

TRI-FORCETM

TM

■ **9 Laser Cut Balsa Fins**
Single Engine Rocket

■ **Flights to 900' / 275m**

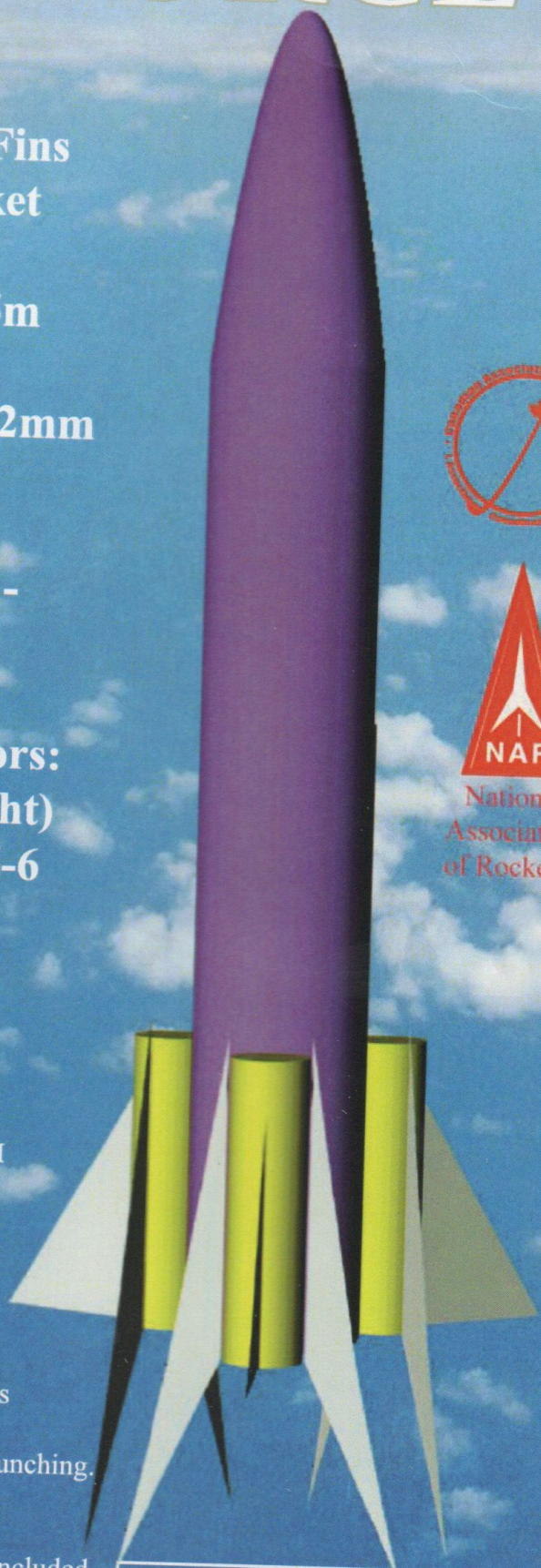
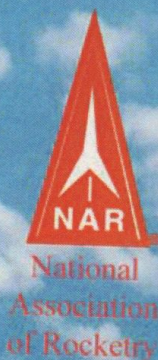
■ **Diameter 1.637" / 42mm**

■ **Safe 18" / 46cm**
parachute recovery -
clear with red printing
for easy trackingTM

■ **Recommended motors:**
A8-3, B4-2 (first flight)
B4-4, B6-2, B6-4, B6-6
C6-3, C6-5, C6-7

www.sunward1.comTM
info@sunward1.comTM
Skill Level 2
One Model Rocket Kit.

Recommended for ages 16 and up.
Adult supervision required
for ages 14-15. Check local regulations
for engine age requirements.
Use only with 1/8" diameter rod for launching.
This model requires assembly.
Glue, epoxy, paint, wadding, engines,
ignitors, launch system, and tools not included.
Plastic bags should be always kept away
from babies and children to avoid suffocation.
Contents subject to change.
Rocket design by Tim MacLeod



SUNWARDTM
TRI-FORCETM
Model
Rocket Kit
00 062

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SUNWARD™ Tri-Force™ Model Flying Rocket™

Recommended for Ages 10 and up
Ages 10-16 with adult supervision
Intermediate skill level recommended

For support:

www.sunward1.com™

Info@sunward1.com™

Use only single stage engines in this model

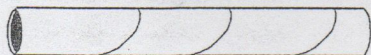
Recommended engines:

A8-3, B4-2(First Flight)

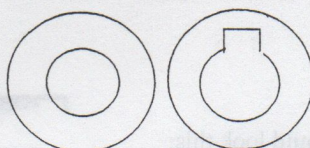
B4-4, B6-2, B6-4, B6-6, C6-3, C6-5, C6-7

Launch Pad, Ignition System, Engines, Igniters
and Recovery wadding not included

1 MAIN BODY TUBE 8" (20cm) LONG



2 ENGINE CENTERING RINGS



NOSE CONE



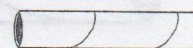
Screw-eye



ENGINE THRUST
RING

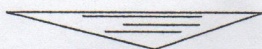


ENGINE TUBE



6 MAIN LASER CUT BALSA WOOD FINS

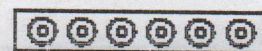
LEADING EDGE



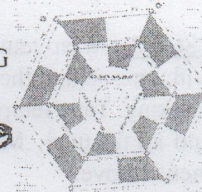
1 LAUNCH LUG



6 PARACHUTE
REINFORCEMENT RINGS

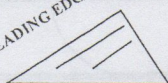


1 PARACHUTE SHEET



3 EDGE LASER CUT BALSA WOOD FINS

LEADING EDGE



METAL ENGINE HOOK



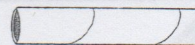
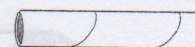
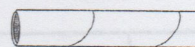
1 PARACHUTE
ASSEMBLY STRING



1 ELASTIC SHOCK CORD



3 Tube for use as side pods



NOTE: Balsa wings and fins must be removed only by cutting them out with a hobby knife. If you try to "punch" them out by hand, they may be seriously damaged

You will also need:

A ruler, 3/4" (2cm) thick book, white glue, scissors, hobby knife, cellophane tape, pencil, fine sandpaper, spray paint.

To install and ignite rocket engine, follow the instructions that are included with the engines or launch pad

This model is built to work with igniters, engines, recovery wadding and launch pads built by the leading manufacturers

TEMPLATE SHEET - ATTACHED

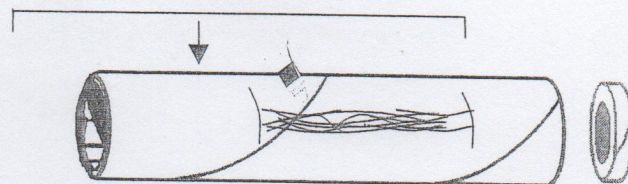
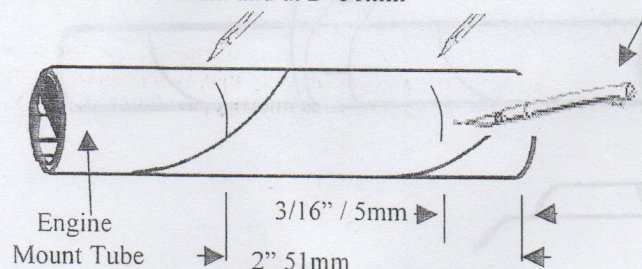
Step #1: Cut the larger main body tube marking template from the template sheet along the outside edge. Set aside.

Motor Assembly Instructions

Step 2A) On on engine tube, mark two lines at 3/16" / 5mm and at 2" 51mm

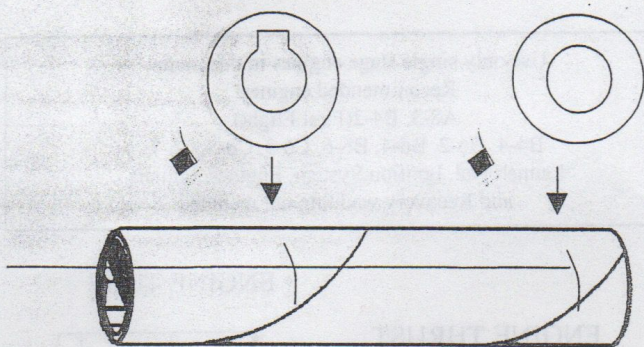
B) Cut a 3/16" 5mm slit

C) Place glue as shown. Position hook.



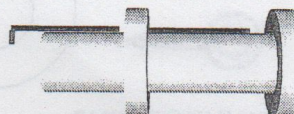
D) Glue smallest ring (thrust ring) inside engine tube, making it even with the end of the engine tube

E) Slide a centering ring to the 2 7/8" mark from 2A and the second centering ring flush with the end as shown and glue in place



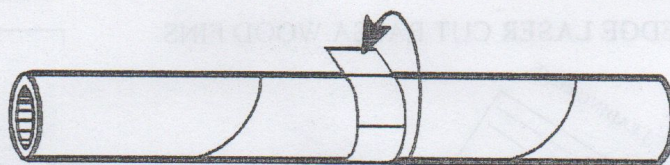
F) Slide second engine centering ring flush with end of engine tube.

Set aside

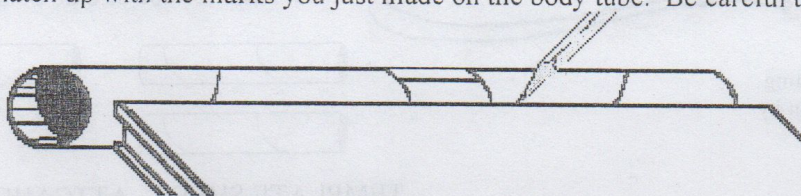


Mounting kit should look this:

#Step 3): Wrap template around body (larger) tube. Fasten it together with tape so that the shaded area is over lapped by the "bottom line" marking. Tape template in place about 5" / 13cm from one end (engine end) of the tube. Mark body tube on either side of the template and then remove.

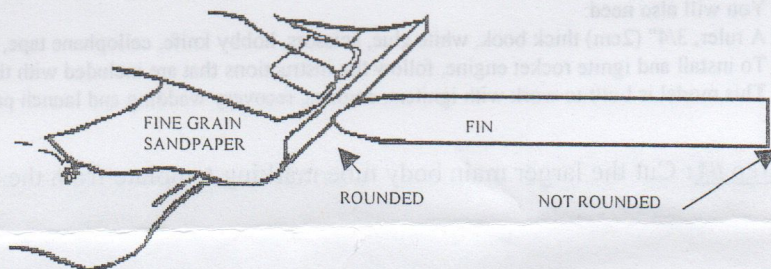


Step 4:A) Using a hard cover book as a straight edge, draw lines from one end(engine end) of body tube to the other end. Be sure that they match up with the marks you just made on the body tube. Be careful to make them as straight as possible!



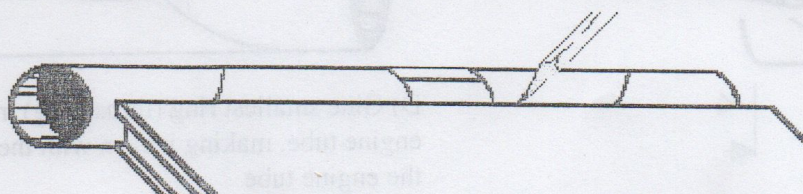
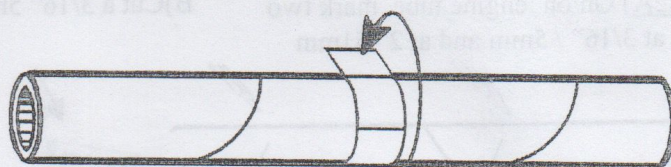
B) Set Aside

Step 5: Carefully cut out all the fins from balsa sheet with a hobby knife. Do not attempt to "punch" them out by hand as this will severely damage the fins. Sand the leading edge for better performance.



Step 6A) Cut out the side pod templates on the template sheet.

B) For each of the 3 engine tubes: wrap the template around the tube. Mark the 4 lines along the length of the tube.



STEP 7A) For EACH of the THREE (3) side pods:

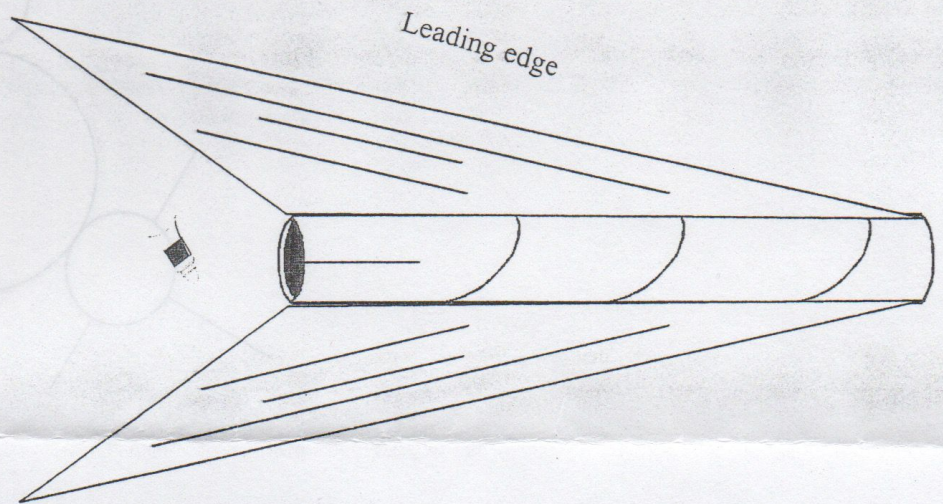
B) Test fit each balsa fins. Sand if needed for a proper fit.

Glue TWO of the main fins and one edge fin as shown to each of the 3 side pods to each of the marks made in Step 6.

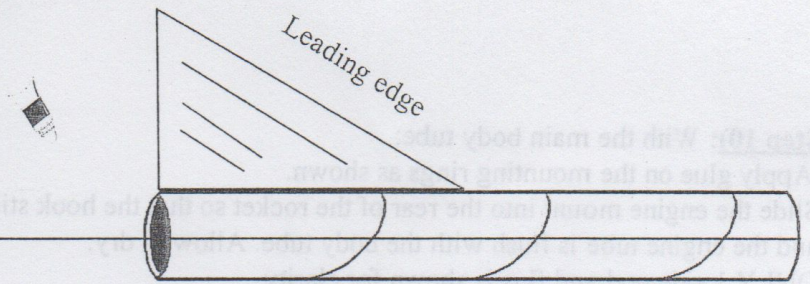
Keep work clean. Allow enough time for glue to dry.

The longest edge is the leading edge

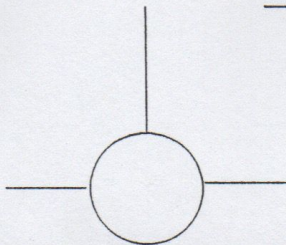
NOTE DIRECTION OF FIN PLACEMENT AND GRAIN.



C) Glue one edge fin as shown. The 2 fins above are now on the sides of the tube



D) Each of the 3 side pods from an end, should look like this:



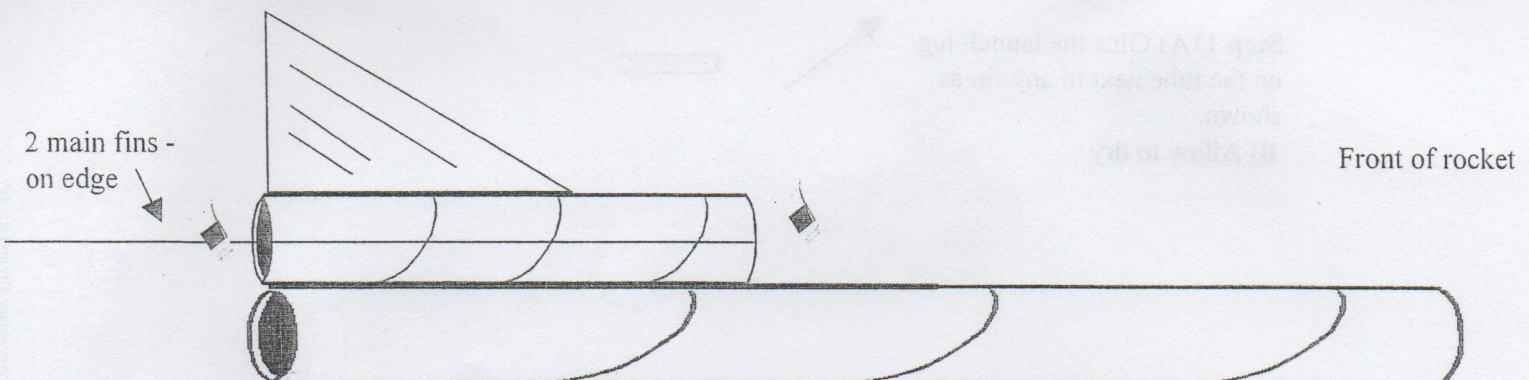
E) Set aside to dry.

Step 8): With the main body tube:

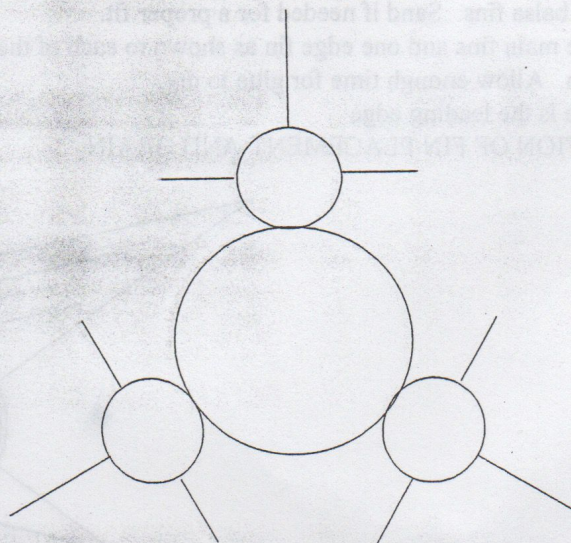
Glue each of the 3 side pods to the main body tube.

Allow to dry.

ONLY 1 is shown for clarity.



Step 9:) When done, you rocket should look as shown from the end

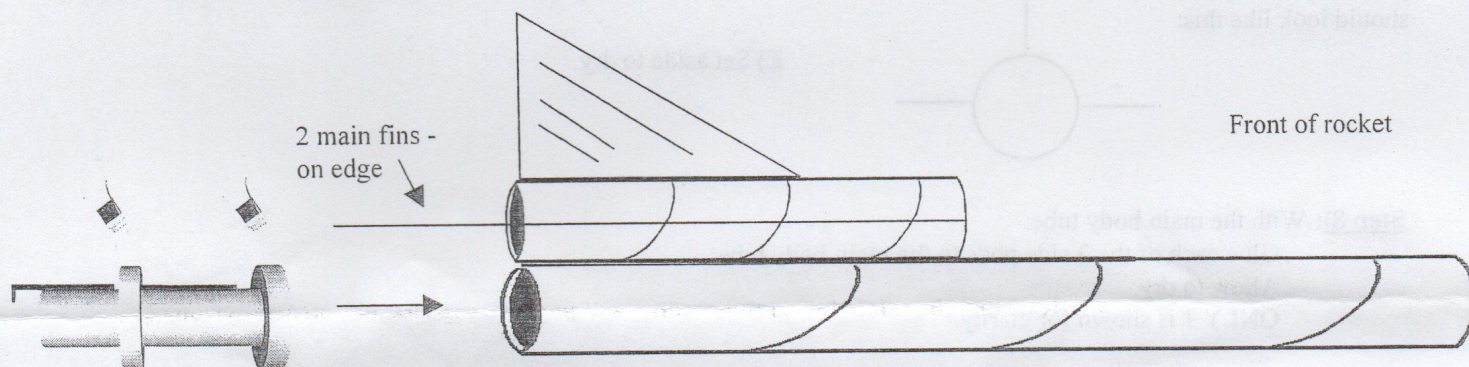


Step 10): With the main body tube:

Apply glue on the mounting rings as shown.

Slide the engine mount into the rear of the rocket so that the hook sticks out and the engine tube is flush with the body tube. Allow to dry.

ONLY 1 side pod and fins is shown for clarity.

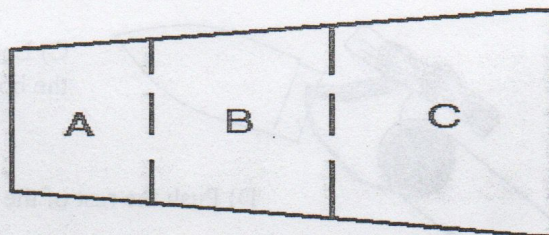


Step 11A) Glue the launch lug on the tube next to any fin as shown.

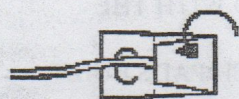
B) Allow to dry

Step 12: Screw the screw eye into the base of the nose cone.

Step 13: Cut Out the Following Shock Cord Mount:



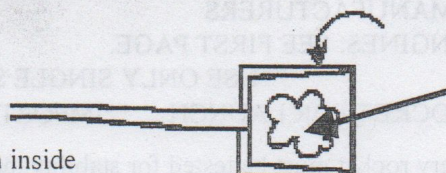
A) Put a blob of glue on the section marked "a" lay the end of the "shock cord" in the glue



B) While the glue is still wet fold section "A" over on the dotted line and press it together with section "B"



C) Fold over sections "A" & "B" and glue them over to section "C" and press it together.

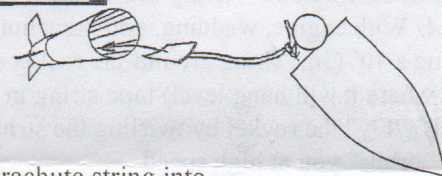


D) Put a blob of glue here

Step 14: A) Glue the "shock cord mount about 1 1/2" (4.5cm) down inside the top of the body tube

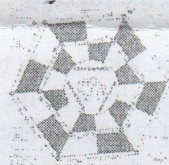
B) In the centre of the base of the nose cone, insert by screwing the screw eye. Secure with glue.

C) Tie the other end of the "shock cord" to the Screw Eye on the nose cone

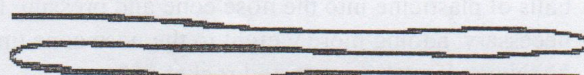


Step# 15: PARACHUTE

A) Cut out parachute with sharp scissors at the 18" mark



15 B) Cut parachute string into 3 equal lengths

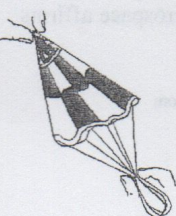


C) Stick the Reinforcement Rings to the Parachute Over the Circles Printed on the Parachute

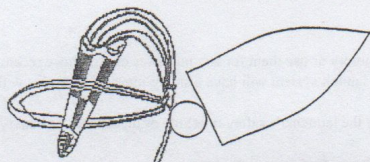
D) With a pencil, punch a hole through the circles printed on the parachute

E) Attach the strings to the parachute by tying them through the rings and holes

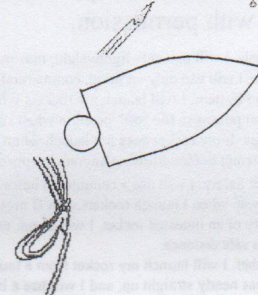
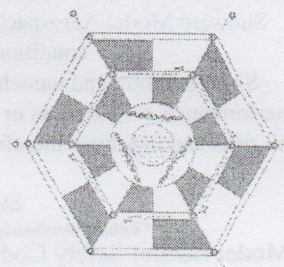
F) Pinching the parachute in the centre, bring all strings to form one loop, pass loop through Screw Eye on the nose cone



G) Pass parachute through loop and pull tight.



H) The parachute is now attached, fold and tuck it inside the body tube



Step 16: Painting your model:

A. Sand fin until they are smooth. (Rounding fin edges by careful sanding will improve appearance and aerodynamics)

B) Sand nose cone if needed.

Step 17: A) Spray paint entire model. Use light coats. Use only enough paint to cover model evenly.

B) Remove nose cone

Step 18: PREPARING ROCKET FOR LAUNCH

A) Stuff 4 loosely crumpled squares of rocket recovery wadding (available from your local hobby retailer) into the top of rocket body tube

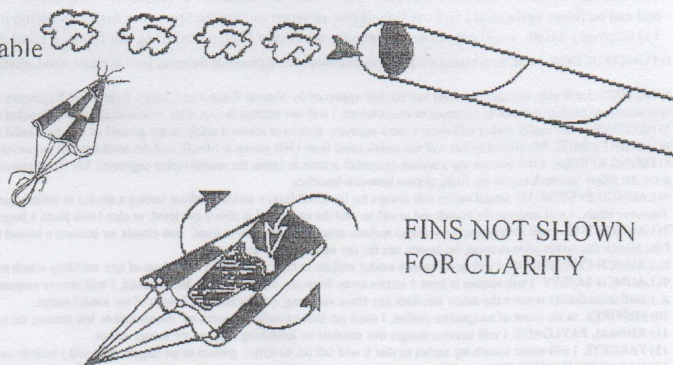
B) Push down with a pencil.

DOT USE FACIAL TISSUE - IT IS FLAMMABLE!!

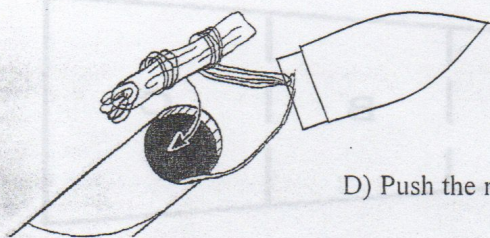
Step 19: Fold and insert parachute

A) Pinch parachute in the centre and straighten its strings

B) Loosely fold over and roll outside edges inward



FINS NOT SHOWN FOR CLARITY



C) Loosely wrap parachute strings around parachute and drop the parachute into the body tube

D) Push the rest of the string and "shock cord" into the body tube and then insert nose cone.

TO INSTALL AND IGNITE ROCKET ENGINE, FOLLOW THE INSTRUCTIONS THAT ARE INCLUDED WITH THE ENGINES OR LAUNCH PAD

THIS MODEL IS BUILT TO WORK WITH IGNITERS, ENGINES, RECOVERY WADDING AND LAUNCH PADS BUILT BY THE LEADING MANUFACTURERS

RECOMMENDED ENGINES: SEE FIRST PAGE.

****USE ONLY SINGLE STAGE ENGINES!!!****

PREPARING THE ROCKET FOR LAUNCH: ****IMPORTANT****

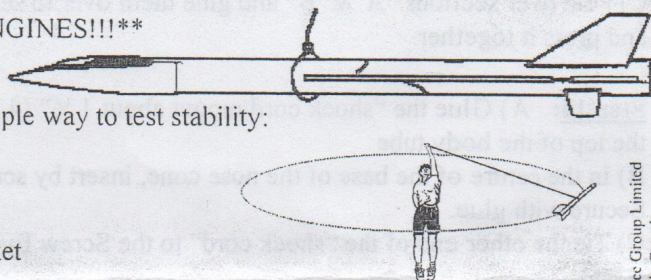
FLIGHT TEST: Every rocket must be tested for stability, here is a simple way to test stability:

A) With engine, wadding, and parachute installed and painting done, tie a 10' (3m) string around the rocket on its balancing point (the spot where it will hang level) tape string in place

B) "Fly" the rocket by twirling the string over your head so that the rocket "orbits" you at high speed

C) If the rocket flies straight, nose first, it is stable. If it does not, add weight to the nose cone. This can be done by dropping small balls of plasticine into the nose cone and pressing them into the point with the flat end of a pencil. Keep on testing, and if necessary, adding more weight to the nose cone until the rocket is stable. Then the rocket is stable, it may be launched.

Never launch an untested rocket.



ROCKET COMPONENTS WARRANTY

Sunward Model Aerospace guarantees that the components of this kit will reach you in good condition. If the kit does not reach you in good condition, simply return it* to the address below and we will send you a replacement as soon as possible.

Since building and launching skills vary from one hobbyist to another, Sunward Model Aerospace will not take responsibility for a rocket's performance, altitude loss or damage to property or injury to persons resulting from the use or misuse of any of our products. The buyer assumes all risks and liabilities therefrom and accepts and uses our products on these conditions. Your purchases from Sunward Model Aerospace affirms your agreement to these conditions.

Sunward Aerospace Group Limited, 9 Rooksgrove Place, Toronto, ON, Canada, M6M 2W3

*Return Merchandise Authorization is required for all exchanges. Please contact Sunward Model Aerospace Customer Service at info@sunward1.com

Model Rocket Safety Code National Association of Rocketry www.nar.org

Used with permission.

- 1) Materials. I will use only lightweight, non-metal parts for the nose, body, and fins of my rocket.
- 2) Motors. I will use only certified, commercially-made model rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer.
- 3) Ignition System. I will launch my rockets with an electrical launch system and electrical motor igniters. My launch system will have a safety interlock in series with the launch switch, and will use a launch switch that returns to the "off" position when released.
- 4) Misfires. If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.
- 5) Launch Safety. I will use a countdown before launch, and will ensure that everyone is paying attention and is a safe distance of at least 15 feet away when I launch rockets with D motors or smaller, and 30 feet when I launch larger rockets. If I am uncertain about the safety or stability of an untested rocket, I will check the stability before flight and will fly it only after warning spectators and clearing them away to a safe distance.
- 6) Launcher. I will launch my rocket from a launch rod, tower, or rail that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up, and I will use a blast deflector to prevent the motor's exhaust from hitting the ground. To prevent accidental eye injury, I will place launchers so that the end of the launch rod is above eye level or will cap the end of the rod when it is not in use.
- 7) Size. My model rocket will not weigh more than 1,500 grams (53 ounces) at liftoff and will not contain more than 125 grams (4.4 ounces) of propellant or 320 N-sec (71.9 pound-seconds) of total impulse. If my model rocket weighs more than one pound (453 grams) at liftoff or has more than four ounces (113 grams) of propellant, I will check and comply with Federal Aviation Administration regulations before flying.
- 8) Flight Safety. I will not launch my rocket at targets, into clouds, or near airplanes, and will not put any flammable or explosive payload in my rocket.
- 9) Launch Site. I will launch my rocket outdoors, in an open area at least as large as shown in the accompanying table, and in safe weather conditions with wind speeds no greater than 20 miles per hour. I will ensure that there is no dry grass close to the launch pad, and that the launch site does not present risk of grass fires.
- 10) Recovery System. I will use a recovery system such as a streamer or parachute in my rocket so that it returns safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket.
- 11) Recovery Safety. I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places.

LAUNCH SITE DIMENSIONS

Installed Total Impulse (N-sec)	Equivalent Motor Type	Minimum Site Dimensions ft / m
0.00-1.25	1/4A, 1/2A	50 / 15
1.26-2.50	A	100 / 30
2.51-5.00	B	200 / 60
5.01-10.00	C	400 / 120
10.01-20.00	D	500 / 150
20.01-40.00	E	1,000 / 300
40.01-80.00	F	1,000 / 300
80.01-160.00	G	1,000 / 300
160.01-320.00	Two Gs	1,500 / 450

Revision of February, 2001

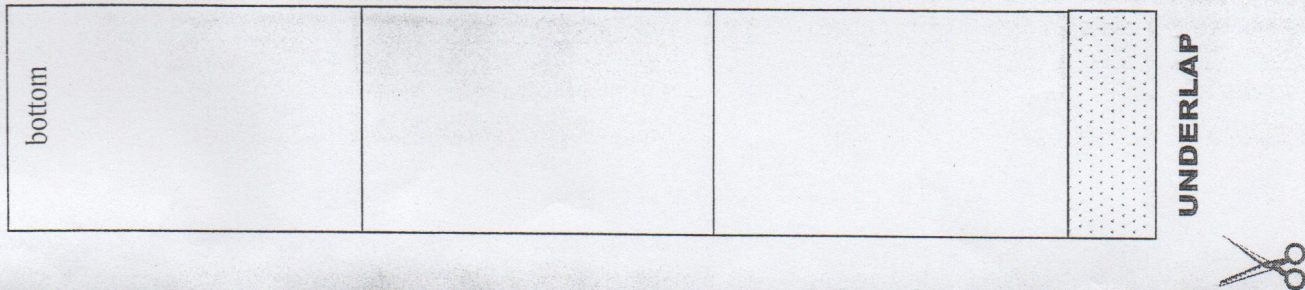
CANADA'S MODEL ROCKET SAFETY CODE

- 1) CONSTRUCTION. I will always build my model rocket using only lightweight materials such as paper, wood, plastics or rubber without any metal airframe components. My model shall include aerodynamic surfaces or a mechanism to assure a safe, stable flight
- 2) MOTORS. I will only use rocket motors and reloads approved by Natural Resources Canada, Explosives Regulatory Division (NRC/ERD). I will store these motors in a safe and secure manner as described by the manufacturer and NRC/ERD. I will never subject these motors to excessive shock or extremes of temperature. I will not attempt to use, alter, or reload commercial rocket motors, except as instructed by the manufacturer.
- 3) RECOVERY. My model rocket will always use a recovery system to return it safely to the ground so that my model rocket may be re-flown. I shall prepare the recovery system with due care to assure that it will properly deploy.
- 4) WEIGHT LIMITS. My model rocket will not weigh more than 1500 grams at lift-off, and the model rocket engine(s) will contain no more than 125 grams of propellant and produce no more than 160 N-s combined total-impulse.
- 5) FIRING SYSTEM. I will always use a remote electrical system to ignite the model rocket engine(s). My firing system will include an ignition switch that returns to "off" when released, and a safety interlock to prevent accidental ignition. I will never leave the safety interlock key in my firing system between launches.
- 6) LAUNCH SYSTEM. My model rocket will always be launched from a stable platform having a device to initially guide its motion. My launcher will have a jet deflector to prevent motor exhaust from directly contacting the ground. To protect myself and other from eye injury, I will position the launch rod or rail so that the upper end is above eye level, or else I will place a large guard on the upper end between launches.
- 7) LAUNCH SITE. I will never launch my model rockets near buildings, power lines, into clouds, or become a hazard to aviation. The area immediately around the launch system will be cleared of any flammable materials. I will always obtain the permission of the launch site owner prior to using the launch site for my model rocket activities.
- 8) LAUNCH CONDITIONS. I will never launch model rockets in high winds or in conditions of low visibility which may impair the observation of my model rocket in flight, or in a direction below 30 degrees from the vertical.
- 9) LAUNCH SAFETY. I will remain at least 5 metres away from any model about to be launched. I will always announce to persons within the launch site that I am about to launch my model rocket, and I shall give a loud countdown of at least 5 seconds duration.
- 10) MISFIRES. In the event of an ignition misfire, I shall not immediately approach my model rocket, but remove the safety interlock key and remain back for a safe period until assured that no ignition will occur.
- 11) ANIMAL PAYLOADS. I will never endanger live animals by launching them in my model rocket.
- 12) TARGETS. I will never launch my rocket so that it will fall on, or strike, ground or air targets. Nor will I include any explosive or incendiary payload.
- 13) HAZARDOUS RECOVERY. I will never attempt to recover my model rocket from a power line, high place, a tree, or other dangerous location.
- 14) PRE FLIGHT TESTS. Whenever possible, I will always test the stability, operation and reliability of my model rocket designs prior to flight. I will launch unproven designs in complete isolation from other persons.

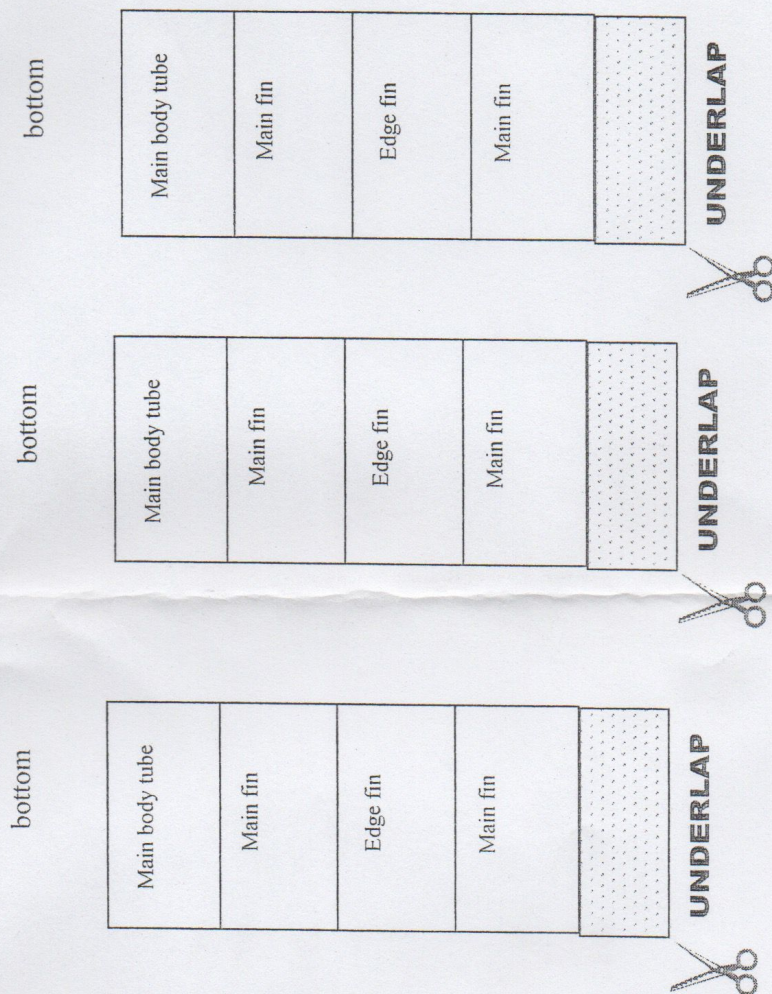
TEMPLATE SHEET

for the Tri-Force™ Model Rocket Kit

Main Body Tube Template



Side Pod Tube Template - 3





1 MADE IN USA 2

3

4

5

6

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8

9

 **Estes!**
estesrockets.com