

OHIO 4-H MASTER PROJECTS



4-H 503M

Rocketry Master

By Dr. Bob Horton, Extension Specialist, Educational Design and Science Education, 4-H Youth Development, Ohio State University Extension; D. Mark Ponder, Electrical Controls Designer and Model Rocket Enthusiast; and Alan Robinson, Ohio 4-H Volunteer and Model Rocket Enthusiast. Reviewed by Savannah Ponder, M.S., Aeronautical Engineering, and Research Engineer.

The Rocketry Master project is for members who want to take the next step after completing the Ohio 4-H 503 *Rockets Away! (Solid-Fuel Model Rockets)* project. Members of any age may complete this project, but must have rocketry experience comparable to what is required for other advanced-level 4-H projects, and be able to plan and complete the project on their own with minimal supervision or assistance.

NAME _____

AGE (as of January 1 of the current year): _____

COUNTY: _____

CLUB NAME: _____

ADVISOR: _____



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
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ohio4h.org

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Project Guidelines

This project is an advanced rocketry project for members who have progressed beyond or have mastered the 503 *Rockets Away! (Solid-Fuel Model Rockets)* project. During this project, you will design, build, and fly a solid-fuel model rocket. Designing your own model rocket challenges your creativity, building capabilities, and knowledge of model rocketry. After learning how to build a safe and stable model rocket, you will not be restricted in your design.

Designing your own rocket can be completed in many different ways. These pages are mainly for project record keeping. For additional information and sample rocket projects, please see *Designing Your Own Model Rocket* by Mark Ponder, available online at www.ohio4h.org/rocketsaway.

Note that radio-controlled (R/C) boost gliders do not fall into this project category. R/C boost gliders can be exhibited within the 365 Self-Determined Project.

Before you begin, review and sign the Model Rocket Safety Code that appears as the last page of this document.

1. Plan, design, build, fly, and evaluate at least one solid-propellant model rocket. What you make should be different from a kit.
2. Take part in at least two learning experiences, as outlined and planned in section 2.
3. Take part in at least two leadership/citizenship activities, as outlined and planned in section 3.
4. Explore career opportunities in which you might apply or use what you learn by completing this project, as outlined in section 4.
5. Keep records of what you do, when you do it, how much you spend, and what you learn as you complete the project.
6. If possible, have someone take pictures of you working on your project at different stages as you progress from the beginning through completion, and attach copies of the photos in section 6 or in a separate project scrapbook.
7. Take part in a judging activity to evaluate the results of your project with someone else. The judging activity could be a simple discussion with your 4-H advisor about what you did particularly well with your project, and what you might like to do better next time, or it could be a more complex activity such as participating in your county's 4-H judging to see how the results of your work compare with those of other members enrolled in the Rocketry Master project.

Section 1: Planning What to Do and Doing What You Plan

To complete this project, you must perform the following tasks:

- Design your own solid-propellant model rocket.
- Show that you have determined your rocket is stable prior to flight.
- If pursuing the kit bashing method, provide a list of which parts come from which kit.
- Center of Gravity (CG) and Center of Pressure (CP) requirements:
 - Document how you found the CG and the CP of your rocket.

- Mark the CG and the CP on the exterior of your designed rocket. (Remember, two stage rockets have multiple CG and CP locations.)

No specific design suggestions are included here. The whole notion of a master project is to decide what *you* want to do. Just make sure what you plan is different from what you could do in other rocketry projects, and do what best suits you and your family's needs and interests. This project may be completed or repeated over several years, as long as new skills are developed each year, and as long as additional sources and activities are used. Be sure to enroll in 4-H and register your project with your Extension office each year.

Before deciding for sure what you want to do or make for your project, complete the following:

- Discuss your ideas with family, friends, and your 4-H advisor.
- Talk with someone who has done something similar to what you are planning, and ask for tips and advice.
- Check out books about your topic at the library before you begin.
- Visit websites that provide more information about what you plan to do.
- Check your county's project guidelines (if any) for additional requirements, especially if you choose to participate in county project judging or prepare an exhibit for the fair.

Most of all, be safe and launch for the field size, NOT the rocket size.		
LAUNCH SITE DIMENSIONS		
Installed Total Impulse (N-sec)	Equivalent Motor Type	Minimum Site Dimensions (ft.)
0.00—1.25	1/4A, 1/2A	50
1.26—2.50	A	100
2.51—5.00	B	200
5.01—10.00	C	400
10.01—20.00	D	500
20.01—40.00	E	1,000
40.01—80.00	F	1,000
80.01—160.00	G	1,000
160.01—320.00	Two Gs	1,500

For additional information and sample rocket projects, please see *Designing Your Own Model Rocket* by Mark Ponder, available online at www.ohio4h.org/rocketsaway.

My Rocketry Master Project Plan

Use this table to outline your goals (what you want to do in your project), the specific steps you need to take to accomplish those goals, and when you plan to do them.

Goals	Objectives	Dates

Section 2: Project Learning Experiences

Learning experiences are organized programs or events in which you learn with other people about things related to your project, beyond what you would by yourself. Choose **at least two** learning experiences from the list below (or create your own). Write them in the table below. Record your progress by asking your project helper to initial next to the date when each one is completed. You may add to or change these activities at any time.

- Participate in a local club launch. These launches are located on the NAR or Tripoli web sites. Document your participation through pictures, video, or both.
- Demonstrate the different recovery systems used in model rocketry. Be able to explain the different parts of a parachute and demonstrate how to fold a parachute using the Carlisle method.
- Apply one method for determining the altitude of your launch. Be able to explain how altimeters work in model rockets.
- Attend a clinic, workshop, demonstration, or speech on a topic related to your project.
- Participate in county judging.

Learning Experiences (include location)	Date Completed	Project Helper Initials

Section 3: Leadership/Citizenship Activities

Leadership/citizenship activities provide opportunities for 4-H teens to live the 4-H pledge—by using their heads, hearts, hands, and health to think clearly, promote loyalty, provide service, and live better to improve their clubs, communities, country, and world. Choose **at least two** leadership/citizenship activities from the list below (or create your own). Write them in the table below. Record your progress by asking your project helper to initial next to the date when each one is completed. You may add to or change these activities at any time.

- Encourage a friend or a younger person to join 4-H and take a rocketry project, or help younger members plan and complete a rocketry project.
- Do an interview practice session for younger members to help them prepare for judging.
- Attend a local township trustees meeting or county commissioners meeting, and tell them about yourself and your club’s service projects.
- Assist in setting up for and cleaning up after a club, county, or other 4-H event, especially those related to rocketry.
- Prepare an illustrated talk, speech, or skit related to your project, and present it to your 4-H club or at the county or area 4-H speaking contest.
- Create an online video that demonstrates a unique feature from one of your rocket designs. Share it with rocketry program leaders.

Leadership/Citizenship Activities	Date Completed	Project Helper Initials

Section 4: Explore Career Opportunities

One benefit of completing 4-H projects is that they give you a chance to think about and explore potential career opportunities. Many former 4-H teens use the skills and abilities developed in 4-H rocketry projects in their careers. Some have successful careers directly related to rocketry, such as maintenance technician, controls engineer, manufacturing engineer, mechanical engineer, electrical engineer, software engineer, and even physician. Even if you do not pursue a career in a rocketry field, you will use your 4-H rocketry experience throughout life.

Since the process you are working through requires selecting a task and developing a solution, the skills you

gain during the project transfer to nearly any career. Every employer is looking for associates who are self-starters and for individuals who can work through a given problem from start to finish.

Talk with a parent, project helper, or friend and brainstorm a list in the table below of at least three careers in which you could apply what you learn through this project. In the middle column, list the name of someone you know who could tell you more about that career. Select *one* of the people listed to interview them about their field and how to succeed in it. Summarize what you learned in the space below.

Related Career/Job Title	Person you could visit with who knows about the career	Date you visited ONE of these people about the career

What I Learned:

Section 6: Project Photos

Use this page to attach photos of you working on your project at different stages. Add additional pages if needed, or keep your photos and project records in a separate project scrapbook.

Section 7: Evaluating Your Results

Take part in a judging activity to evaluate the results of your project with someone else. The judging activity could be a simple discussion with your local 4-H advisor about what you did particularly well with your project and what you might like to do better next time, or a more complex activity such as participating in your county's 4-H judging to see how the results of your work compare with those of other members enrolled in the Rocketry Master project. To prepare for judging, evaluate what you did for your project using by answering these questions:

1. Describe what you did for this project.

2. What led to this decision?

3. What did you do especially well in your project? What are the best parts of your project?

4. If you could improve anything about your project, what would it be? What will you do differently next time you attempt to make something like what you made in your project?

Date Judging Activity Completed: _____

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Keith L. Smith, Associate Vice President for Agricultural Administration; Associate Dean, College of Food, Agricultural, and Environmental Sciences; Director, Ohio State University Extension; and Gist Chair in Extension Education and Leadership.

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Model Rocket Safety Code

The *Model Rocket Safety Code* from the National Association of Model Rocketry must be followed to provide a positive and safe experience in the field of model rocketry. In this project, where you are modifying existing designs or designing your rocket from scratch, your focus must be on safety. Review the current code before you begin and verify that you are still following it before every launch.

Effective August 2012

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. When conducting a simultaneous launch of more than ten rockets I will observe a safe distance of 1.5 times the maximum expected altitude of any launched rocket.
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.
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 [page 3], 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.

I have reviewed the Model Rocketry Safety Code and am following its guidelines before every launch.

Print Name

Signature

Date