

Successful Rocketry for Scouting, 4-H, and Other Youth Groups

by Andy Heren, NAR # 71711

Introduction

So, you want to use model rockets with your scout troop or 4-H club? Great idea! Model rocketry can be fun, educational, and exciting. You may have decided to do rocketry with your scouts to earn the Aerospace or Space Exploration badge; or with your 4-Hers to prepare for a county fair entry. You may be doing rocketry just because it is fun. However, there is more to it.

By doing this activity, you may be the catalyst to something BIG. This little venture that you are leading may be what starts a young person on the road to a career in a math or science related field. You may be sparking that interest in a boy or girl who may even become a professional rocket scientist or even an astronaut.

Here are a couple of examples. Watching *Sputnik* streak through the sky in 1957 led Homer Hickam, Jr., down the road that culminated in his dream of being a NASA engineer. His story can be seen in the movie *October Sky*, or the book *The Rocket Boys*. In 1945 a 17-year-old boy from Milwaukee, Wisconsin, built his first rocket. Rockets were also the topic of his term paper at the U.S. Naval Academy at Annapolis. Oh, the name of the young man? James Lovell, Jr. of *Apollo 13* fame.

If you are a novice rocketeer or somewhat experienced, you may not quite know where to start. First, be assured that model rocketry is a safe hobby. Second, check out the guidelines below. I have broken your activity down into categories and numbered your steps. The person responsible for organizing each step is listed in parenthesis after the heading. These guidelines cover the key points to organizing a successful launch. Use the "Notes" column to tailor them to suit your schedule needs.

Getting Started (You)

1) Have you ever build, launched, and recovered a model rocket? If not, then that must be your first step! I suggest that you go to your local hobby store or discount store and find a starter set. This set includes a launcher, launch pad, one or two rockets, and enough motors and supplies for two to three launches. Build the rocket, launch it, and get to know how it works.

2) I strongly suggest finding a copy of *The Handbook of Model Rocketry* by G. Harry Stine. Check your local public library and bookstore. Mr. Stine explains model rocketry in simple terms that aren't overly scientific. He, along with Orville Carlisle, founded the National Association of Rocketry. The *Handbook* is the official handbook of the NAR. If you only get one book on rocketry, this is the book you need.

3) If you know another adult or a young person who is into rocketry, ask him or her for help. They would probably be glad to help! Even if they're not interested to do it for the whole activity, you can probably get help for at least for part of it.



Preparing for Your Group's Activity (You)

1) Decide which rocket your group will build. I suggest all the kids doing the same rocket. That way, you can all follow step by step together. Consider these things when choosing your rocket:

- (a) What is the age of your group?
- (b) Do any of them have prior rocket knowledge?

If your group is mainly 10 and under and/or inexperienced, you should choose one of the easiest to build. Many of these have pre-molded plastic fin units which allow you to skip cutting out, sanding and attaching balsa fins. You should also consider avoiding kits using "mini" motors (13 mm in diameter). They are much tougher to prepare for flight when small children are involved. If your group consists of kids over 10 and they're somewhat coordinated, you could choose a skill level 1 rocket. If any of your kids are experienced, use them to help! They will love the responsibility of helping you!

2) Select your launch field and get permission to launch. Don't take for granted that it is OK to launch. If launching from a school field, get permission from the principal or school district. If launching in a park, check with your park district, etc. See the NAR Safety Code, Rule #7 to select a field size to insure it is big enough for the size motors you are using.

3) Where will you get the rockets? Some rocket kits are offered to groups in "bulk packs" of 12 kits. If you are ordering for a group that has at least 10 kids, I would suggest the bulk packs as the least expensive alternative. Use your head and be a smart shopper. You have a few choices for shopping locations.

- (a) You can go to your local hobby shop or discount store and see what they have in stock.
- (b) You can order directly from the company from their catalogue.
- (c) You can order from the Internet. A good list of companies is available at Rocketry Online (www.rocketryonline.com), and many of them offer discounts to clubs and groups.

4) How will your group pay for the rockets? That depends on where you purchase them. If you get them from a local store, you could send each child to get his or her own or you could buy them all at once. If you mail order them, you should collect money before you order so you don't have to foot the bill. Will the group's treasury pay for them?

5) Be sure to order one for yourself. It is important for you, the leader, to be sure of what you are doing before you lead your group. Order one of the rockets for yourself and build it ahead of time so that you are familiar with the steps for building this particular rocket.

6) A note on ordering your motors. There are different ones to choose from, but I would suggest getting the recommended "First Flight" motor for your rocket as suggested by the manufacturer. This will ensure that they don't go so high that they disappear. Also, you will be able to see the recovery device deploy. That is pretty exciting! Finally, consider buying "Bulk Packs" of motors as an option. They are less expensive when ordered that way, but may not contain the right motors for your rockets. Check the contents of the pack before you purchase.



7) Order your materials so they arrive at least two weeks ahead of time. This will allow you ample time to build one of the rockets. It will also give you enough time to be sure you have all the needed supplies. As you order the rockets, be sure you order enough motors, igniters, etc. for all your kids. If they come early, you won't be sweating out the delivery time.

8) Gather all building supplies. Note on the instructions which building supplies you will need for your group. Some possible supplies you will need are a hobby knife, sandpaper, scissors, masking tape, paint, and glue. Make sure you get the proper kinds of glue to use for your particular kit. Glue recommendations are in "Building Your Rockets" below.

9) Think about your meeting place. Is it conducive to rocket building? Are there enough tables and chairs? If not, try to find a larger room to use. Be sure you can clean up after your building is through, too.

10) How much time do you have? You might need to split your rocketry activities into multiple sessions. It's tough to build, paint and fly rockets all in one class session. Splitting things up may make more sense for your group, particularly if they have short attention spans. Make sure you have storage for materials and supplies if you need to split up your rocketry activity sessions.

11) Arrive early and get everything set up before the kids arrive. If you will need more than one night to build the rockets, you may want to consider opening all kits and separating the parts. This way you can distribute the parts as they are needed so that no pieces are lost between meetings. Make sure your storage area is safe and secure, and that all storage containers are labeled properly.

12) Read the NAR Safety Code so you are familiar with it before your group begins their work. A copy of the Safety Code comes with each rocket. Be sure each child gets a copy of this and go over it with the group so they understand the safety rules and promise to follow them. You could even have them sign the bottom showing that they agree to follow all safety rules. This is no time for goofing around!

Building Your Rockets (You, helpers and your kids)

1) Have a lot of extra patience. By now you know that it takes lots of patience to work with children in any setting. Sometimes their excitement and enthusiasm get the best of them and they can be impatient. You may have three asking for help at once. Remember to keep your cool and help whenever they need it. Be positive with them. Show that it is fun for you, too!

2) Go slowly through the directions so that the entire group can keep up. If you have experienced kids in your group, again, enlist their help. Kids love to be helpful. Look for opportunities to let them be.

3) This would be a good time to have other adults there to help. Use parents, older scouts or 4-Hers to help the younger ones.

4) Go through all steps in building and then paint rockets. The rockets come with decals and show how to be painted, but most of the children will want to paint them with their own designs. They may do away with the original design and decals. I have seen some *awesome* paint jobs. Let them be creative!



5) Read all instructions first. (Now that's a novel idea!)

6) Use the right kind of glue. When gluing plastic parts to the paper body tube, you will need plastic model cement. When gluing the paper body tube to paper or wood fins, you will need a different type of glue. White school glue is too runny. I learned from G. Harry Stine in his *Handbook of Model Rocketry* to use Aleen's Original Tacky Glue. It is a thick craft glue that has worked great for me. Other people use regular wood glue, such as Elmer's or Titebond. Either of these types would be an excellent choice. They dry clear and can be painted. We don't recommend either epoxy or instant (cryanoacrylic, or CA) glues. Epoxies required mixing, take time to cure, and are messy and expensive. CA can harm sensitive body tissue, particularly eyes, and result in brittle, easy to break joints.

7) Sand balsa fins properly. When sanding balsa fins, sand the leading edge of the fin to round it into an airfoil shape. This makes it a little more aerodynamic (and it looks better, too).

8) Make the fin joints strong with two simple tricks. After marking the body tube, punch small holes along the line where your fin will be glued on. This creates a rivet-like joint and a very strong attachment. Then rub a thin film of glue onto the root edge of fin. Allow it set a minute or two to become tacky. Apply a second thin film of glue to the root edge of fin. Gently press the root edge along the body tube fin line. Adjust the fin, if needed, so it will project straight from the body tube. Work slowly and carefully so as not to disturb the glue joint.

9) Check your fin alignment. After all fins are attached, sight from the front or rear of the rocket and make sure all fins are on straight and evenly spaced around the body tube. Some kits contain a shaded end view in the directions to check proper fin spacing. Stand rocket on end (upside down) so fins can dry properly. Make sure the rocket can't be knocked over while fins are drying.

10) Use glue fillets to help strengthen the fin/body tube attachment. That is, run a bead of glue down each side of the fins where it meets the body tube and smooth it with your finger.

Painting Your Rockets (You, helpers and kids)

1) Fill the balsa wood fins with a sanding sealer. Balsa wood absorbs paint and the finish is dull. Sealing them makes the fins smooth for a nicer finish.

2) Fill the body tube grooves with a sealer to make it smooth. Many people prefer Elmer's Finishing Wood Filler. Again, this step makes for a nicer finish.

3) Tape around the shoulder of the nose cone before you paint it. Paint on the shoulder could make a tight fit. You can remove the tape after painting.

4) Spray paint is definitely the way to go. They will give a smoother finish than brushed on paint. I would not suggest buying small cans of model spray paint. They will not go very far. Many people use the larger cans of Krylon. These work great. You can also buy similar paint in large cans that is much cheaper at discount stores. This dollar or so savings per can will add up when buying many colors.



5) Make a wand of a rolled-up newspaper or coat hanger and put it into the bottom of the body tube. This enables you to hold the rocket while avoiding overspray. Wearing an old glove also helps protect your hand.

6) Use a gray or white primer as your first coat.

7) If painting different colors, use masking tape and newspaper (or the shiny coupons from Sunday's paper) to mask areas between colors.

8) If painting multiple colors, start with the lightest color first and work toward the darkest.

9) Spray the paint on in a few light coats, not one big one. The paint will run and bubble if you try to do everything in one coat. Patience! Light even coats.

10) When applying water decals, use a soft brush to move the decal on the rocket until it is in place.

11) Pat the decal dry to remove the bubbles. You can use a paper towel, Kleenex or soft cloth for this.

12) When the decals are dry, apply a coat of clear paint to help hold the decals in place. If your rocket has a clear paint finish, you can then use a little window cleaner to remove smudges.

Pre-Launch (You and helpers)

1) Before the kids arrive for the launch, prepare the field. Set up your launcher and launch control table. Use chalk or temporary marking paint (if permission is given) to mark a circle 15 feet around the launch pad for people to stand behind.

Note the wind direction and speed. If the wind is stronger than 20 miles per hour, you should postpone your launch. Since you are probably more concerned with launching and retrieving the rockets than which one reaches the highest altitude, point the launch rod slightly into the wind to ensure successful recoveries. Rockets flown this way will nose uprange, into the wind, and give you more room to recover them.

2) Recruit other adults or older scouts or 4-Hers to help. Assign someone that knows rocketry to be the Range Safety Officer. The RSO inspects the rockets prior to launch. He/she makes sure the motor and igniter are in correctly and checks nose cone for loose fit. You may also want to be sure others will be there to help corral the excited young people.

3) Establish the launch order beforehand. When it comes to kids, everyone wants to be first. If you establish an order beforehand, then you will prevent any problems. There is alphabetical order, reverse alphabetical order, age, experience, drawing names out of a hat, etc. Just pick a method before the launch and then stick to it at the field.

4) Be sure to have extra batteries for your launch controller. Nothing will disappoint your youngsters more than not having the motor ignite. When launching a large volume of rockets, batteries can get worn down quickly. Having extras on hand means no disappointed future astronauts.



5) Set the launch pad so the top of the launch rod is above eye level. Also be sure to put the Safety Cap on the rod.

Your Rocket Launch (You, helpers and kids)

1) Go over the NAR Safety Code again, this time with everyone. Now is the time to go through the Safety Code with them and have them sign the bottom to show they will comply with ALL rules.

2) A few additional rules that I use in my classroom launches.

- A. Everyone pays attention at all times!
- B. Everyone stands behind the 15 foot circle during the launch.
- C. To keep rockets from getting stepped on and broken, each person retrieves his/her own rocket. After pushing the button and launching rocket, replace the safety cap and retrieve your rocket.
(OR, you can designate certain people to be rocket retrievers. For instance, the previous launcher retrieves the next person's rocket.)

3) As a group, prepare the rockets for launch. Follow your rocket's directions for inserting the recovery wadding, the recovery system (parachute or streamer?), motor, igniter, and plug.

Launch Preparation Steps

- a) Loosely crumple each sheet of wadding separately and push into top of body tube. A pencil or old knitting needle is a perfect tool for this.
- b) Fold parachute or streamer as tightly as possible. It should fit loosely so that it ejects easily. Fold the parachute according to the kit directions or use the Carlisle Method shown in *The Handbook of Model Rocketry*.
- c) Instead of tying your parachute to the nosecone, tie it to a fishing spinner or snap swivel. This enables you to hook it on the nosecone and then take it off for storage so it can hang open and not be crumpled.
- d) If the weather is humid, sprinkle a little baby powder in the parachute before folding to prevent it from sticking.
- e) Write your name and phone number on the streamer or parachute with a permanent marker. If it gets lost, someone can let you know. You could also write it on a piece of tape and put it around the shoulder of the nosecone.

4) Everyone goes to launch field. Have everyone go to their proper positions and BEGIN LAUNCHING!

5) Some additional ideas to spice up your launch.

- a) Use flags to mark where the rockets land and see whose rocket lands closest to the launch pad.
- b) Use altitude trackers (available in hobby shops) and record the altitude that each rocket reaches.



Post-Launch (You, helpers and kids)

1) Pick up your field. It is a good idea to have everyone spread out and pick up all wadding, igniters, plugs, and spent motor casings. Let there be no sign that you were there.

2) Plan your next launch. There is a good chance that many of the kids will want to launch again. Model rocketry is addicting!

3) Look for other resources. Some of your rocketeers will be interesting in finding out more. You can point them to these resources so they can continue their exploration of this exciting hobby.

Internet Resources

National Association of Rocketry - www.nar.org

The world's largest and oldest organization supporting the hobby of rocketry, NAR membership benefits include:

- **Sport Rocketry**, a 48 page bimonthly magazine
- connections to NAR local clubs
- discount coupons for special offers from manufacturers
- NAR Technical Services (NARTS), which stocks for dozens of technical reports, plans, scale data and software not available from any other source.

Usenet Newsgroup - rec.models.rockets

Accessible from the NAR website, this active discussion group is visited by 55,000 modelers in an average week. Here, you can get a wealth of information from other rocketeers.

Rocketry Online - www.rocketryonline.org

An active website with connections to virtually all rocket manufacturers and suppliers, ROL as it is known, also features a tips library and discussion groups.

Yahoo - www.yahoo.com

Go to Outdoor Recreation, to Hobbies, to Rocketry, to find numerous personal and commercial websites covering all aspects of rocketry.

Printed Resources

Several of these were used in the preparation of this document.

Sport Rocketry magazine, available as an NAR membership benefit, and at retail stores carrying Kalmbach publications

Stine, G. Harry, *The Handbook of Model Rocketry*, Sixth Edition, New York, John Wiley and Sons, Inc., 1994

Wiersbe, Bob (Compiler), *NIRA'S Big Book-O-Tips*, Volume 1, available from National Association of Rocketry Technical Service (NARTS)

Various rocket kit directions themselves

Andy Heren, Rcktnut007@aol.com



Checklist for "Successful Rocketry for Scouting, 4-H, and Other Youth Groups"

By Andy Heren, Rcktnut007@aol.com

Getting Started

Assigned to: _____

- 1) Build, launch, and recover a model rocket.
- 2) Find and read *The Handbook of Model Rocketry* by G. Harry Stine.
- 3) If you know another adult or a young person who is into rocketry, ask him or her for help.

Preparing for Your Group's Activity

Assigned to: _____

- 1) Decide which rocket your group will build.
- 2) Select your launch field and get permission to launch.
- 3) Decide where to buy the rockets.
- 4) Decide how to pay for the rockets.
- 5) Be sure to order one for yourself.
- 6) Think about which motor to buy and use.
- 7) Order your materials so they arrive at least two weeks ahead of time.
- 8) Gather all building supplies.
- 9) Think about your meeting place.
- 10) Think about how much time you have.
- 11) Arrive early and get everything set up before the kids arrive.
- 12) Read the NAR Safety Code so you are familiar with it before your group begins their work.



Building Your Rockets

Assigned to: _____

- 1) Have a lot of extra patience.
- 2) Go slowly through the directions so that the entire group can keep up.
- 3) This would be a good time to have other adults there to help.
- 4) Go through all steps in building and then paint rockets.
- 5) Read all instructions first.
- 6) Use the right kind of glue.
- 7) Sand balsa fins properly.
- 8) Make the fin joints strong with two simple tricks.
- 9) Check your fin alignment.
- 10) Use glue fillets to help strengthen the fin/body tube attachment.

Painting Your Rockets

Assigned to: _____

- 1) Fill the balsa wood fins with a sanding sealer.
- 2) Fill the body tube grooves with a sealer to make it smooth.
- 3) Tape around the shoulder of the nose cone before you paint it.
- 4) Spray paint is definitely the way to go.
- 5) Make a wand of a rolled-up newspaper or coat hanger and put it into the bottom of the body tube.
- 6) Use a gray or white primer as your first coat.
- 7) If painting different colors, use masking tape and newspaper (or the shiny coupons from Sunday's paper) to mask areas between colors.
- 8) If painting multiple colors, start with the lightest color first and work toward the darkest.
- 9) Spray the paint on in a few light coats, not one big one.
- 10) When applying water decals, use a soft brush to move the decal on the rocket until it is in place.
- 11) Pat the decal dry to remove the bubbles.
- 12) When the decals are dry, apply a coat of clear paint .



Pre-Launch

Assigned to: _____

- 1) Before the kids arrive for the launch, prepare the field.
 - chalk line 15 feet away from launcher
 - angle the launch rod properly
- 2) Recruit other adults or older scouts or 4-Hers to help.
- 3) Establish the launch order beforehand.
- 4) Be sure to have extra batteries for your launch controller.
- 5) Set the launch pad so the top of the launch rod is above eye level.

Your Rocket Launch

Assigned to: _____

- 1) Go over the NAR Safety Code again, this time with everyone.
- 2) A few additional rules
 - Everyone pays attention at all times!
 - Everyone stands behind the 15 foot circle
 - Each person retrieves his/her own rocket.
- 3) As a group, prepare the rockets for launch.
- 4) It's Time To Fly!

Post-Launch

Assigned to: _____

- 1) Pick up your field.
- 2) Plan your next launch.
- 3) Look for other resources.

