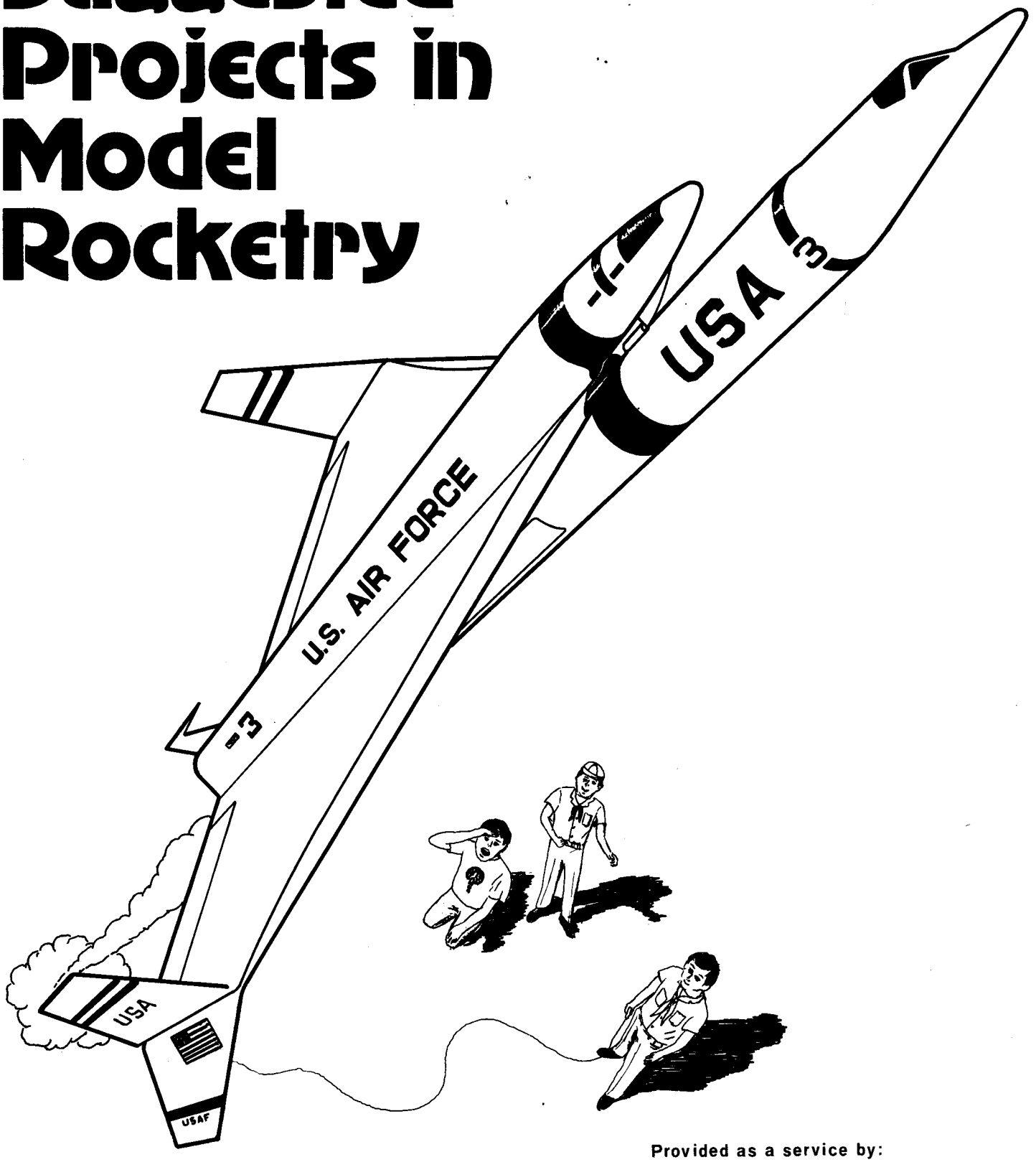
# Suggested Projects in Model Rocketry

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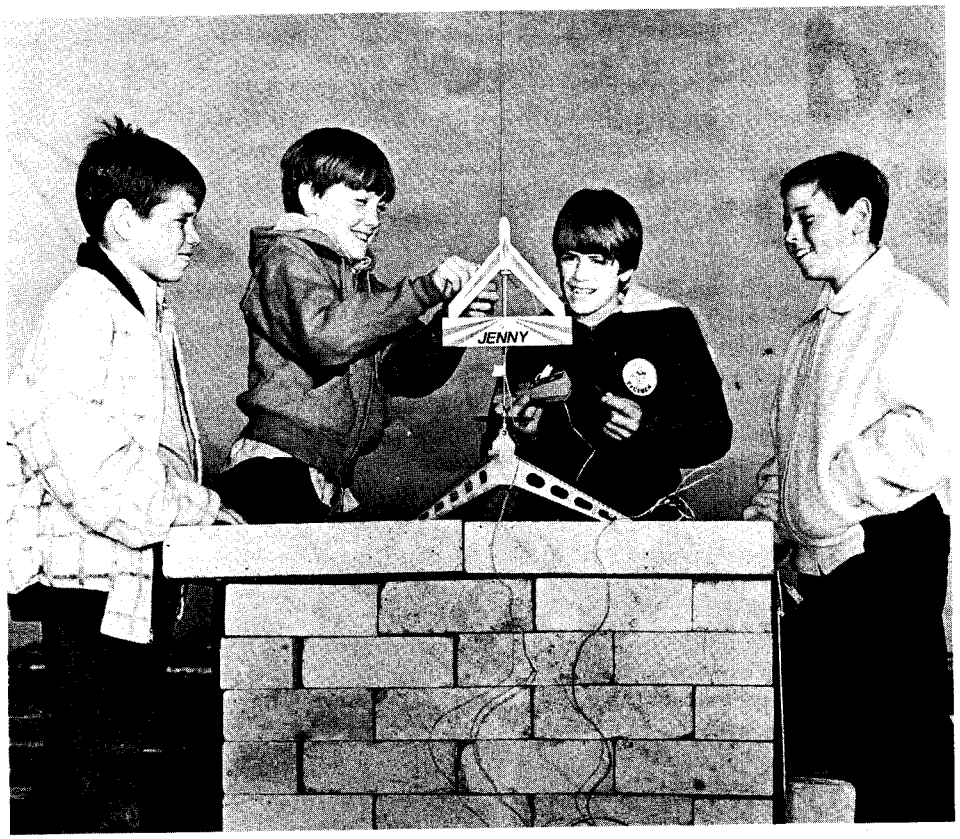



Model Rocketry, the Space Age Hobby, is one of the most popular hobbies for young men. Most of the approximately one million individuals who engage in model rocketry each year are boys 10 to 14 years in age.

The wide spectrum of activities available in model rocketry make it popular with many thousands of adults also. Many fathers are active rocketeers with their sons. Thousands of teachers use model rocketry each year with their classes because it is educational as well as exciting and safe. Whether it is used as a sport or as a miniature technology, model rocketry is fun.

This publication provides specific ideas for fun-learning projects suitable for individual or group projects. With each suggested basic activity one or more references are noted to help the rocketeers to find more information about that topic.

Scout and other youth group leaders are invited to write to Estes Industries, Dept. 23, Penrose, Colorado 81240 for additional copies of this publication and for sample copies of some of the publications noted. We will be happy to furnish a copy of our introductory leader's guide ("Aerospace Education and Model Rocketry"), our introductory booklet for rocketeers ("The Alpha Book of Model Rocketry"), a current Estes catalog, "Model Rocketry Technical Manual," ordering and discount information, and a free sample Astron Alpha model rocket kit to each adult leader of a recognized youth group who writes requesting our Club Packet CP-1 before December 31, 1973. Please identify your official title and the name of your group and its affiliation with your request.

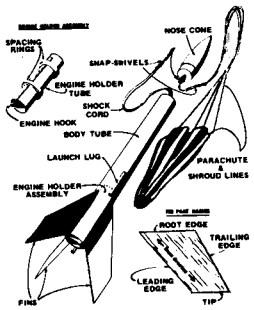
## IMPORTANT BASIC PROJECTS

1. History of Rocketry and Model Rocketry

   Find out about the history of rocketry and why model rocketry was created. ("Space Age Technology," chapter 4, or an encyclopedia provide information on the history of rockets and space travel for the history of rocketry. "Why Model Rocketry?" gives a brief explanation of the origin of model rocketry.)


   Become familiar with and follow the "Model Rocketry Safety Code." ("Model Rocketry Safety Code is found in "The Alpha Book of Model Rocketry" and in the Estes catalog.)

2. Theory of Model Rocketry




   Tell the basic parts of a model rocket.

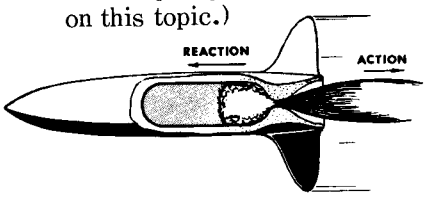
   Describe the flight characteristics of a model rocket.

   Explain the performance of model rocket engines.

   (Information on the previous items is found in "The Alpha Book of Model Rocketry" and in "The Model Rocketry Technical Manual."

   Tell why different model rocket engines are recommended for specific missions. ("The Alpha Book of Model Rocketry," "Model Rocketry Technical Manual," and the current Estes catalog provide information on engines.)

   Review Newton's Third Law of Motion ("For every action, there is an equal but opposite reaction.") and explain the relationship between Newton's Third Law and the operation of a model rocket. (Encyclopedias, physics and science textbooks, and "The Laws of Motion and Model Rocketry" provide information on this topic.)



3. Construction of Model Rockets

Become familiar with good construction techniques and correct finishing procedures for building model rockets. ("The Alpha Book of Model Rocketry" and "Model Rocketry Technical Manual" provide information on these.)

Build a simple, single stage model rocket kit. (The Astron Alpha is the ideal model rocket kit for beginners.)

Describe how a basic model rocket launch system works.

Construct a simple model rocket launch system from a kit or with your own materials.

("The Model Rocketry Technical Manual" provides information on launchers and how to build them. The Solar Launch Control system using AA alkaline dry cells or the FS-5 Launch Control System for car or lantern batteries are the recommended electrical ignition systems. The Porta-Pad or Tilt-A-Pad are good launch pads.)

4. Launch of Model Rockets

Prepare a Flight Data Sheet to record the details of your launches.

Learn the correct procedures for preparing your rocket for launch. Prep your model for flight.

Make a pre-flight safety check of the launch area. Give a short countdown, and launch your model rocket.

("The Alpha Book of Model Rocketry" explains how to prep your rocket and how to use a Flight Data Sheet. A Flight Data Sheet is included in this booklet.)

5. Stability of Model Rockets

Tell about model rocket stability.

Perform one of the recommended pre-flight stability tests, such as the string or swing test, on your first model rocket to illustrate this principle.

("The Alpha Book of Model Rocketry" and the "Model Rocketry Technical Manual" explain stability and the swing test.)

## EXCITING ADVANCED PROJECTS

Complete any two

1. Engines

Make several flights with your model rocket using different engines and compare the flights. Tell about one of the following topics:

(a) Explain why the rocket performed differently using different engines.

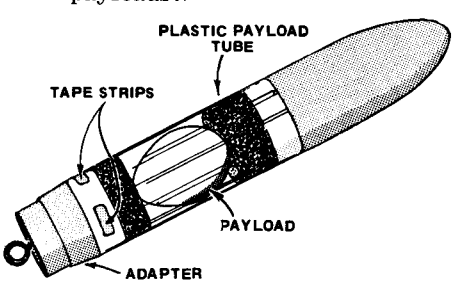
(b) Describe the difference between end-burning and core-burning model rocket engines and the purposes for which each was designed.

(Technical Note TN-1, "Model Rocket Engines," and Technical Note TN-2, "Model Rocket Engine Performance," provide technical information on engines.)

2. Payloads

Construct a payload compartment for your model rocket or build a model rocket with a payload compartment. (The Astron X-Ray, Astron Constellation, and the Astron Avenger are among the many model rocket kits available which feature payload compartments.)

Choose an interesting payload and learn the correct procedures for preparing the payload compartment for your cargo. (Technical Note TN-4, "The Fine Art of Payload Launching," provides useful information about payloads.)



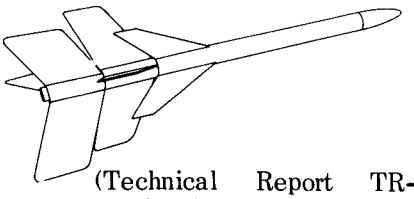

Check the stability of your model rocket with payload in place. (Technical Report TR-1, "Rocket Stability," provides data on this topic.)

Carry out a payload launch and record this mission on your Flight Data Sheet.

3. Multi-Stage

Tell about multi-stage model rockets for maximum altitude and performance.

Study stage-to-stage coupling methods, how booster engines work, and in-flight separation and ignition procedures.



(Technical Report TR-2, "Multi-Staging," provides information on all of these subjects.)

Construct and fly a multi-stage model rocket and record this mission on your Flight Data Sheet. (The Astron Apogee II, the Astron Farside, the Astron Avenger, and the Astron Shrike are excellent multi-stage model rockets.)

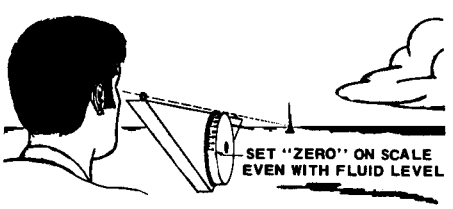
4. Altitude Tracking

Read about the various methods used to determine the maximum altitude reached by a model rocket.

Explain why there is a difference in reliability between single station, two station, and three-dimensional tracking. Explain which method is the most accurate.

(Basic information on tracking is contained in "The Alpha Book of Model Rocketry" and "Model Rocketry Technical Manual." Technical Report TR-3, "Altitude Tracking," supplies much more information.)

Build an altitude tracking device from a kit or from your own materials. With the help of a friend, set up a tracking station. Launch one of your rockets with several different engines, track the flights, and record their altitudes on your Flight Data Sheet.




"ZEROING IN" ON THE ROCKET WITH AN ALTISCOPE

(The Altiscope is a fine tracking device. "How High Did It Go?", Model Rocket News, Volume 9, Number 3, November, 1969, tells how to build your own tracking device.)

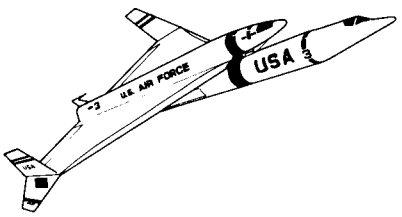
5. Design

Describe the principles and techniques for designing your own model rockets.

Using these procedures design an original plan for either a high performance/low drag vehicle or for a sport flying/fun model.

Record all stability calculations and plan your entire rocket on graph paper before constructing it.

Build and finish your design.




(Technical Report TR-9, "Designing Stable Rockets," explains procedures for use in designing stable model rockets. For high performance models, Technical Report TR-11, "Aerodynamic Drag of Model Rockets," provides very useful information.)

Carry out a simple pre-flight stability test ("string test" or wind tunnel test), prep it for flight, and launch your original design.

Record the flight on your Flight Data Sheet. ("Model Rocketry Technical Manual," "The Alpha Book of Model Rocketry," and the Technical Report TR-1 "Rocket Stability," provides data on stability.)

6. Contests

Learn the suggested rules and regulations for various types of model rocket competition.

Participate with your friends in organizing and conducting a model rocket contest featuring two or three competitive events.

In addition to competing, take part in at least three of the following range activities:

(a) Tracking

(b) Data Reduction

(c) Communications

(d) Safety Check

(e) Recovery Team

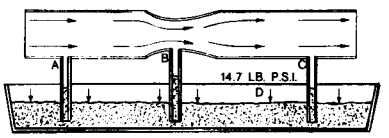
(f) Launch Controller

(g) Range Safety Officer

("Model Rocket Contest Guide" supplies information on all aspects of contests.)

7. Gliders

Learn the basic aerodynamics of glider flight and Bernoulli's Law as it applies to boost glider configurations. (Encyclopedias or chapter 3 of "Space Age Technology" provide basic information on these topics. Technical Report TR-4, "Rear Engine Boost-Gliders," and Technical Report TR-7, "Front Engine Boost-Gliders," provide much more detailed technical information.)



BERNOULLI PRINCIPLE

Complete one of the following. A twenty-second or longer flight is required before this requirement is successfully met.

(a) Construct a small parasite glider from a kit or with your own materials. Trim the craft and then fly it using one of your model rockets as the booster vehicle. Record its flight on your Flight Data Sheet.

(b) Construct a front or rear engine boost-glider from a kit or with your own materials. Trim and launch the model and record its flight on your Flight Data Sheet.



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