



4-H ROCKETRY

Member's Guide

Cooperative Extension **University of California**
Division of Agriculture and Natural Resources

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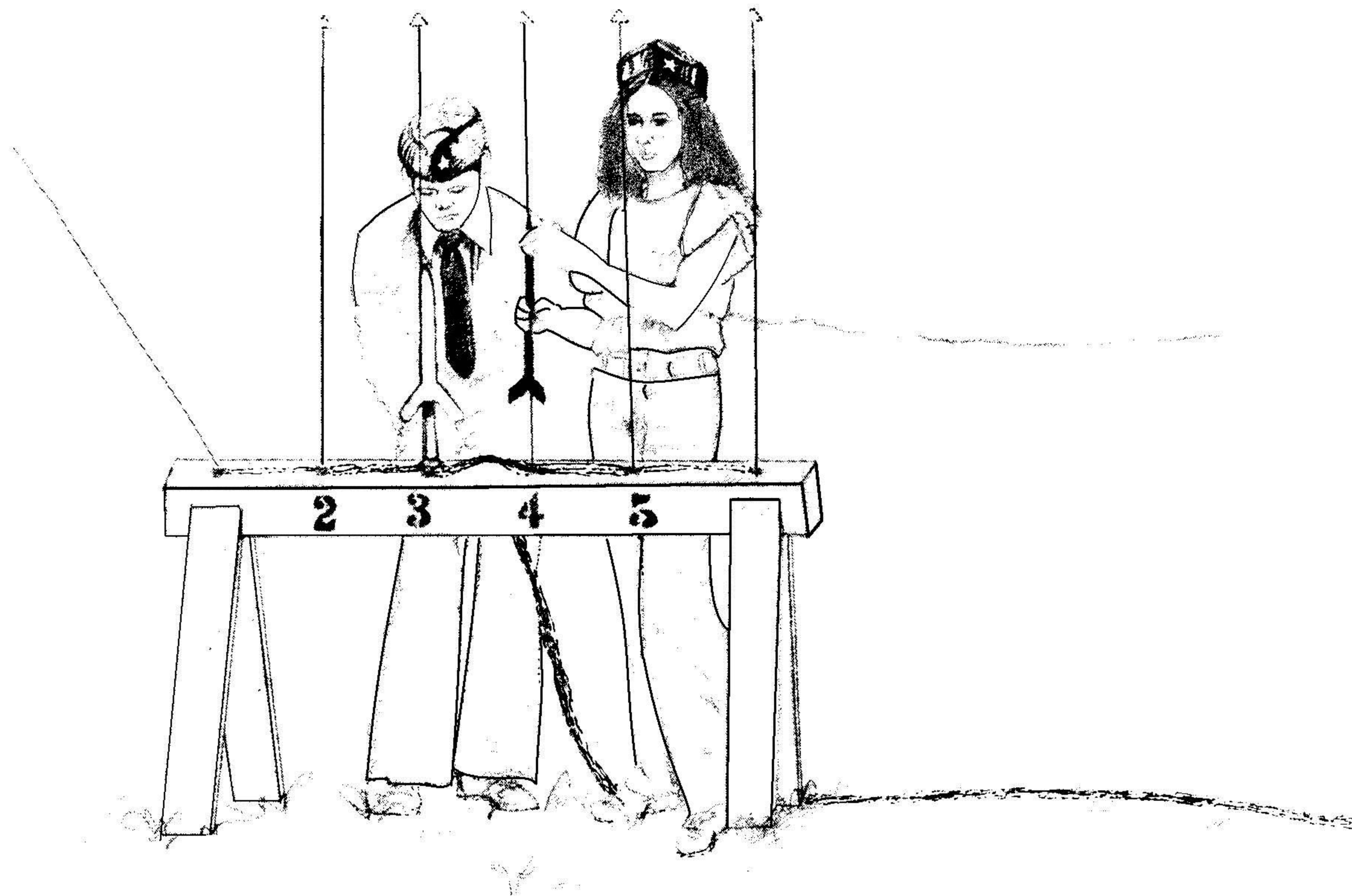
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This 4-H Member's Guide was developed by a committee composed of 4-H Teen Leaders Jon Schmitz of Humboldt County and James Marshall of Del Norte County; and 4-H Youth Advisor Charles Hilgeman of Humboldt County in cooperation with Kathryn Cirincione-Coles, 4-H Specialist: Curriculum/Publications, U.C., Berkeley.

Some of the material is adapted from a publication prepared by Humboldt County 4-H All-Star Mark Bent in 1973. The authors are grateful for information provided by Estes Industries, Inc., and the National Rocket Association.



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4-H Rocketry Member's Guide

Safety for yourself and others should be your first concern as a member of a 4-H rocketry program. Without safety precautions, someone is bound to get hurt. A single slip-up might cause a serious accident. If you build your rocket with care and follow the rules, you will have a project that is highly successful through completion.

To stay within legal boundaries, check with your local or state fire marshall's office or fire department safety officer for regulations covering the use of model rockets in your area. You can learn the basics of rocketry by starting out with simple-to-build Level I rockets. Learning the names of all the rocket parts is a good beginning. The names are part of the special terminology and language you will need to know for communicating with professionals in the field.

4-H Rocketeer's Pledge

I am proud to be a model rocketeer. I will uphold the outstanding safety record of model rocketry by following the Rocketeer's Code of Safety and by acting with maturity in all my rocket activities. I will always strive to be considerate of other people and their property.

Rockets are not toys. Those whose career is with rockets in the space program, or missiles in the military, treat them with a great deal of respect. You can learn about responsibility and respect—the two “Rs” of model rocketry—by learning and practicing the Model Rocketry Safety Code (p. 4). 4-H model rocketry members should always respect the equipment with which they are working...and always respect their fellow 4-H rocketeers.

Skill levels

There are five skill levels for members in the rocket project.

- Level I. The beginner with no previous experience with models will build models that are simple to build.
- Level II. The rocketeer with other experience with models, or who has built the simple rocket of Level I, can build a model that is easy to build.
- Level III. Intermediate skills. Build and fly more complex rockets.
- Level IV. Participating in staging, boost glider, or scale model rockets.
- Level V. Advanced challenge. Designing rockets.

Tools and materials

You do not need a large number of tools to be involved in the 4-H rocketry project. You will need: an X-ACTO or small hobby knife, scissors, a ruler or straight edge, balsa wood, white wood glue, paint, rubber bands, clothes pins, straight pins, sandpaper,

wax paper, and cellophane tape. Rocket kits purchased from local hobby stores or by mail contain most of the materials necessary to complete each rocket. Only in the advanced unit of this project will you work without a kit.

Reaching new heights

4-H offers the opportunity for you to progress as fast and go as far as you wish. Giving the project your best effort, see how far you can go. After you have mastered the elementary levels of rocketry, look for challenges requiring additional learning. Level II and III rockets introduce you to the concepts of staging, multiple engines, or larger rockets with larger payloads. Bring science and math into your rocket launches and learn how to accurately measure the height of each of your launches. You may want to challenge other members to see who can build a rocket that goes the highest with the biggest payload. In case you haven't noticed, for nearly 30 years some nations also have

been flexing their missile might to impress each other.

In Level IV and V rocketry you may want to explore the world of astrophotography and include a camera as part of the payload. If you are really interested in rockets and space you may be able to have a career in that industry.

As you become older and more experienced in 4-H rocketry you may wish to contact companies associated with the space industry, NASA, or the military about careers in rocketry.

In case of accident

Accidents can happen, even when we follow the safety codes. Be prepared. Be sure your rocketry group has a first aid kit. Each member should know the basics of first aid. When you go on your launches, appoint a range "safety officer" who will find out where the nearest phone is and bring the phone number of the nearest emergency aid service, such as a fire department or an ambulance service. Put that

number with the first aid kit. If someone does get hurt, DON'T PANIC. Keep calm and keep the injured person calm. Water carried in a plastic gallon jug is useful for treating heat and acid burns that could occur. Flooding with cold, clean water is the best treatment. Puncture wounds can be treated by flushing with cold water, applying pressure to stop the bleeding, then getting proper medical attention.

Ever want to be a teacher?

Make a presentation about 4-H rocketry, covering what model rockets are, how they work, how to launch them, where to buy them, and what supplies are needed. Learning something well enough to teach it gives a feeling of pride and accomplishment.

Your leaders can help you learn how to put together a 4-H presentation. Your county has 4-H events where you can share your knowledge and compare how well you did with others in giving 4-H presentations.

Model Rocketry Safety Code*

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 preloaded, 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 ounces) at liftoff, and the engines will contain no more than 113 grams (4 ounces) 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 10 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 buildings, power lines, tall trees, or low-flying aircraft, or under any conditions that 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 use only non-flammable recovery wadding in my rockets.
10. **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.
11. **Power lines.** I will never attempt to recover my rocket from a power line or other dangerous places.
12. **Launch targets and 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.
13. **Prelaunch test.** When conducting research activities with unproven designs or methods, I will, when possible, determine their reliability through prelaunch tests. I will conduct launchings of unproven designs in complete isolation from persons not participating in the actual launching.

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Date completed

Leader's initials

Unit I _____

Have your leader initial and date each objective as you complete it:

- 1. List at least five parts of a rocket.
- 2. List at least five sections of the model rocketry safety code.
- 3. Assemble a Skill Level I rocket.
- 4. Prepare a presentation showing the steps in building a Skill Level I rocket.
- 5. Write an evaluation of another member's rocket presentation using 4-H Presentation Evaluation (4-H 8017).
- 6. Attend a rocket launching.
- 7. List at least five contents of a first aid kit and explain the use of each item.

Unit II _____

Have your leader initial and date each objective as you complete it:

- 1. List the seven parts of a rocket.
- 2. Assemble your own rocket launching system.
- 3. Assemble a Skill Level II rocket.
- 4. Prepare and present a talk for first-year members about the Rocketry Safety code which includes all 13 points.
- 5. Prepare a demonstration about rocketry and present it in your county contest.
- 6. Launch a rocket that you have assembled.

Date completed	Leader's initials
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Unit III

Have your leader initial and date each objective as you complete it:

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| | | 1. Name the three rocket recovery systems. <input type="checkbox"/> |
| | | 2. Assemble a Skill Level III or IV rocket. <input type="checkbox"/> |
| | | 3. Prepare a report about a two-stage rocket for a club meeting. <input type="checkbox"/> |
| | | 4. Prepare a report about a rocket with a payload for a club meeting. <input type="checkbox"/> |
| | | 5. Build an altitude measuring device and explain to club members at a meeting how it works. <input type="checkbox"/> |
| | | 6. Describe one possible cause for failure of a rocket to launch. <input type="checkbox"/> |
| | | 7. Prepare a list of ten questions first-year members have about rocketry and, through research, find the answers to those questions. <input type="checkbox"/> |

Unit IV

Have your leader initial and date each objective as you complete it:

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| | | 1. Assemble a Skill Level V rocket. <input type="checkbox"/> |
| | | 2. Prepare a plan for being a junior/teen leader in rocketry using 4-H 8034 Leadership Project Plan and Report. <input type="checkbox"/> |
| | | 3. Make a list of sources for visual aids on rockets. <input type="checkbox"/> |
| | | 4. Assemble a rocket with a camera. <input type="checkbox"/> |
| | | 5. Assemble a rocket without using a kit. <input type="checkbox"/> |
| | | 6. Describe one way to test a rocket for stability. <input type="checkbox"/> |
| | | 7. Prepare an educational display about rockets for a fair or other public event. <input type="checkbox"/> |
| | | 8. Prepare a report about careers related to rocketry and present the report at a 4-H club. <input type="checkbox"/> |