition 0.903"
Body Dia. below transition 1.130"
+Takeoff weight without engine:- 1.45 oz.(57 gr)

Recommended F.S.I. Engines: *B3-4 C4-4
D4-6 D6-6
D18-4 D18-6
E5-6 F7-6

Kit No. MRK-III---$2.50

+ All takeoff weights approximate.
* Suggested for lower altitude flights to facilitate recovery.

OSO MRK-V



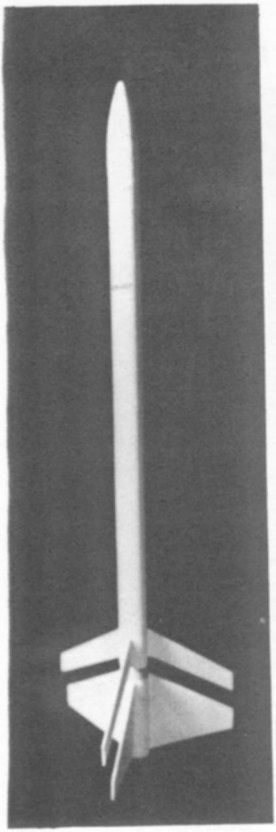
Propel heavy experimental payloads to extreme altitudes with this highly stable and majestic bird. Payload section and rocket body are recovered as one unit. Oso was designed to make use of an engine which was a break-through in model rocket engine design, the F100. Other recommended engines will also assure spectacular flights. Order Conversion Kit -C20 for using D engines.

SPECIFICATIONS: Length ----- 29"
Body Dia.---1.130"
+Takeoff weight without engine:-----3.5 oz.(99 gr)

Recommended F.S.I. Engines: * D6-6 F7-6
D18-4 F100-8
D18-6

Kit No. MRK-V -----$3.00

STAR GAZER MRK-II



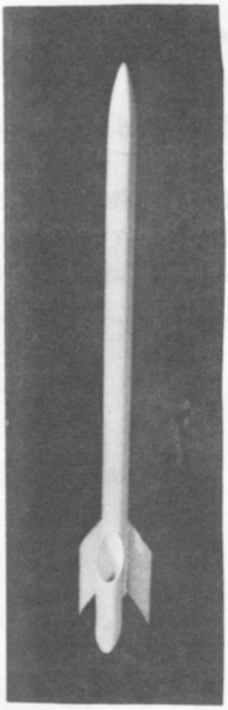
High performance two stage rocket. Unique fin design blends upper and lower fins into one smooth aerodynamic shape. 1st stage has tumble recovery. 2nd stage can be flown without booster stage. This bird streaks to altitudes of well over 4000 feet with the proven superior performance of Flight Systems' D and E series engines.

SPECIFICATIONS: Length ----- 23"
Body Dia.--0.903"
+Takeoff weight without engines:---1.94 oz.(55gr)

Recommended F.S.I. Engines:	1st stage	2nd stage
	* B3-0	* B3-4
	C4-0	C4-6
	D6-0	D6-6
	D18-0	D18-6
	E5-0	E5-6

Kit No. MRK-II ---$2.50

VIKING I MRK-IX



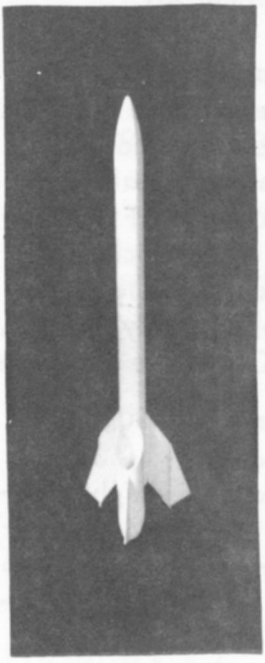
An advanced design rocket. New and superior type of stabilizers permit ma ximum stability with minimum drag. The lower drag coeficient results in greater altitudes than have been possible with the more conventional flat fin designs. This rocket is great in competition and sport flying. Explore the sky with the Viking Series by Flight Systems, Inc.

SPECIFICATIONS: Length -----20"
Body Dia.---0.903"
+Takeoff weight without Engine:---1.6 oz.(30 gr.)

Recommended F.S.I. Engines: *A4-4 D4-6
B3-4 D6-6
C4-4 D18-6
C4-6 E5-6

Kit No.MRK-IX ---$2.25

VIKING II MRK-X



Another of the Viking Series rockets, this model makes a fine display rocket as well as a highly stable flying model. This bird, designed by F.S.I. rocket engineers is a high performance vehicle which will soar thousands of feet into the sky with little effort. Parachute recovery or streamer recovery as with other F.S.I. rockets. Be a contest winner. Fly with F.S.I.!!!

SPECIFICATIONS: Length --- 16"
Body Dia.- 0.903"
+Takeoff weight without engine:1.5oz(30gr)

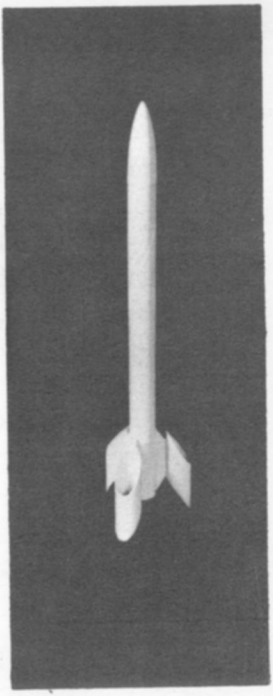
Recommended F.S.I. Engines: *A4-4 D6-6
B3-4 D18-4
C4-4 D18-6
D4-4 E5-6
D4-6

Kit No.MRK-X ---$2.50

+All takeoff weights approximate.

*Suggested for lower altitude flights to facilitate recovery.

VIKING III MRK-XI

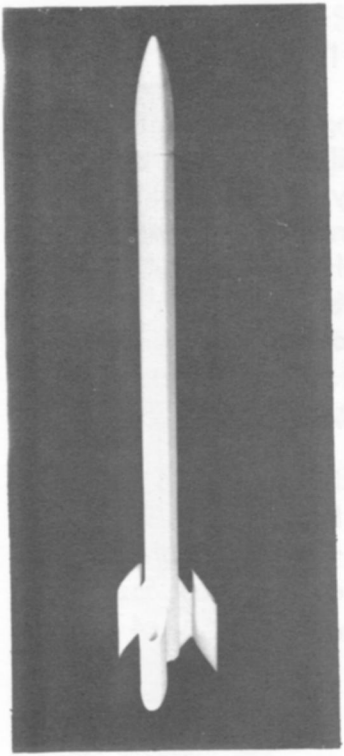


Included in this kit are all of the features found in the Viking I and II, with the addition of extended stabilizers. Extreme stability even in less than ideal flying weather are characteristic of this superior rocket. Altitudes to 3500 feet.

SPECIFICATIONS: Length -----15"
Body Dia.---0.903"
+Takeoff weight without engine:---1.5 oz.(30gr.)

Recommended F.S.I. Engines: *A4-4 D4-6
B3-4 D6-6
B3-6 D18-6
C4-4 E5-6

Kit No. MRK-XI---$2.75



VIKING IV MRK-XII

The big brother of the advanced design Viking rockets. Features extreme stability, and low drag due to the latest inovation in stabilizer design. Results are altitudes to 4000 feet and more using the F Series rocket engines by F.S.I. This rocket is designed for the advanced rocketeer who wants the finest in stable high flying birds. Order Conversion Kit C20 to use D engines.

SPECIFICATIONS: Length--- 20¼"
Body Dia- 1.130"
+Takeoff weight without engine:2.1oz(57gr)

Recommended F.S.I. Engines: D18-4 F7-6
D18-6 F100-8

Kit. No. MRK-XII --$3.00

+All takeoff weights approximate.
*Suggested for lower altitude flights to facilitate recovery.

FLIGHT SYSTEMS, INC.
MODEL ROCKET ENGINES

Proven power and reliability. Longest thrusting engines in the industry. Programmed for maximum thrust with minimum drag. Extreme penetration of space. For the best available fly with FSI.

Distributed by REESE INDUSTRIES
9300 East 68th Street
Raytown, Mo. 64133

Area code 816-353-1616

FLY WITH F.S.I., THE LEADER IN THE INDUSTRY IN LIGHT-WEIGHT HIGH PERFORMANCE ROCKETS AND LONG BURN ENGINES.

METRIC and ENGLISH MEASUREMENT

Much technical information concerning model rockets is expressed using metric measurements. Therefore it is desirable that the rocketeer understand the relationship between the metric and english system of measurements. The following table expresses that relationship.

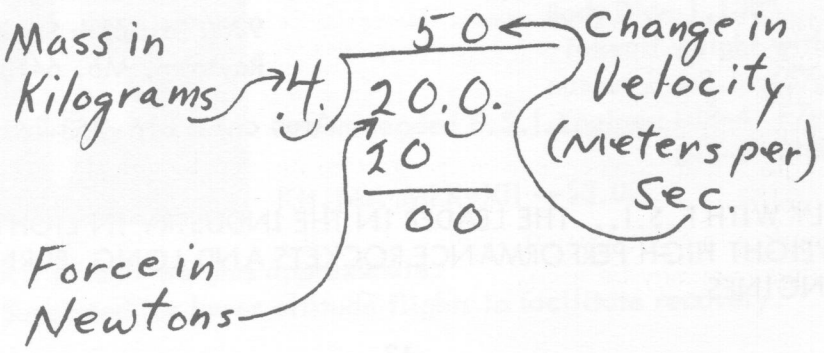
Millimeter	= .03937 inches	Newton = 0.225 pounds of force	
Centermeter	= .3937 inches	Newton second = 0.225 pound sec.	
Meter	= 39.37 inches	Ounce = 28.35 grams	
Meter	= 3.281 feet	1 pound of force = 4.45 newtons	
Gram	= 0.0353 ounces	1 pound second = 4.45 newton sec.	
Kilogram	= 35.3 ounces		
Kilogram	= 2.207 pounds		

NEWTON

The energy required to move an object is expressed in newtons. A newton is the amount of energy needed to move one kilogram with a change in velocity of one meter per second each second it is being acted on by the force.

$$\text{change in velocity (meters per sec.)} = \frac{\text{Force in newtons (20)*}}{\text{Mass in kilograms (0.4)*}}$$

Example: 0.4* kilogram rocket acted upon by a force of 20* newtons will have a change in velocity of 50 meters per second each second it is being acted upon, as per the formula given 0.4* kilograms divided into 20* newtons of force equals 50 meters per second change in velocity for each second this force is acting upon the rocket.



FLIGHT SYSTEMS, INC. MODEL ROCKET ENGINES

All FSI model rocket engines are SAFETY APPROVED and CONTEST CERTIFIED by the National Association of Rocketry.

NFPA All FSI Model Rocket engines comply with the National Fire Protection Association code for Model Rocketry, No. 41L-1968.

ELECTRIC IGNITORS - Electric ignitors are included with all FSI rocket engines.

ENGINE CLASSIFICATION CODE - Total impulse limits set by the National Association of Rocketry (NAR) and the Federation Aeronautique Internationale (FAI).

ENGINE MARKING CODE

E5-6
- 6 — Delay Time (sec)
- 5 — Average thrust (Newtons)
- E — Total impulse from table at right

ENGINE CLASSIFICATION CODE

ENGINE TYPE	TOTAL IMPULSE Newton Seconds	TOTAL IMPULSE Pound-Seconds
A	1.26 to 2.50	0.29 to 0.56
B	2.51 to 5.00	0.57 to 1.12
C	5.01 to 10.00	1.13 to 2.24
D	10.01 to 20.00	2.25 to 4.48
E	20.01 to 40.00	4.49 to 8.96
F	40.01 to 80.00	8.97 to 17.92

ENGINE SELECTION

Which Engine Should I Use?

FLIGHT SYSTEMS, INC. produces a variety of engines for model rocketeers to choose from. These fall in several broad catagories of uses. FSI has NAR Safety Approved & Contest Certified Model Rocket Engines in all sizes A through F.

INITIAL THRUST - All FSI engines have a high initial thrust so that aerodynamic stability of Model Rocket is obtained when model leaves the launch rod.
Note: Initial thrust is the high peak on the thrust-time curve.

SUSTAINER THRUST - Thrust necessary to keep Model Rocket accelerating after initial thrust of engine. Note: Sustainer thrust is the lower plateau on the thrust-time curve. Recommended maximum weight of rocket system is based on amount sustainer phase of engine can accelerate after initial boost phase.

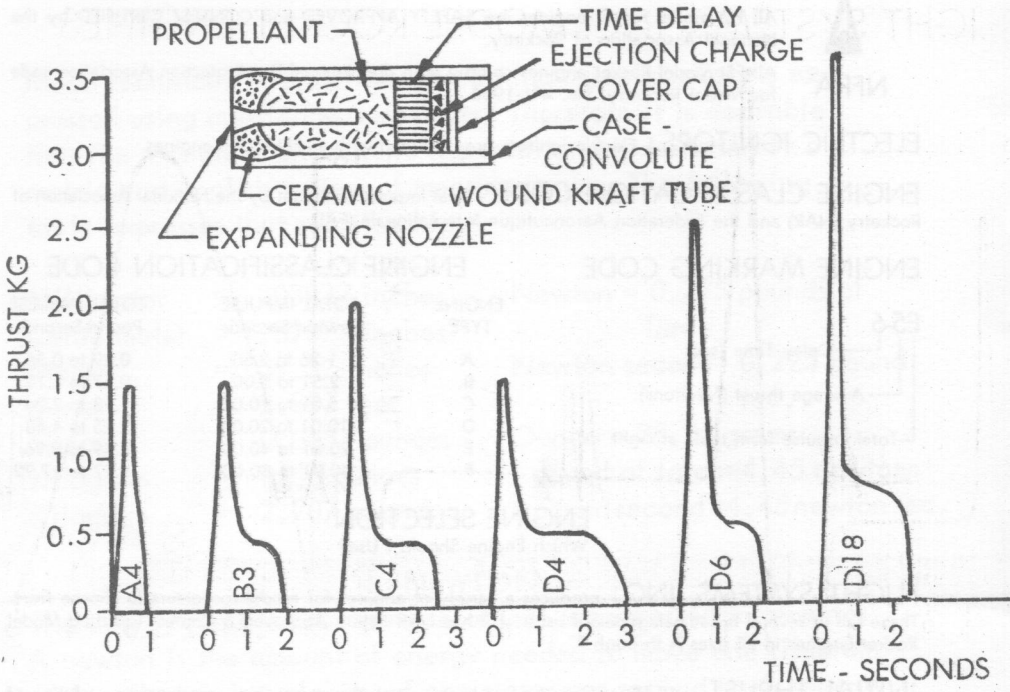
LONG THRUSTING - Engine with normal initial thrust but with a long sustaining thrust for very high altitudes and much realism in Model Rocket flights. Use D4-x, E5-x, F7-6. Specify delay time in place of x. See table of delay times manufactured for each engine designation.

LOAD LOFTING - Engine with large total impulse but very short burn-time for lofting heavy models to altitude. Use F100-x. Specify "O" time for booster engine or "8" for delay time engine.

ZERO DELAY TIME - Engine with no delay time or ejection charge. Used for lower stage engines and ignition of upper stage engines. Specify "O" after dash in code number, example: D6-O.

DELAY TIME - Use 6 and 8 second delay time for upper stage on staged models or for models which are to descend from apogee before recovery. These engines are B3-6, C4-6, D4-8, and D6-8. Use other delay times for recovery at apogee. NOTE: All engines with delay time have ejection charges.

ENGINE SCHEMATIC

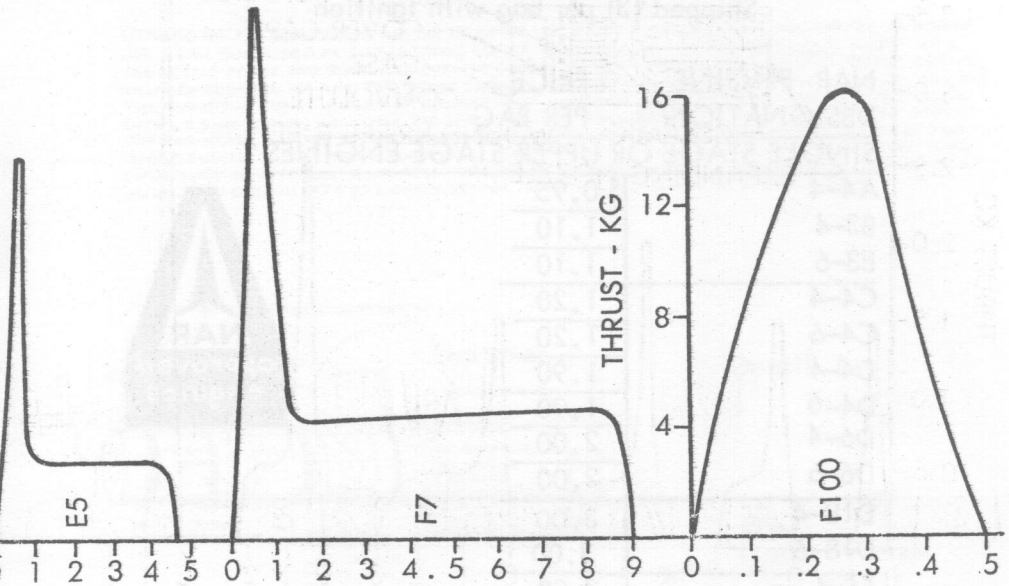


ENGINE DESIGNATION (1) * NAR CODE	PRICE PER PKG. OF 3 ROCKET ENGINES	TOTAL IMPULSE (N SEC.)	TOTAL IMPULSE (lb SEC.)	THRUST-MAX (KG)	THRUST-MAX (OZ)
A4-x	$0.95	2.5	.56	1.5	53
B3-x	$1.10	5.0	1.1	1.5	53
C4-x	$1.20	9.0	2.0	2.0	71
D4-x	$1.90	11.0	2.5	1.5	53
D6-x	$2.00	14.0	3.2	2.5	88
D18-x	$3.00	20.0	4.5	3.6	127
E5-x	$3.00	22.0	5.0	2.5	88
F7-6	$8.75	60.0	13.5	3.5	7.7 lb
F100-x	$8.75	50.0	11.3	16.0	35 lb

* NOTES:

1. In place of "x" substitute desired delay time from column of "Delay Times Manufactured."
2. "O" Delay time is for booster engines. Booster engines do not contain an ejection charge.
3. Recommended weight is based on amount sustainer phase of engine can accelerate after initial boost phase.

TYPICAL THRUST vrs TIME CURVES
for
FLIGHT SYSTEMS, INC. MODEL ROCKET ENGINES



THRUST TIME (SEC.)	DELAY TIMES * MFG. (2) (SEC.)	ENGINE SIZES & WEIGHTS					RECOMMENDED MAXIMUM LIFT OFF WT. (3)* (GRAMS)
		Length (MM)	Dia (MM)	Init WT (G)	Burnout WT (G)	Prop WT (G)	
.7	0, 4	70	21	22	15	3.9	90
1.8	0, 4, 6	70	21	26	15	7.8	125
2.5	0, 2, 4, 6	70	21	30	15	11.7	150
2.9	0, 4, 6	70	21	32	15	13.4	125
2.2	0, 4, 6	70	21	32	15	13.4	150
2.3	0, 4, 6	95	21	43	21	19.0	175
4.5	0, 2, 6	95	21	45	21	21.0	150
9.0	2, 4, 6	150	27	110	50	50.0	225
.5	0, 4, 8	150	27	110	50	50.0	400

TD-406

FLY WITH FSI

FLIGHT SYSTEMS, INC.

MODEL ROCKET ENGINES

Shipped (3) per bag with ignition

NAR ENGINE DESIGNATION	PRICE PER BAG
SINGLE STAGE OR UPPER STAGE ENGINES	
A4-4	$0.95
B3-4	1.10
B3-6	1.10
C4-4	1.20
C4-6	1.20
D4-4	1.90
D4-6	1.90
D6-4	2.00
D6-6	2.00
D18-4	3.00
D18-6	3.00
E5-6	3.00
* F7-6	8.75
* F100-4	8.75
* F100-8	8.75
BOOSTER STAGE ENGINES	
A4-0	$0.95
B3-0	1.10
C4-0	1.20
D4-0	1.90
D6-0	2.00
D18-0	3.00
E5-0	3.00
* F100-0	8.75
BOOST GLIDER ENGINES	
A4-2	$0.95
B3-2	1.10
C4-2	1.20
D4-2	1.90
D4-4	1.90
E5-2	3.00
* F7-2	8.75

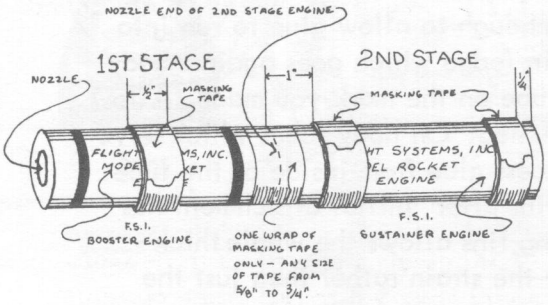
NAR approved engines

* F engines are not mailable see page 32.

MANUFACTURERS ONLY OBLIGATION SHALL BE TO REPLACE SUCH QUANTITY OF THE PRODUCT PROVED TO BE DEFECTIVE. USER SHALL DETERMINE THE SUITABILITY OF THE PRODUCT FOR HIS INTENDED USE, AND ASSUME ALL RISK AND LIABILITY IN CONNECTION THEREWITH

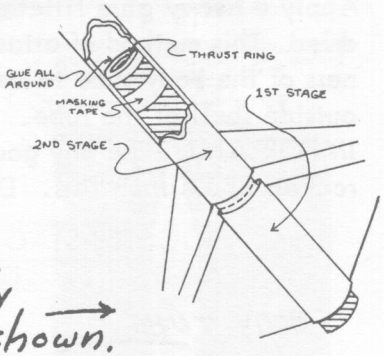
STAGING ENGINES FOR MULTI-STAGE ROCKETS

STAGED ROCKET ENGINES — FOR THE 1ST STAGE USE A F.S.I. BOOSTER ENGINE AND FOR THE 2ND STAGE USE A F.S.I. SUSTAINER OR SINGLE STAGE ENGINE. DO NOT ALTER THIS ARRANGEMENT. INSERT INTO THE NOZZLE OF THE 2ND STAGE ENGINE THE ENGINE IGNITOR SUPPLIED WITH EACH F.S.I. ROCKET ENGINE. NOW LAY BOTH THE 1ST AND 2ND STAGE ENGINES ON A FLAT SURFACE AND BUTT THE 1ST STAGE AGAINST THE 2ND STAGE ENGINE AND WRAP THE BUTT JOINT WITH ONE ONLY LAYER OF MASKING TAPE (FOLLOW DETAIL E DIRECTIONS). NOW TAKE THE TAPED ENGINES AND WRAP SUFFICIENT MASKING TAPE AROUND THE 2ND STAGE ENGINE AT THE 2 LOCATIONS SHOWN ON DETAIL E TO INSURE A FIRM FIT OF 2ND STAGE ENGINE TO 2ND STAGE BODY TUBE. NOW PUSH TAPED ENGINES INTO 2ND STAGE BODY TUBE UNTIL THEY TOUCH THRUST RING. NOW WRAP THE 1ST STAGE ENGINE WITH MASKING TAPE (SEE DETAIL E) USING ONLY ENOUGH TAPE TO LIGHTLY SECURE 1ST STAGE SECTION TO 1ST STAGE ENGINE.



METHOD FOR STAGING ENGINES

Detail E



Slide 1st stage fin assembly onto 1st stage engine as shown. →

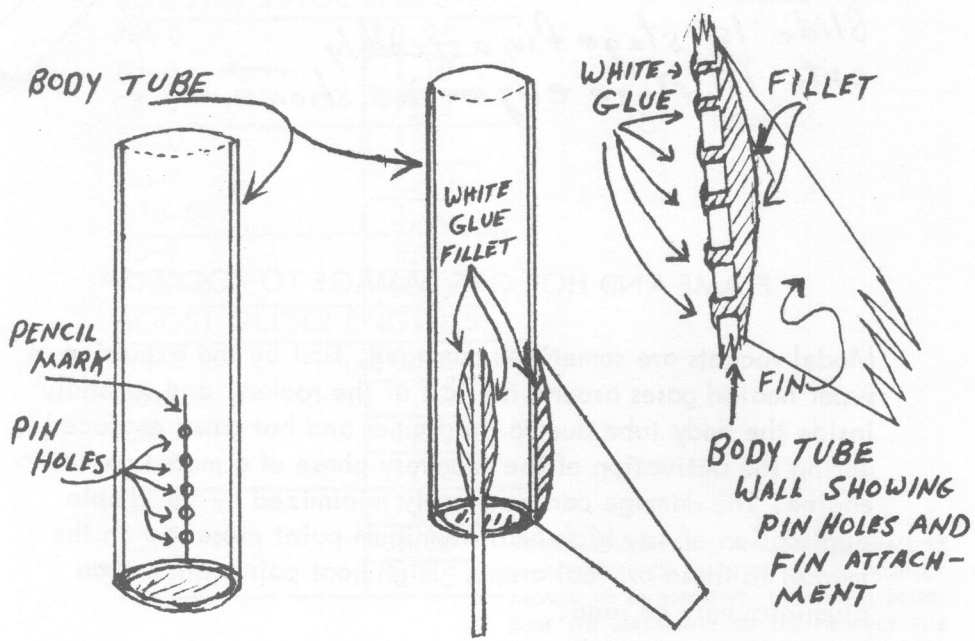
FLAME AND HOT GAS DAMAGE TO ROCKETS

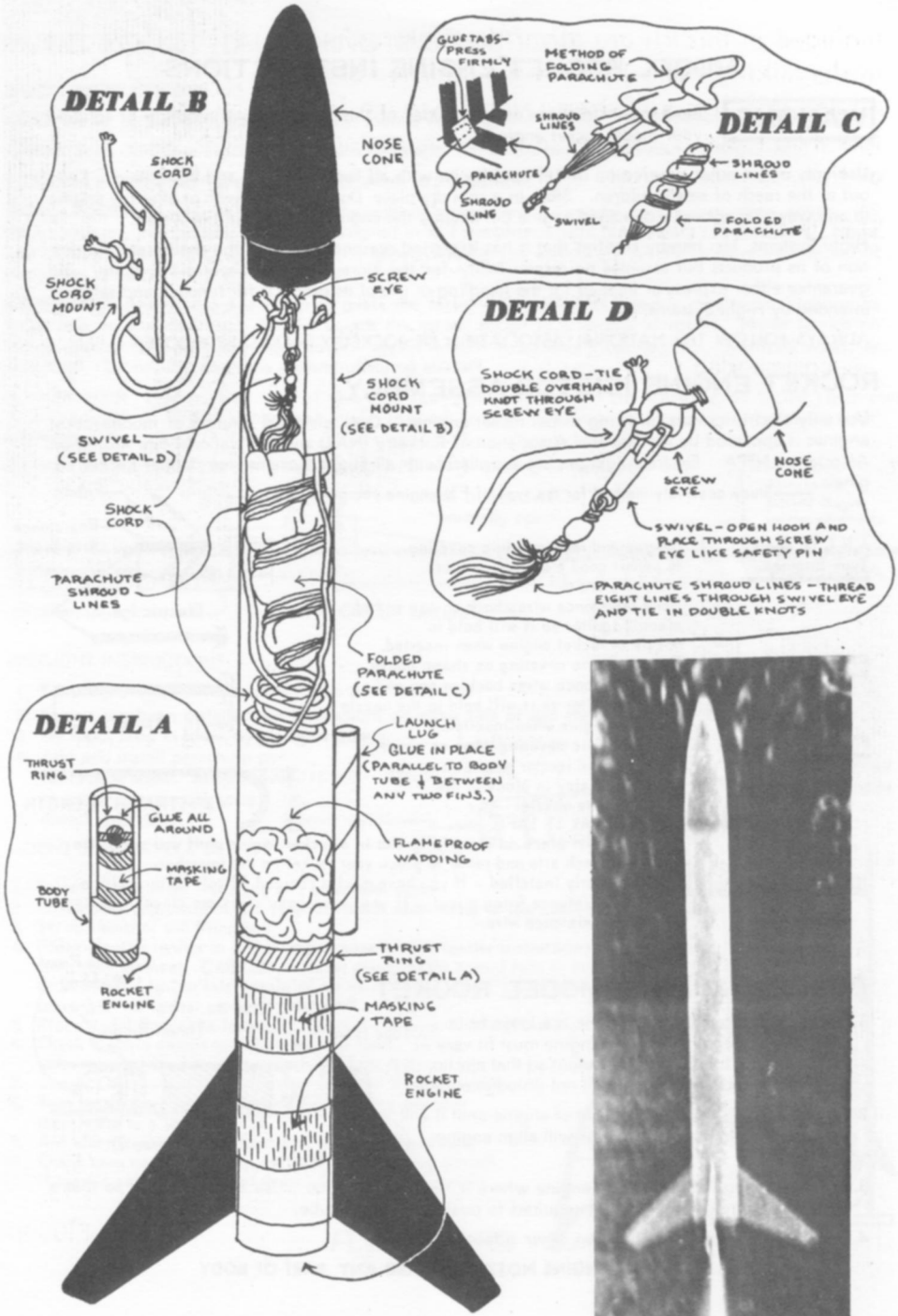
Model rockets are sometimes damaged, first by the expulsion of super heated gases around the tail of the rocket, and secondly inside the body tube due to the flames and hot gases produced during the activation of the recovery phase of a model rocket engine. The damage can be greatly minimized by the simple application of any high heat aluminum paint presently on the market to these critical areas. High heat paints other than aluminum may be used.

STABILIZER FIN ATTACHMENT

When the fins on a model rocket receive abuse they tear loose along with the outer shell of the body tube. Forces acting upon the model during staging on multi-stage rockets as well as the stresses incured during liftoff have torn fins from body tubes. Usually the outside of the tube tears rather than the glue letting go. The following will help to deter this problem. Before attaching fin, locate the place where the fin will be attached to the body tube. Mark this location on the body tube with a pencil mark, (FIG. 1). Take a straight pin or similiar pointed object and punch a series of holes large enough to allow glue to run into them. Apply glue to root of fin (edge which goes against body tube) and attach fin to body tube on the mark you made. Allow glue to run into holes you punched. On body tubes which serve as the engine mount, wipe excess glue from inside of the tube. Apply a heavy glue fillet to fins after initial attachment has dried. This method of attaching fins allows the whole thickness of the body tube to carry the strain rather than just the outside shell of the tube.

IMPORTANT: Use any good quality white glue to build rockets and attach fins. Do not use airplane type cement.




DETAIL B
SHOCK CORD
SHOCK CORD MOUNT
NOSE CONE
SCREW EYE
SHOCK CORD MOUNT (SEE DETAIL B)
SWIVEL (SEE DETAIL D)
SHOCK CORD
PARACHUTE SHROUD LINES
FOLDED PARACHUTE (SEE DETAIL C)
DETAIL A
THRUST RING
GLUE ALL AROUND
MASKING TAPE
BODY TUBE
ROCKET ENGINE
LAUNCH LUG
GLUE IN PLACE (PARALLEL TO BODY TUBE & BETWEEN ANY TWO FINS.)
FLAME PROOF WADDING
THRUST RING (SEE DETAIL A)
MASKING TAPE
ROCKET ENGINE
GLUE TABS- PRESS FIRMLY
METHOD OF FOLDING PARACHUTE
SHROUD LINES
PARACHUTE
SHROUD LINE
SWIVEL
DETAIL C
SHROUD LINES
FOLDED PARACHUTE
DETAIL D
SHOCK CORD - TIE DOUBLE OVERHAND KNOT THROUGH SCREW EYE
SCREW EYE
NOSE CONE
SWIVEL - OPEN HOOK AND PLACE THROUGH SCREW EYE LIKE SAFETY PIN
PARACHUTE SHROUD LINES - THREAD EIGHT LINES THROUGH SWIVEL EYE AND TIE IN DOUBLE KNOTS

MODEL ROCKET ENGINE INSTRUCTIONS

WARNING Read the instructions on both sides of this sheet before installing or igniting your model rocket engines.

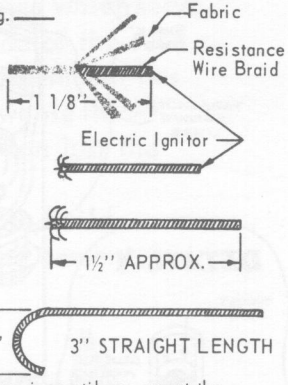
Use only under adult supervision in full compliance with all Federal, State, and Local laws. Keep out of the reach of small children. Store in a cool dry place. Do not tamper with or alter the engine in any way. Do not use a damaged engine but destroy the engine by soaking it in water.

Flight Systems, Inc. hereby certifies that it has exercised reasonable care in the design and fabrication of its products but assumes no responsibility for the storage or use beyond this point. No guarantee either express or implied for the handling or use of its products for function and safety is intended by Flight Systems, Inc.

ALWAYS FOLLOW THE NATIONAL ASSOCIATION OF ROCKETRY (NAR) SAFETY CODE

ROCKET ENGINE IGNITOR ASSEMBLY

Use only electric ignitors for firing model rocket engines. Only electrical ignition of model rocket engines is approved by the National Association of Rocketry (NAR) and the National Fire Protection Association NFPA. Electrical ignitors are supplied with all Flight Systems, Inc. Model Rocket engines. ——Study assembly method for the type of FSI engine you are using.——



A,B,C,D, and E Type Engines.
1. Unwrap and remove fabric covering to permit good electrical contact with wire braid.
2. Bend resistance wires back on one end of electric ignitor so it will hold in nozzle of rocket engine when inserted.

F7 Type Engine.
1. Remove fabric covering as shown above.
2. Bend resistance wires back on one end of electric ignitor so it will hold in the nozzle of an F7 engine when inserted.

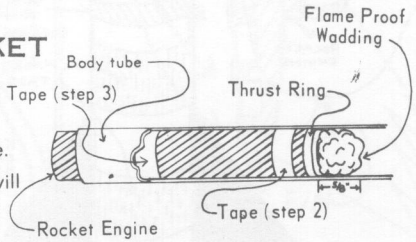
F100 Type Engine.
1. Remove fabric covering same as above.
2. Bend electric ignitor as shown so the ignitor will stay in place in the rocket engine nozzle.

CAUTION ——— PLAY IT SAFE

Never place an electric ignitor in a rocket engine until you are at the launch site and ready to place your rocket on the launcher.

NEVER FAIL IGNITOR – If properly installed – If you have a fully charged 12 volt battery with a low resistance firing circut – If your microgator clips are clean at contact with resistance wire.

PLACE ENGINE IN MODEL ROCKET



1. Notice that Model Rocket engine is a loose fit in body tube or engine mount. Engine must fit very tight in body tube or engine mount so that ejection charge for recovery system will not dislodge engine.
2. Wrap masking tape around front of engine until it will slip freely into body tube. This will align engine properly.
3. Wrap masking tape at rear of engine where it enters body tube. Use enough wraps so that a force of approximately 10# is required to push engine into tube.
4. Follow launching instructions on other side of this sheet.

DO NOT POINT ENGINE NOZZLE TOWARD ANY PART OF BODY

MODEL ROCKET LAUNCHING INSTRUCTIONS

SAFETY INSTRUCTIONS

FIRST AID If propellant is taken internally, induce vomiting and consult a doctor immediately.

BURNS For mild burns use a first aid burn ointment. For severe burns, see a doctor immediately.

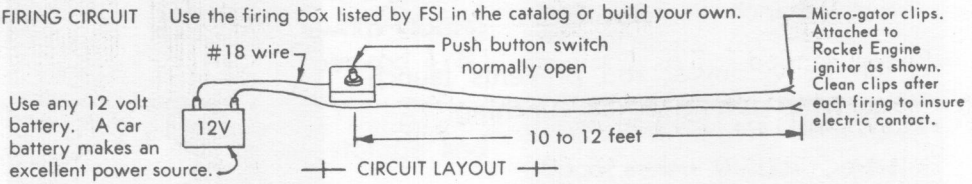
FIRES Use an approved fire extinguisher or water to put out fire.

MODEL ROCKET Build your model rocket exactly as shown on the model rocket instruction sheets. All Flight Systems, Inc. model rockets are designed in full compliance with NAR Safety requirements. Never use metal parts around or near the rocket engine. Always use a recovery system to slow the descent of the rocket to earth.

LAUNCHING Always use a launcher to guide the rocket until sufficient speed is obtained to stabilize its flight in a vertical direction. Always launch the model rocket in a vertical direction. Never launch on windy days or days with low cloud cover. Never launch in an area close to trees, overhead wires, or buildings. Do not launch in the vicinity of flying aircraft.

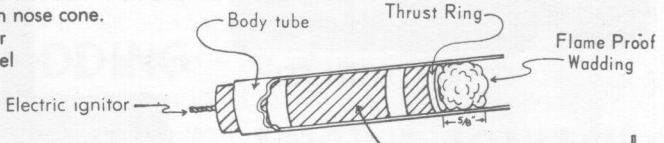
LAUNCHER Use either one of the FSI launchers listed in the catalog or build your own. A 36" length of 3/16" diameter rod, placed in a 6" X6" board for support, makes an excellent launcher.

FIRING CIRCUIT Use the firing box listed by FSI in the catalog or build your own.



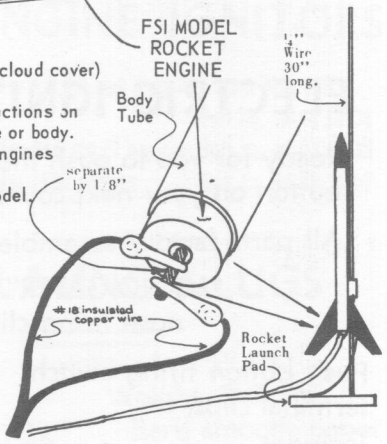
PREFLIGHT INSTRUCTIONS

1. Tamp a 5/8" wad of flame proof cotton over thrust ring.
2. Engine has been installed per instructions on other side of this sheet.
3. Tie shock cord to screw eye in nose cone.
4. Fold and install parachute per instruction sheet. Snap swivel to screw eye in nose cone.
5. Install nose cone.



COUNT DOWN CHECK LIST

1. Select a large clear launching site of several acres.
2. Check wind and cloud cover. (Do not launch when windy or low cloud cover)
3. Set up launcher and firing box.
4. Place electric ignitor in rocket engine nozzle. See ignitor instructions on other side of sheet. **CAUTION** – Never point nozzle toward face or body. Push electric ignitor into nozzle as far as it will go. On F100 engines leave 3/8" of ignitor protruding.
5. Place Model Rocket on launcher. Check for free movement of Model.
6. Check electric circuit to make sure it is open. To be safe, remove wire from battery terminal-Safe Arm.
7. Connect microgator clips to ignitor on Model Rocket engine
8. Warn persons present of intended rocket firing and have them retire to a safe distance.
9. Arm electric circuit. (connect wire to battery terminals)
10. Check area again for safety and look for low flying aircraft.
11. If area is safe – Start count down –5–4–3–2–1–Launch!

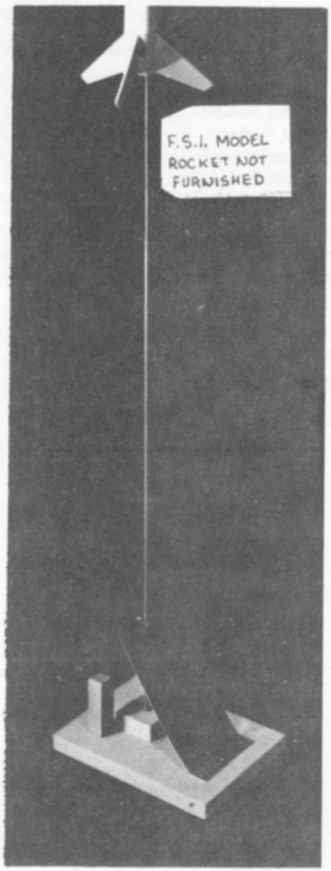


FLY WITH FSI

LAUNCHING SUPPLIES by FSI

Proper launching equipment is very important to good model rocket flights.

ROCKET LAUNCH PAD



Wide base for good solid support during launch.

Sheet metal exhaust deflector.

Launch rod disassembles into two pieces for easy handling and storage.

Lower rod 3/16 inch diameter. Upper rod 1/8 inch diameter.

The heavy lower rod prevents launch rod whip during rocket launching.

Launch rod 30 inches long.

Part No. LP-1 --- $2.50

FLY WITH FSI

ELECTRIC IGNITION

Ready for you to push the firing button on your next count down.

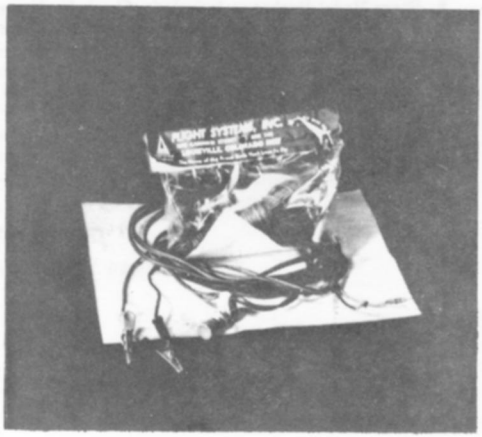
All parts factory assembled

"MICRO-GATER" smooth nose firing clips.

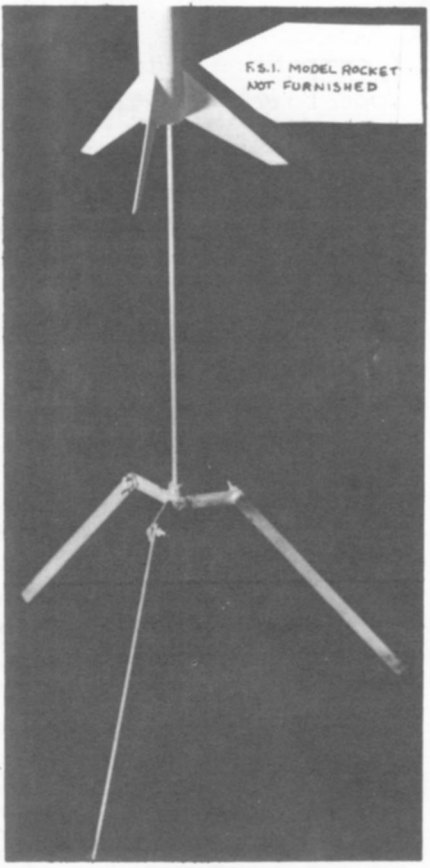
Push button firing switch. Battery terminal clips.

Includes: 16 feet of firing cable

Part No. EC-101
$3.95



COUNT DOWN
5,4,3,2,1, IGNITION
ADJUSTABLE BASE LAUNCH PAD



Professional type launcher. All heavy steel construction - no wood parts.

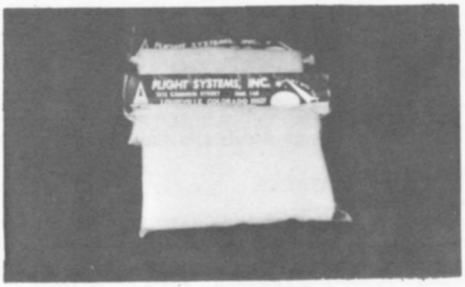
Tripod legs are adjustable so launch rod can be positioned vertically on uneven ground or tipped for wind conditions.

Large diameter lower rod (3/16") prevents launch rod whip during rocket launching. Upper rod 1/8" diameter.

Two piece rod makes storage and handling easier.

Part No. LP-2 --- $3.95

Flame Proof WADDING

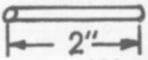


WADDING FW-1--$0.45

ENGINE IGNITORS

For A,B,C,D, and E engines other than D18 Part No. 1A-10 $0.04
For D18 and F7 engines Part No. 1A-20 $0.05
For F100 engines Part No. 1A-30 $0.07

LAUNCH LUGS



¼" ID
Weight .3 Grams
hard smooth paper

Part No. LL-12
$0.10

FIRING CLIPS

Smooth nosed "MICRO-GATOR" clips

Part No. FC-12
$0.20

FLY WITH FSI

SELECT-A-CHUTE by FSI

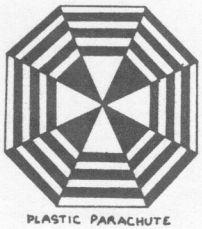
An eight sided (octagonal canopy) one mil plastic brightly colored red and black panels.

Panels are marked so that seven sizes of canopys from 10" to 16" can be made.

Try an 8 panel parachute on your next rocket flight - discover for yourself the advantages of an 8 panel parachute over the commonly used 6 panel parachutes.

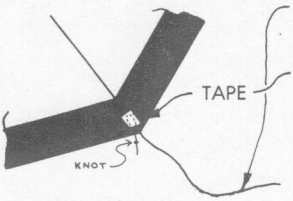
PARACHUTE RECOVERY SYSTEM

KIT P-12 ---$0.50
SELECT-A-CHUTE KIT INCLUDES CANOPY 16" TO 10" RED & BLACK
8 SHROUD LINES AND TAPES AND SWIVEL.
KIT PC-12 ---$0.20
CANOPY ONLY

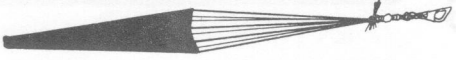


FOLLOW THE INSTRUCTIONS BY NUMBER FOR A PERFECT RECOVERY EVERY FLIGHT--

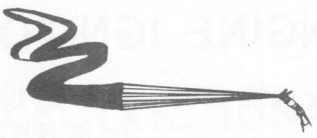
1. Size dimensions are marked along color breaks in parachute panels. Cut out desired parachute size along color break lines.
   Note: 16" is maximum size for a 1⅛" ID tube.
   13" is maximum size for a ⅞" ID tube.
2. Smooth "cut to size" chute out on a flat surface with printed side up.
3. Place a shroud line on each corner of the octagon with about ¾" of the line on the chute.
4. Do not touch sticky side of tape. Place a piece of sticky tape over each shroud line end. Do not let tape lap over edge of chute as it will stick to other parts of the chute and prevent opening during recovery.

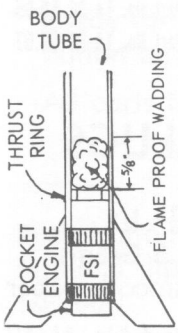


5. Gather all eight shroud lines together and thread through eye of swivel then tie in double knot.
6. Trim ends of knot.



7. Pull parachute into a straight round bundle as shown in step 5. Now fold canopy into thirds.
8. Wrap shroud lines around chute. Parachute should slip easly into body tube.





IMPORTANT PREFLIGHT STEPS FOR PERFECT RECOVERY

1. Place a 5/8" long flame proof wadding plug above engine mount. Tamp in place with a stick. This plug keeps the hot ejection gases from melting the plastic parachute. It also acts as a piston to force out the parachute recovery system.
2. Do not fold and pack the parachute until ready to launch. A parachute which has been folded for a period of time, takes a set and will not unfold easily when the recovery system activates. Talcum powder maybe sprinkled on the parachute before packing to aid in opening; especially on new parachutes.
3. Place parachute in body tube with open canopy end toward rocket engine.

Flight Systems, Inc.

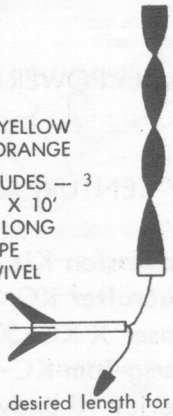
STREAMER RECOVERY SYSTEM

STATE COLOR/RED, YELLOW OR ORANGE

STREAMER KIT INCLUDES — 3 STREAMERS 2"WIDE X 10' LONG
ONE 4" STICKY TAPE
SHROUD LINE & SWIVEL

KIT S-12--

$0.35



WHY USE A STREAMER?

A streamer is a drag device used to return a rocket to earth at a faster rate of descent than allowed by a parachute.

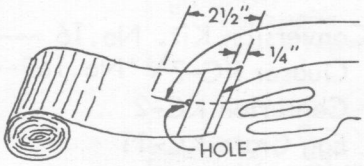
On windy days a faster rate of descent is desired so that rocket will not drift out of launch range area.

Use for very high flying rockets. A faster descent will allow rocket to be recovered in launch area.

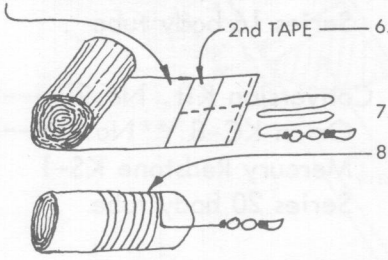
All models designed by Flight Systems, Inc. have plywood fins. The stronger plywood fins will withstand the shock of faster descent landings.

FOLLOW THE INSTRUCTIONS BY NUMBER FOR A PERFECT RECOVERY EVERY FLIGHT

1. Cut streamer to desired length for body tube you are using. Note: A 7½' long streamer will fit a ⅞" ID body tube. A 10' long streamer will fit a 1⅛" ID body tube.

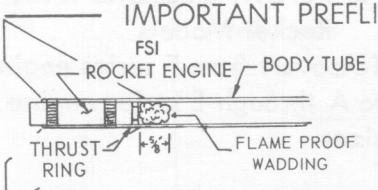


2. Lay 2½" of shroud line on end of streamer.
3. About ¼" from end of streamer, place sticky tape across shroud line and streamer.
4. With a pencil push a hole through streamer at edge of tape and under shroud line.
5. Push shroud line through hole and turn streamer over so that tape side is down.



6. Put the second piece of sticky tape over end of shroud line covering the hole through which the shroud line came through the streamer.
7. Tie swivel to end of shroud line.
8. Streamer may be either folded or rolled into a tight bundle. Wrap shroud line around bundle. Streamer bundle should slide freely into body tube.

IMPORTANT PREFLIGHT STEPS FOR PERFECT RECOVERY



1. Place a ⅝" long flame-proof cotton plug above engine mount. Tamp in place with a stick. This cotton plug acts a a barrier. It keeps the hot gasses from the ejection charge from burning the streamer. It also acts as a piston to force out the recovery system.
2. Make sure streamer bundle slides freely in body tube. Snap shroud line swivel to eye in nose cone.
3. Put sufficient masking tape around rocket engine so that engine is a very tight fit in body tube. Engine must fit tight enough so that it will not be ejected when recovery charge activates.

FLIGHT SYSTEMS, INC.

FLY WITH FSI

LOOK! FSI CONVERSION KITS

Fly your MODELS with dependable F.S.I. SUPER POWER ROCKET ENGINES

For ESTES Rocket Models

Conversion Kit C-55 --- $0.55
- Avenger K-38
- Cherokee D K-47
- Sandhawk K-51
- Arcas K-26
- Interceptor K-50
- Estes BT-55 body tube

Conversion Kit No. C-60---$0.60
** No. C-60F--$0.65
- Big Bertha K-23
- Cobra K-10
- Ranger K-6
- Scrambler K-37
- Farside X K-12
- Omega K-52
- Thor Agena-B K-28
- Saturn V K-39
- Mercury Redstone K-41
- Estes BT-60 body tube

Conversion Kit No. C-70 ---$0.70
** C-70F-- $0.75
- Gemini-Titan K-21
- Little Joe II K-30
- Estes BT-70 body tube

Conversion Kit. No. C-101--$1.00
** No. C-101F-$1.10
- Saturn V K-36
- Saturn IB K-29

For CENTURI Rocket Models

Conversion Kit. No.13 ---$0.50
- Recruiter KC-30
- Laser X KC-50
- Long Tom KC-4
- Series 13 body tube

Conversion Kit. No.16 ---$0.60
- Quaser KC-7 **No.16F--$0.65
- Centurion KC-2
- Egg Crate KC-11
- Nike Smoke KS-15
- Series 16 body tube

Conversion Kit. No.20 ---$0.70
- Orion KC-8 **No.20F--$0.75
- Mercury Redstone KS-1
- Series 20 body tube

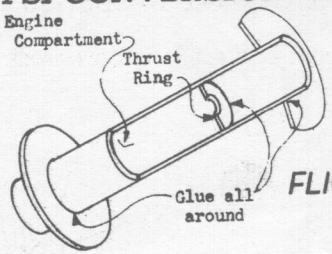
For FLIGHT SYSTEMS INC. Rocket Models

To covert from F series engines to A through E series engine sizes.

Conversion Kit. No.C-20 ---$0.50
- Voyager MRK-IV
- Oso MRK-V
- Viking 4 MRK-XII
- F.S.I. 1.130 (1 1/8") body tube

** F following the kit number converts the listed kit to use F.S.I.'S "F" series engines.

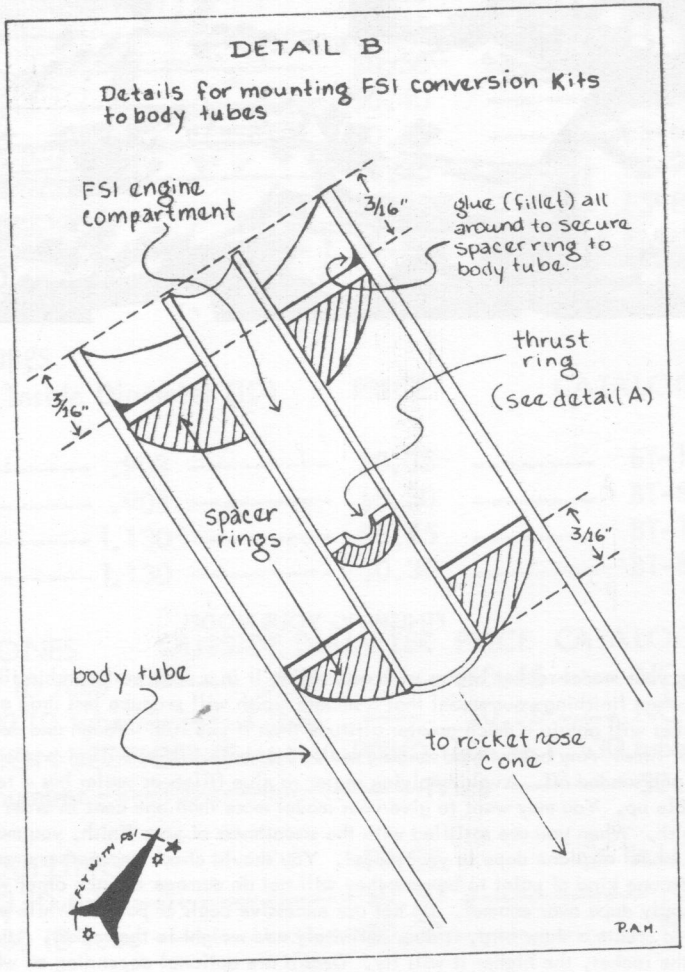
FSI CONVERSION KIT



DETAIL "A"
For A, B, C, and D engines glue in thrust ring so engine projects outside of engine compartment ¼".
For "E" engine let project 5/8".

FLIGHT SYSTEMS, INC.

FLY YOUR MODELS WITH DEPENDABLE F.S.I. SUPER POWER ROCKET ENGINES



FINISHING YOUR MODEL

Finishing your model rocket begins with assembling it in a neat workmanship like manner. Bear in mind when finishing your model that a smooth finish will produce less drag and consequently your rocket will obtain a much greater altitude than if you rush through and do a poor job. So take your time! Any hobby type sanding sealer (not balsa filler) will give good results when applied and sanded off. Avoid applying sealer to glue fillets as sealer has a tendency to shrink and bubble up. You may want to give your model more than one coat in order to produce a slick finish. When you are satisfied with the smoothness of your finish, you may want to apply paint or model airplane dope to your model. You should check on another area before applying more than one kind of paint to be sure they will not do damage to each other when used together. Never apply dope over enamel. Do not use excessive coats of paint. While paint may be applied to create a show bird, it does definitely add weight to the rocket. Logic dictates: the lighter the rocket, the higher it will fly. Decals are optional depending on whether you are building your bird for a show or go. They may be obtained at any well supplied hobby shop.

PARTS AND ACCESSORIES

FIN ALIGNMENT FIXTURE FA-101 ---------- $ 2.00

5 minute epoxy cement for quick repairs in the field ------- $ 1.25

PRECUT PLYWOOD FINS

(Set of Three)	PRICE	CATALOG NUMBER
Penetrator fins	$0.35	FS-1
StarGazer fins (upper)	$0.40	FS-2U
(lower)	$0.50	FS-2L
Nova	$0.35	FS-3
Voyager	$0.55	FS-4
Oso	$0.40	FS-5
Orbit	$0.50	FS-6
Sprint	$0.35	FS-7
Micro	$0.35	FS-8
Sheet plywood fin stock (1/16" x 6" x 6")	$0.50	FM-1

BODY TUBES

Length	Inside Diameter (ID)	PRICE	CATALOG NUMBER
16"	.903	$0.35	BT-169
8"	.903	$0.30	BT-89
18"	1.130	$0.45	BT-1811
8"	1.130	$0.30	BT-811

NOSE CONES	OUTSIDE DIAMETER	PRICE	CATALOG NO.
Fits .903 ID tube	.903	$0.45	NC-1
Fits 1.130 ID tube	1.130	$0.55	NC-2

TRANSITION SECTION (Couples .903ID tube to 1.130 tube)
catalog number ----TS-1----------Price -------- $0.50

TUBE COUPLINGS	PRICE	CATALOG NO.
FOR .903 ID tube	$0.30	TC-1
FOR 1.130 ID tube	$0.30	TC-2

THRUST RINGS	OUTSIDE DIAMETER	
MM-2	.903	$0.25
MM-3	1.130	$0.35

SHOCK CORD Per foot-----$0.10
S-1 (Not ordinary elastic cord. Special flame retardent covering)

IMPORTANT

PLEASE READ THIS INFORMATION BEFORE ORDERING MERCHANDISE

* F engines are not mailable. They will be shipped prepaid by United Parcel Service (U.P.S.) or Merchants Delivery to areas served by these carriers. If these carriers do not deliver to your area, contact us before ordering F engines.

NO. C.O.D. orders accepted. Reese Industries will not be responsible for UNINSURED ORDERS. Add $.20 for insurance if desired. Due to the high cost of postage and handling,

ON ORDERS OF LESS THAN $6.00 ADD 50¢ FOR HANDLING

Missouri Residents add 3½% tax

Manufacturer's and distributors's only obligation shall be to replace such quantity of the product proven to be defective. User shall determine the suitability of the product for his intended use, and assume all risk and liability in connection therewith.

WARNING: NO MERCHANDISE WILL BE SHIPPED WITHOUT DISCLAIMER SIGNATURE

All items other than F series engines are sent postpaid.

Discounts to organizations and clubs on quantity orders. Write for details. DEALER INQUIRIES INVITED.

Watch for new products as we add to our available line.

Prices subject to change without notice.
No order will be filled without notifying customer of price change.

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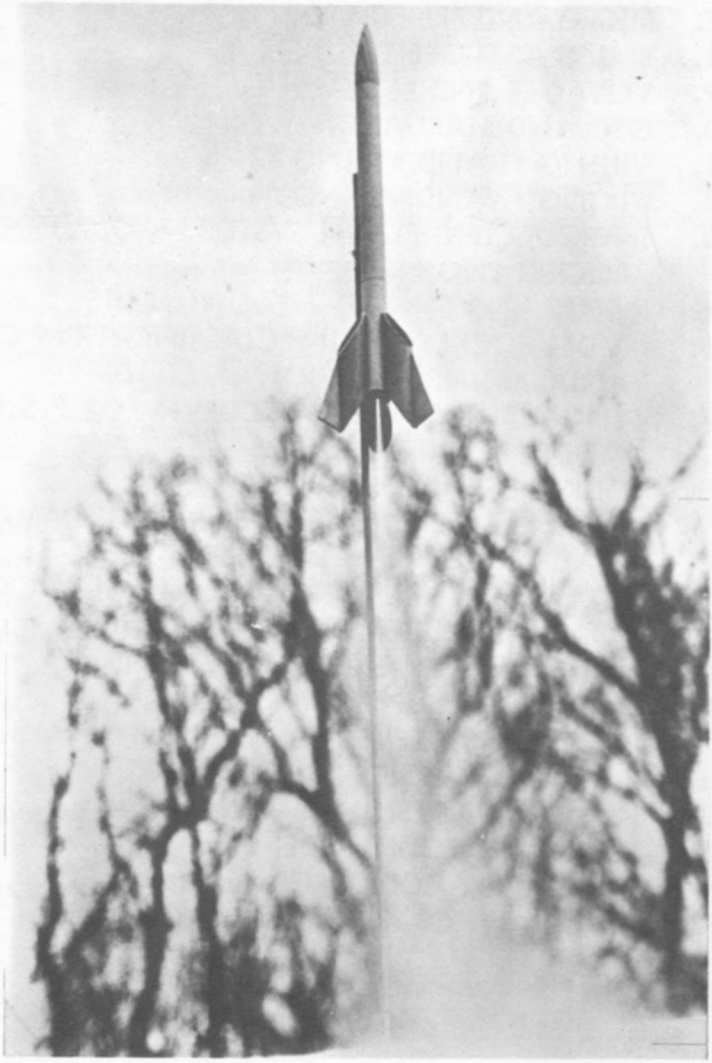
Viking II

lift off



CATALOG
RC-1— 40¢

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