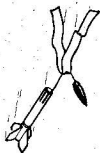


OTHER RECOVERY SYSTEMS



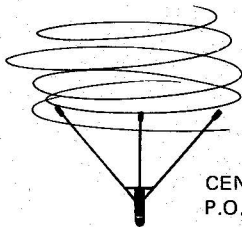
STREAMER — for light, extremely high fliers . . . won't drift as far away as rockets with parachutes.



GLIDE — a portion, or all, of the rocket is designed to actually glide to a safe landing.



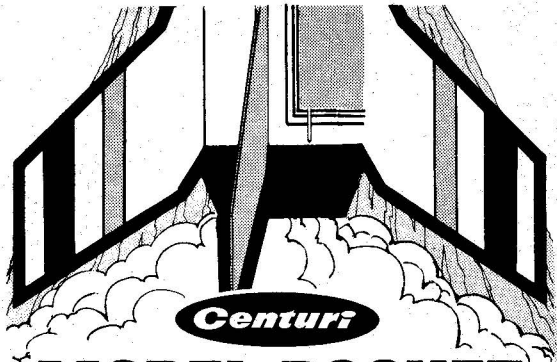
HIGH DRAG — rockets designed to tumble slowly or "break" apart in mid-air. These lightweight rockets have high air resistance and drag, thus falling safely.



GYRO — challenging designs that come back spinning rapidly, but falling slowly, like a helicopter.

Centuri

CENTURI ENGINEERING COMPANY
P.O. Box 1988, Phoenix, Arizona 85001



Centuri

MODEL ROCKET MINI-MANUAL

Keep this handy pocket-sized manual with you when flying model rockets . . . It answers many questions and is filled with valuable tips on how to successfully fly your model rockets!

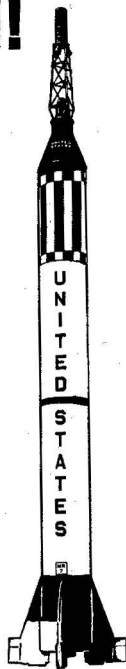
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3-2-1-IGNITION!

Alan Sheppard lifted off in the famous Mercury Redstone on Americas first manned space flight, about the same time that model rocketry got started! Now you can build and launch actual flying rockets!

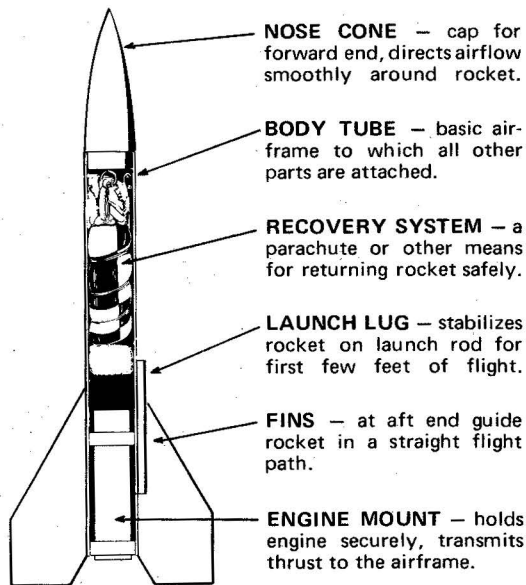
Model rocketry is a fun and rewarding way to take part in the excitement of today's great Space adventure! This sophisticated science/hobby/sport is inexpensive, and thrilling to people of all ages. Just like many full-size rockets, model rockets operate on sound scientific principles, are electrically ignited, recover safely, and are great fun! . . . An activity for the whole family!

By following the Model Rocket Safety Code and observing assembly and launching tips, you will have many happy hours with Model Rocketry!



WHAT IS A MODEL ROCKET?

A SIMPLE VEHICLE, CONSISTING OF:



HOW DOES IT WORK?

5 APOGEE — as rocket reaches peak altitude and begins descent.

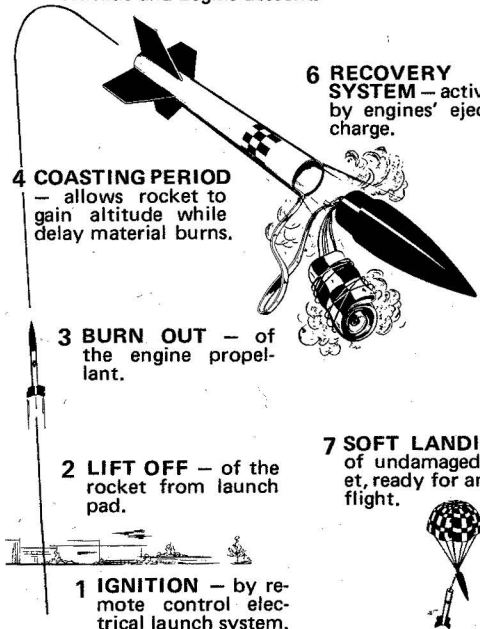
6 RECOVERY SYSTEM — activated by engines' ejection charge.

4 COASTING PERIOD — allows rocket to gain altitude while delay material burns.

3 BURN OUT — of the engine propellant.

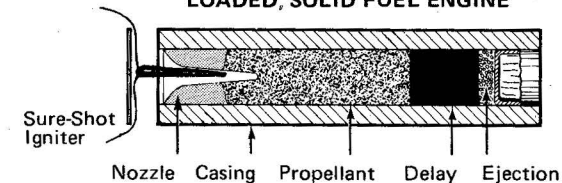
2 LIFT OFF — of the rocket from launch pad.

1 IGNITION — by remote control electrical launch system.



HOW DO ENGINES WORK?

SAFE, INEXPENSIVE, FACTORY LOADED, SOLID FUEL ENGINE



Battery operated launch system heats igniter in engine nozzle, starts propellant burning.

Engine develops pre-determined thrust. Action and Reaction principle causes rocket lift off.

Propellant burns out, delay charge burns slowly permitting rocket to coast to peak altitude. Produces dense white smoke for ease of tracking.

Ejection charge ignites, providing hot, expanding gas to activate recovery system.

WHY MODEL ROCKETRY?

In 1957, the Russians launched the first Sputnik, and the race for Space was on. Excited by space exploration, thousands of young people attempted to build their own metal rockets and mix fuels. Many serious accidents followed and caused lawmakers to try eliminating non-professional rocketry. However, laws did little to prevent accidents. Model rocketry was created by concerned people as a safe answer to the experimenting urge.

From its start in 1957, model rocketry has become one of the fastest growing recreations in the country. Over 40,000,000 model rocket launches have happened in the United States alone with this scientific hobby/sport spreading to Canada and many other countries.

Nationally recognized agencies such as the Federal Aviation Administration and National Fire Prevention Association have established rules and guidelines for the manufacture and use of model rockets.

In a spirit of cooperation, model rocket manufacturers adhere to industry-wide standards of engine size, power, and safety precautions.

Model rocketry has established an enviable safety record while fulfilling a creative urge of thousands of people.

The "National Association of Rocketry" (NAR), a non-profit governing body, has developed as the national spokesman for this aerospace hobby. The basic purpose of the NAR is to promote model rocketry safety and fun. The NAR publishes a monthly magazine, helps clubs get started, sanctions contests, certifies U.S. and World Records, and sells emblems and technical papers. Membership includes liability insurance while flying model rockets under the rules and license of the NAR. Incidentally, no significant insurance claims have resulted, due to the safety conscious attitude of most rocketeers.



For more information, write: National Association of Rocketry, P.O. Box 178 McLean, Virginia 22101

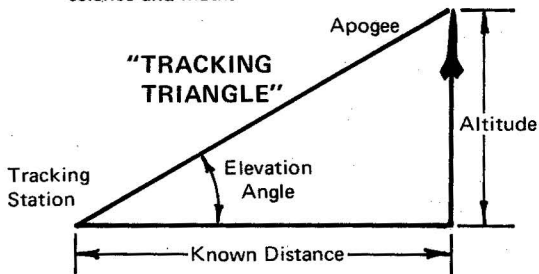
Like most nationally enjoyed hobbies, model rocketry is featured in many hobby magazines. JUNIOR AMERICAN MODELER has articles, photos and plans of interest to the beginner as well as the "professional".

"JUNIOR AMERICAN MODELER" is available at most hobby stores and by subscription. For more information, write:

Junior American Modeler
733 Fifteenth Street, N.W.
Washington D.C. 20005

IS IT JUST A HOBBY?

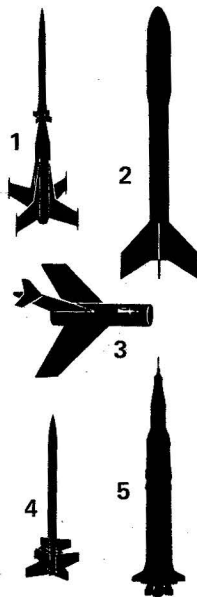
The fun aspect of model rocketry is obvious, but thousands have also found it a rewarding scientific and educational pursuit. Many schools, from grammar to university level, have used model rocketry as a tool to turn students on to science and math.



One of the most common questions asked by a newcomer is "Wow! How high did it go?" This question can be answered by simple trigonometry and an understanding of basic surveying techniques. Students, under the leadership of a creative teacher, find themselves applying math and science principles to real situations. They may move on to problems in space biology, aerodynamics, drafting and modeling skills, electronics, physics, and countless other activities. Highly detailed and inexpensive reference books are available from the manufacture.

THINGS TO DO AND TRY

The variety of kits and "own-designs" built from custom parts is endless . . .



1 SPORT MODELS — general purpose "fun" rockets in a wide range of shapes and prices!

2 PAYLOAD ROCKETS — with special compartments for carrying insects and instruments. Some rocketeers try to launch and recover an egg without breaking it!

3 BOOST GLIDERS — soar up under rocket power, and glide back like airplanes.

4 MULTI-STAGED MODELS — fly to altitudes over one-half mile with real staging action.

5 HIGH DETAILED SCALE MODELS — challenging exact replicas of rockets that make history — spectacular lift offs!

HOLD CONTESTS — for parachute, streamer and boost glide duration, altitude, spot landing.

MODEL ROCKETEER'S SAFETY CODE

CONSTRUCTION

My model rockets will be made of only lightweight materials such as paper, wood, plastic, and thin metallic foils, with the exception of payloads and engine holders made of wirelike material.

ENGINES

I will use only pre-loaded 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.

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.

WEIGHT LIMITS

My model rocket will weigh no more than 453 grams (16 oz.) at liftoff, and the engines will contain no more than 113 grams (4 oz.) of propellant, as prescribed by Federal Regulations.

STABILITY

I will check the stability of my model rockets before their first flight except when launching models of already proven stability.

LAUNCHING SYSTEM

The system I use to launch my rockets will 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.

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.



FLYING CONDITIONS

I will not launch my model rocket in high winds, near buildings, power lines, tall trees, low flying aircraft or under any conditions which might be dangerous to people or property.

LAUNCH AREA

My model rockets will always be launched from a cleared area, free of any easy to burn materials, and I will only use non-flammable recovery wadding in my rockets.

BLAST DEFLECTOR

My launcher will have a blast deflector device to prevent the engine exhaust from hitting the ground directly.

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.

POWER LINES

I will never attempt to recover my rocket from a power line or other dangerous places.

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.

PRE-LAUNCH TEST

When conducting research activities with unproven designs or methods, I will, when possible, determine their reliability through pre-launch tests. I will conduct launchings of unproven designs in complete isolation from persons not participating in the actual launching.

HOW TO SELECT ENGINES

Model rocket engines are available in a wide variety of power ratings, each for a purpose. Use only the engines recommended for your model rocket.

TYPICAL ENGINE CODING



A5-2

TOTAL THRUST CODE

Total "power" produced by the engine. Each succeeding "letter" has twice the power as the previous letter. (example: "B" engines have twice the power of "A" engines. "C" engines have twice the power of "B" engines, etc.).

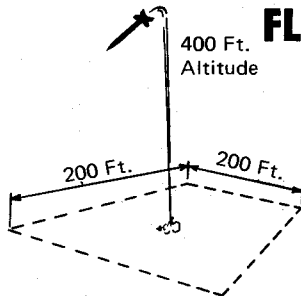
AVERAGE IMPULSE CODE

The average "push" exerted by the engine.

DELAY CODE

Number indicating time (in seconds) between "end of thrusting" and chute ejection. Long delays are for small lightweight rockets; short delays are larger, heavier rockets; "O" delays are for multi-stage rockets only.

FLYING TIPS:



LAUNCH AREA:

Choose an area free of trees and buildings, and with side dimensions roughly equal to at least half the expected altitude. Choose soft dirt or grassy area.

WIND:

Avoid launching in winds over 15 mph, never in winds over 20 mph. For mild breezes, tilt launch pad slightly into wind, to compensate for parachute drift.

WEATHER COCKING:

Launch within 30 degrees of the vertical! Rockets tend to head into the wind, like a weathervane. This "weathercocking" decreases altitude and may cause the rocket to fly unpredictably.

FIRE SAFETY:

As with many outdoor activities, take steps to avoid fire hazards. Use only recommended launchers with exhaust deflector plates. Avoid launching in areas with extremely dry vegetation.

LAUNCH SYSTEM TIPS:

Model rockets are launched only by remote-control electrical means. Inexpensive commercial launchers are readily available.

All recommended launch systems must consist of:

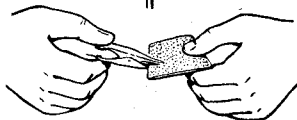
1. A rod to stabilize the rocket.
2. A launch pad to provide a sturdy base.
3. An engine exhaust deflector.
4. A battery power source.
5. A safety key to prevent premature ignition.
6. A switch that returns to "off" when released.
7. A continuity light to indicate completed circuit.

It's always a good idea to test a launcher for satisfactory operation before going out to launch.

CAUTION: Always handle launch rod with care. To avoid injury, cap the rod with an expended engine when not in use.

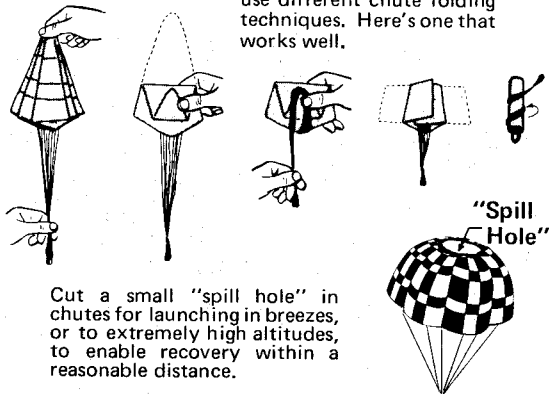


The engine exhaust will build up residue on the igniter micro-clips. Run a piece of sandpaper through the jaws after every few launches, to clean the clips and insure continuity.



PARACHUTE TIPS:

Fold chutes tightly to allow for smooth ejection. Pack chute just before launch! Different people use different chute folding techniques. Here's one that works well.



Cut a small "spill hole" in chutes for launching in breezes, or to extremely high altitudes, to enable recovery within a reasonable distance.

ALWAYS use the recommended Flameproof Parachute Wadding to prevent hot ejection gases from melting the parachute!

Fly model rockets only with the engine types recommended for the specific kit. Flying with non-recommended engines may result in torn-off fins, ripped parachutes, unstable rockets, and a host of other problems.