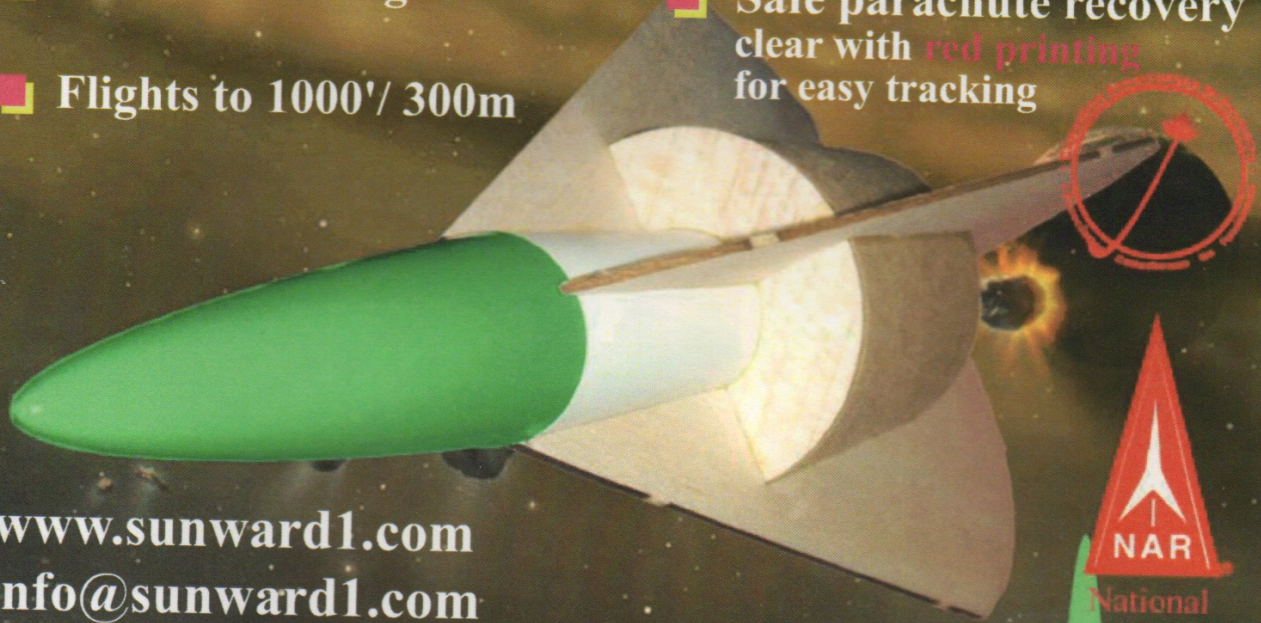


Interplanetary Shuttle

Skill Level 2

- Easy to build!
- Clear Instructions
- Clear Instructions.
- Over 5 1/4" / 13cm high
- Laser Cut 4 Balsa Fins
- Wingspan 11" / 28cm
- Distinctive Design
- Safe parachute recovery clear with red printing for easy tracking
- Flights to 1000' / 300m

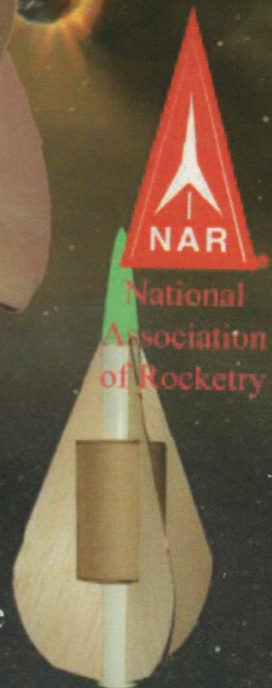


www.sunward1.com
info@sunward1.com

One Model Rocket Kit.
Recommended for ages 10 and up.
Adult supervision required for children 10-16.
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

Side image



SUNWARD
Interplanetary
Shuttle
Rocket Kit
00 029

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All Rights Reserved. Made in Canada.

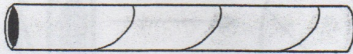
SUNWARD Interplanetary Shuttle Flying Rocket

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

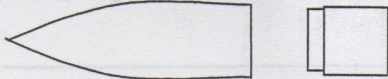
For support:
www.sunward1.com
Info@sunward1.com
 Ver 2.0

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 18" (45cm) LONG



1 PLASTIC NOSE CONE
 (Nose cone may be in one piece)



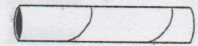
2 ENGINE CENTERING RINGS



1 ENGINE THRUST RING



1 ENGINE TUBE



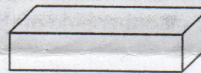
1 METAL ENGINE HOOK



1 LAUNCH LUG



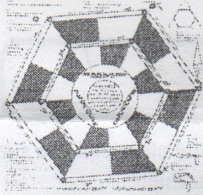
Nose weight.



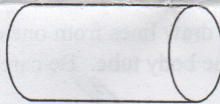
1 ELASTIC SHOCK CORD



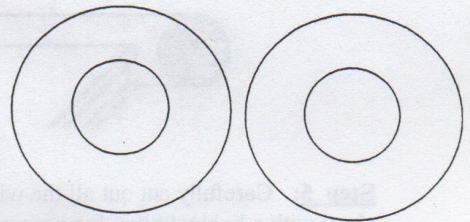
1 PARACHUTE SHEET
 1 PARACHUTE ASSEMBLY STRING



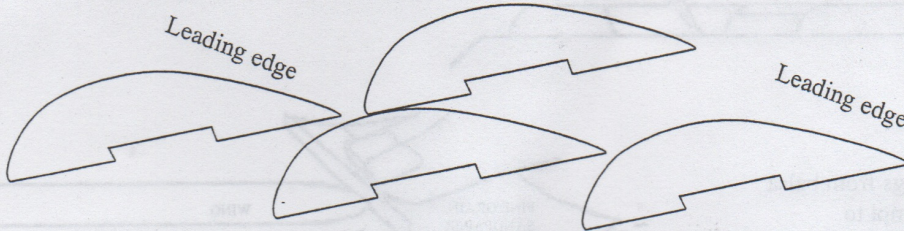
Small tube.



2 Balsa rings



4 LASER CUT BALSA WOOD FIN



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.

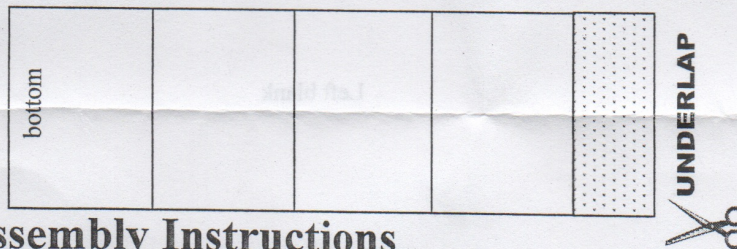
To install and ignite rocket engine, follow the instructions that are included with the engines or launch pad

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

6 PARACHUTE REINFORCEMENT RINGS



Step #1: CUT OUT THIS MARKING TEMPLATE ALONG THE OUTSIDE EDGE

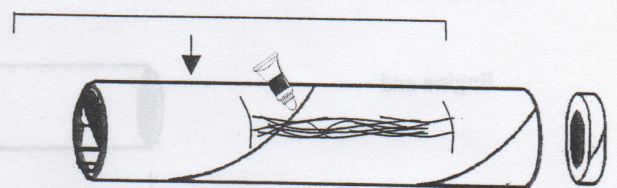
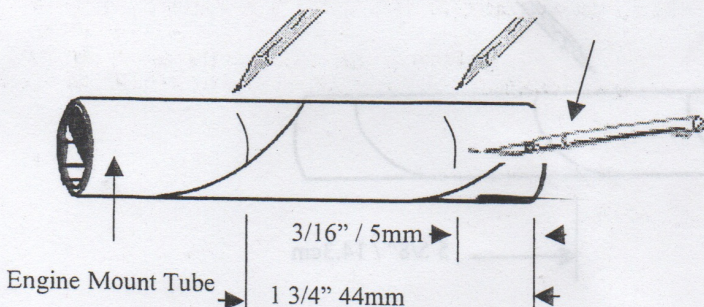


Step 2: Motor Assembly Instructions

A) On the engine tube, mark two lines at 3/16" / 5mm and at 1 3/4" 44mm

B) Cut 3/16" 5mm slit

C) Place glue as shown. Position hook. Hook may not be exactly as shown.

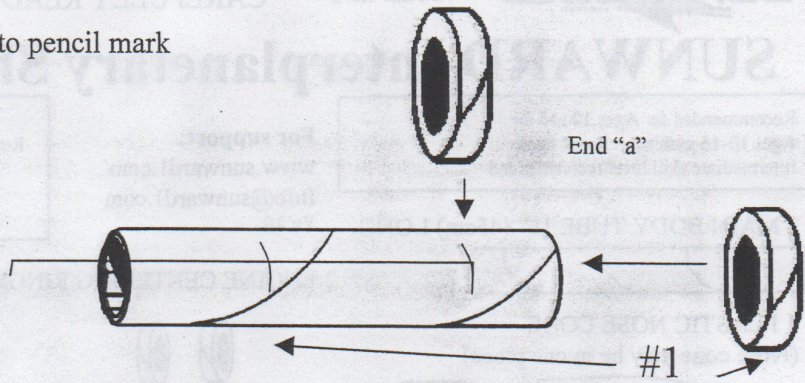
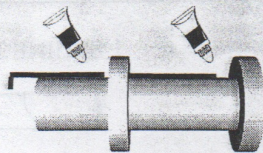


D) Glue smallest ring (thrust ring) inside engine tube, making it even with the end of the engine tube

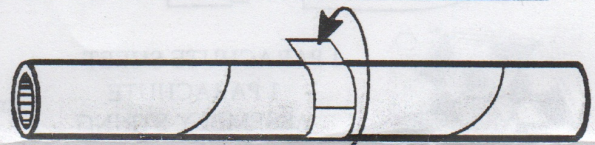
E) Slide one engine centering ring (#1) to pencil mark shown from end "a"

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

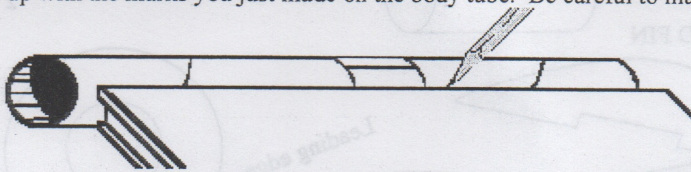
G) Complete tube should be as shown.



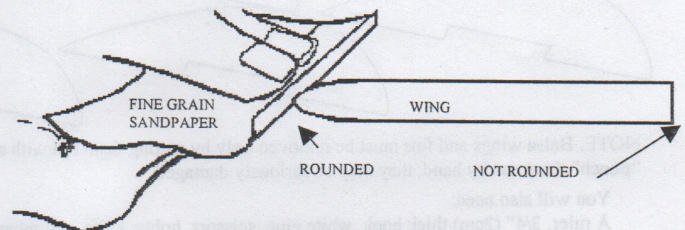
#Step 3: Wrap template around body (larger) tube. Fasten it together with tape so that the shaded area is over lapped by the "bottom line" marking. Tape template in place about 5"/ 13cm from one end (engine end) of the tube. Mark body tube on either side of the template and then remove.



Step 4: 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!

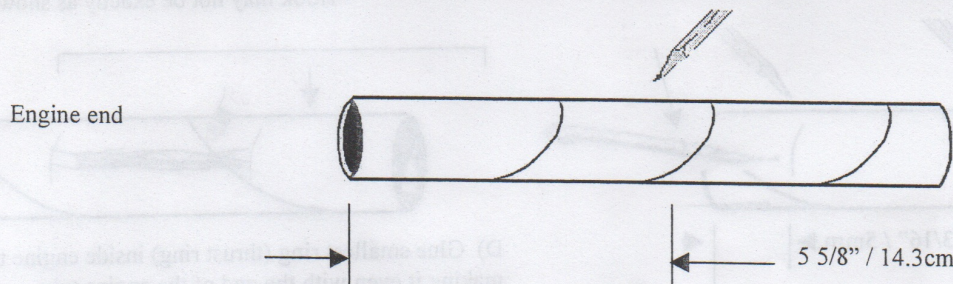


Step 5: Carefully cut out all the wings from balsa sheet with a hobby knife. Do not attempt to "punch" them out by hand as this will severely damage the wings. Sand the leading edge for better performance.

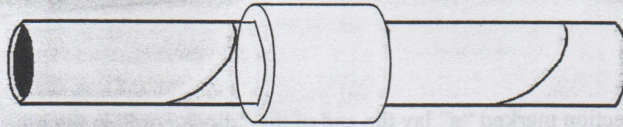


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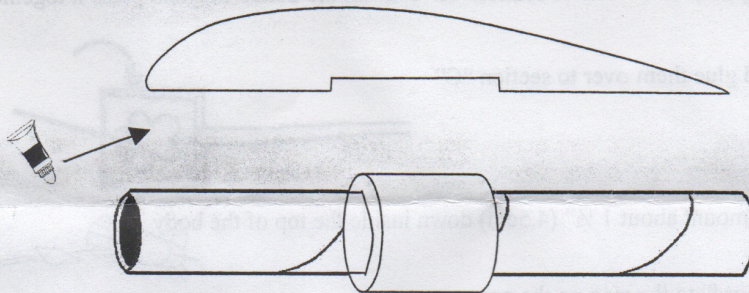
Step 6) On the large body tube, from one end (to be the engine end) mark a line at $5 \frac{5}{8}$ " / 14.3cm



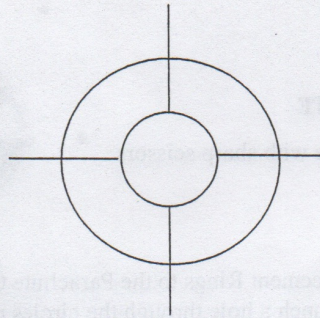
- Step 7A) Test fit the balsa rings. Lightly sand the inside if needed for a good fit.
 B) Slide one balsa ring to the 5 5/8" / 14.3cm mark and glue in place. Let Dry.
 C) Slide the large tube and align with the first Balsa ring. Glue on the edge.
 D) Slide the second balsa ring in place and glue in place. Your rocket should look as follows:



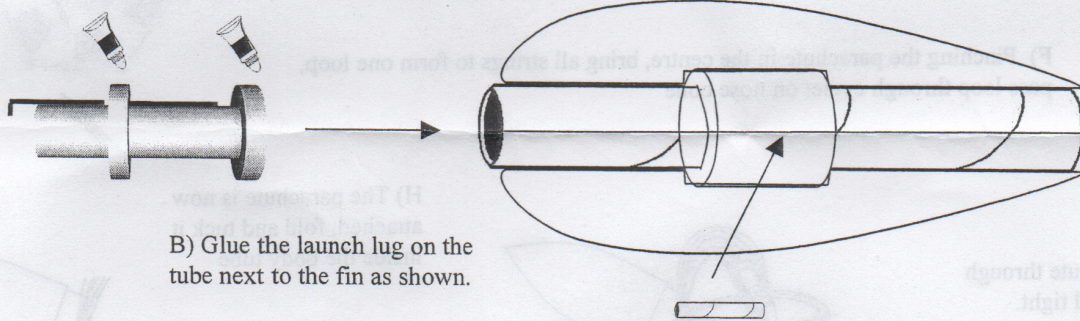
Step 8: Test fit each balsa fin. Sand if needed for a proper fit. Then glue one fin in place to the rocket at each marked line. Keep work clean. Allow enough time for glue to dry.



Step 9: The rocket, from the engine end, should look like this:



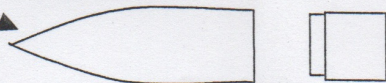
Step 10A: Place glue on the edges of the two mounting rings as shown. Slide the engine mount into the rear of the rocket so that the hook sticks out and the engine tube is flush with the body tube.



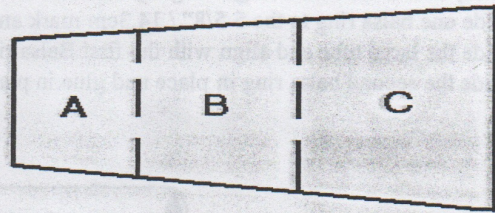
B) Glue the launch lug on the tube next to the fin as shown.

- Step 11A) Test fit the 2 halves of the nose cone. DO NOT FORCE THEM.
 B) Stuff the nose weight into the front of the nose cone. MAKE SURE YOU ARE STILL ABLE TOO ATTACH THE SECOND HALF OF THE NOSE CONE. Apply a coat of glue to the surface of the weight to hold it in place
 C) Let dry
 D) Apply liquid cement and glue the 2 halves together. Do not use too much glue.

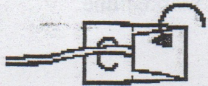
Nose weight into this half



Step 12: Cut Out the Following Shock Cord Mount:

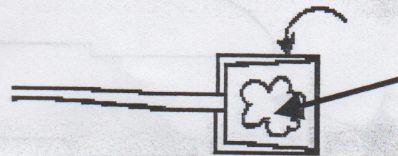


A) Put a blob of glue on the section marked "a" lay the end of the "shock cord" in the glue



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

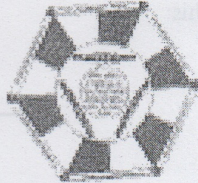
Step 13: A) Glue the "shock cord mount about 1 1/2" (4.5cm) down inside the top of the body tube



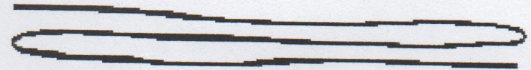
B) Tie the other end of the "shock cord" to the ring on the nose cone

14: PARACHUTE

A) Cut out parachute with sharp scissors at the 12" mark.



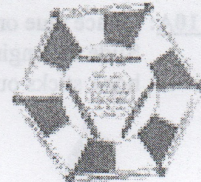
B) Cut parachute string into 3 equal lengths



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

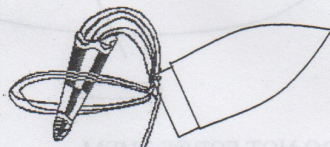
D) With a pencil, punch a hole through the circles printed on the parachute

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

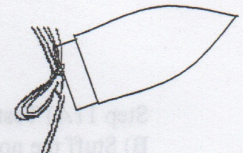


F) Pinching the parachute in the centre, bring all strings to form one loop, pass loop through eyelet on nose cone

G) Pass parachute through loop and pull tight.



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



NOTE: The parachute included is larger than may be needed. If the descent is too slow after first flight, cut the hole in the middle!



Step 15: Painting your model:

- A. Sand wings and nose cone until they are smooth. (Rounding wing edges by careful sanding will improve appearance and aerodynamics)
- B) Sand nose cone thoroughly.

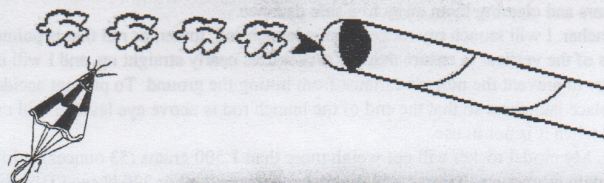
Step 16: A) Spray paint entire model. Use light coats. Use only enough paint to cover model evenly. Keep paint can at least 14" from model

- B) Remove nose cone

Step 17: PREPARING ROCKET FOR LAUNCH

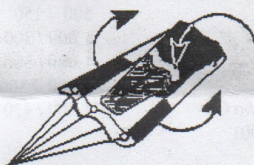
- A) Stuff 4 loosely crumpled squares of rocket recovery wadding (available from your local hobby retailer) into the top of rocket body tube
- B) Push down with a pencil.

****DOT USE FACIAL TISSUE – IT IS FLAMMABLE!!****



Step 18: Fold and insert parachute

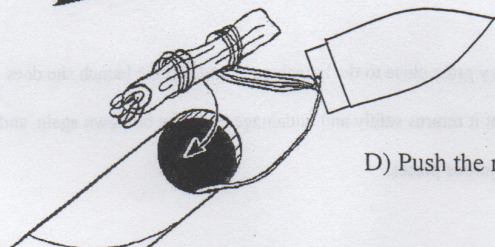
- A) Pinch parachute in the centre and straighten its strings



- 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

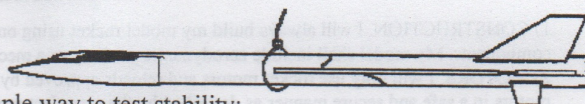
THIS MODEL IS BUILT TO WORK WITH IGNITERS, ENGINES, RECOVERY WADDING AND LAUNCH PADS BUILT BY THE LEADING AMERICAN MANUFACTURERS

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

Join the www.nar.org National Association of Rocketry
www.maac.ca Model Aeronautics Association of Canada
www.canadianrocketry.org Canadian Association of Rocketry

Image courtesy of NASA

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 reflown. 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 or 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. I shall immediately remove the safety interlock key from my firing system after the launch of my model rocket.
- 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.

