

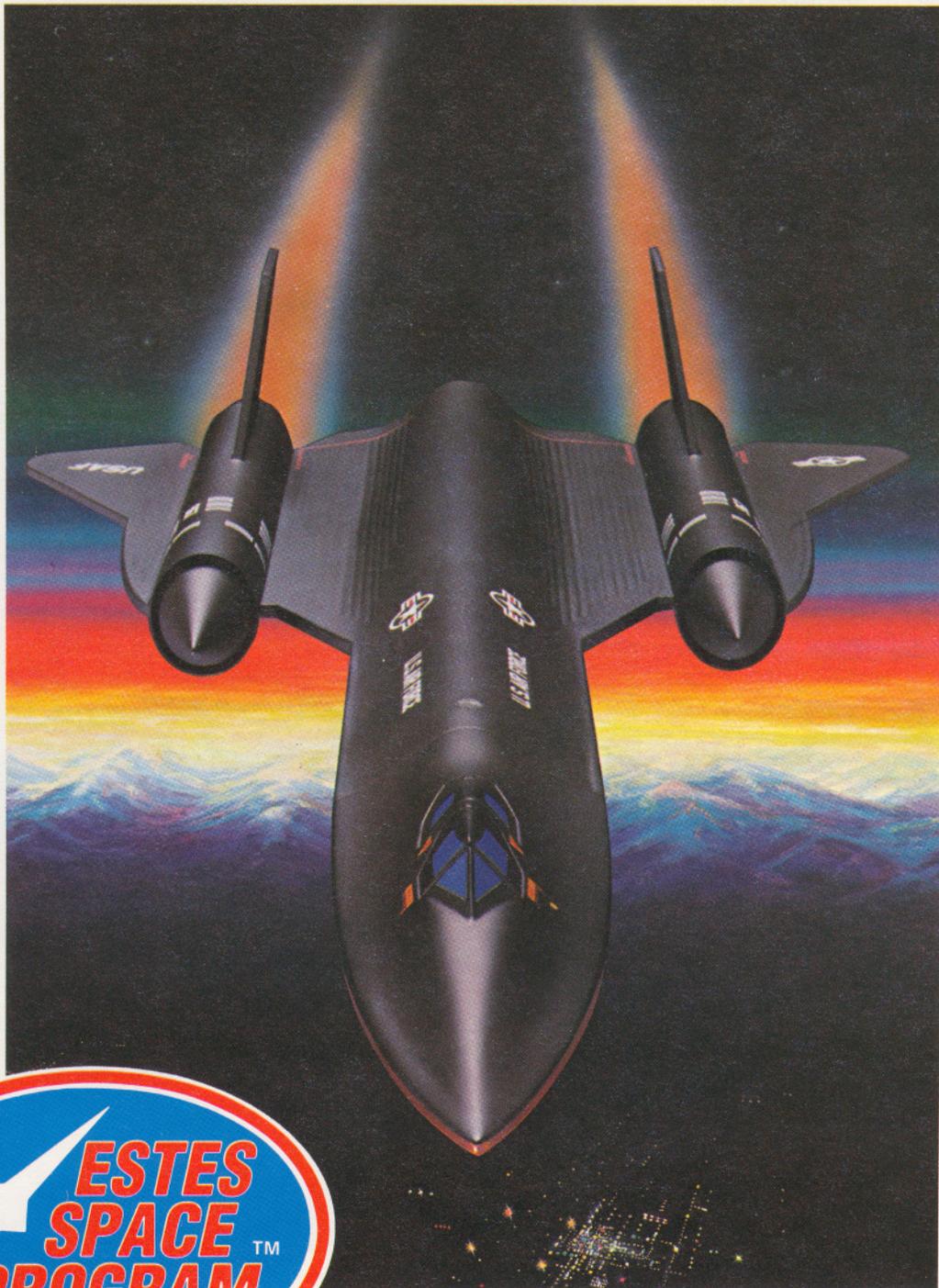


SPECIAL
EDITION
1987/88

MODEL ROCKET NEWS

M A G A Z I N E

DEDICATED TO AND PUBLISHED FOR ESTES ROCKETEERS, AMERICA'S FUTURE IN SPACE



Why participate in model rocketry? Because its fun!

Few activities offer as much excitement and pleasure. Building a rocket is fun. Getting everything "just right" brings out your best modeling skills.

Preparing the model rocket gives you a chance to make sure everything is ready. The completed rocket goes on the launch pad for connection to the electrical ignition system. Then Countdown...and Blastoff!

Your bird rises into the air, rapidly becoming a shrinking dot in the sky. The tiny pop as the ejection charge operates, and you have a 'chute! Now to recover your rocket after it has safely drifted back to the ground, ready for reprep and flying again and again.

Safe model rocketry began over 30 years ago. Since the first flights, more than 300 million model rocket launches have taken place. Model rocketry is popular in all 50 states, and in many other countries. Building, finishing, and launching activities are more fun when done together. Model rocketry is a great parent-child activity, too.

For the serious rocketeer, the National Association of Rocketry* offers a good monthly magazine, many contests, and the opportunity to form lasting friendships with others.

Model rocketry is a popular activity with Scout groups, from rocket launches with the Pack to a great theme for Explorer Posts. Model rocketry is a key element in the Space Exploration merit badge. Thousands of 4-H clubs are active in model rocketry. The Young Astronaut Program** uses model rocketry.

About 25,000 teachers use model rocketry with their classes because it is a great way to learn science and math, and have fun at the same time.

No one knows how many model rocket clubs exist. The variety of activities engaged in by these clubs include the usual business and planning meetings, frequent construction sessions where the more experienced builders help the novices, informal fun launches, contests, fund-raising activities, public demonstrations, and other programs. It is not uncommon for local clubs to receive TV and newspaper coverage. (See page 4 for article on how to form your own rocket club.)

The best way to get started in model rocketry is to purchase a starter set. This provides you with your first model rocket kit plus a launch pad, an electrical ignition system, and several model rocket engines. The Estes Alpha III Starter Set™ is an excellent choice.

Space Camp*** sponsored by the Alabama Space and Science Center, will have thousands of participants building and launching two-stage rockets this year, plus doing many other exciting activities unique to the Space Age.

Model rocketry is safe, it can be very educational, it may develop an interest which leads to a lifetime career, it is a great parent-child and group activity, and it is FUN!

2 MRNM

WHY MODEL ROCKETRY ?

Scott Branche, Scarsdale, NY



Adam Gooder, St. Paul, MN



ESTES MODEL ROCKET NEWS MAGAZINE

See you at the launch pad!

* National Association of Rocketry
182 Madison Drive
Elizabeth, PA 15037

** Young Astronaut Program
Box 65432
Washington, DC 20036

*** Space & Rocket Center
US Space Camp
Huntsville, AL 35807

Send self-addressed, stamped envelope for membership information

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Claudia Smith Typesetter

Unless otherwise stated, all the model rocketry kits advertised in this magazine are hobby kits requiring assembly. Launch system, engines, glue, and finishing supplies are not included. Recommended for ages 10 through adult. Adult supervision suggested for those under 12 years of age when flying model rockets. Prices subject to change without notice.

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Welcome to the Estes Space Program!
Yankee Clipper™

Build and fly this beautiful model rocket with pride. It is the official rocket of the Estes Space Program™ (ESP) and is available only to members.

Awards

Earn special awards as you advance your model rocketry skills. Follow the guidelines in the advancement program and soon you will have earned a number of distinctive award patches.

Safety

Always keep your model rocketry activities safe by following the Model Rocketry Safety Code.

Model Rocket News Magazine

This is your copy of the special ESP edition of Model Rocket News Magazine. We hope that you will enjoy it, and that you will find some good ideas to pursue in your model rocketry activities.

Want to receive Model Rocket News Magazine, free, on a regular basis (3 to 4 times a year), plus the new Estes catalog each year? Earn a new award (at least once a year)! You may continue to purchase your model rocketry supplies at your local hobby shop. However, we have no way of knowing who you are or where you live if you purchased this Estes Space Program™ Membership Kit in a store. As soon as you earn an award, our computer will pick up your name and address. You will then continue to receive future issues of the magazine free until you stop being an active Estes Space Program™ member. It is important you read MRNM because announcements of new awards and other ESP news will appear in this magazine. Some hobby shops will post announcements of new awards.

We extend to you a special invitation--Contribute stories about your model rocketry activities, photos, and technical articles to Model Rocket News Magazine. *We will give special preference to contributions from ESP members.*

MULTI-STAGERS

Once you have become good at building and launching single-stage model rockets, you can tackle more exotic rockets. Try your hand at "The sky is the limit!" altitude flights with a multi-stage launch. This requires much more expertise than a regular launch. Test your skills with the Hercules™ with a payload on your second stage.

**ASTRO CAM
110/DELTA II
#1327**



Messages From Launch Control

Identify yourself by name, full address (including zip code), and state that you are an Estes Space Program™ member with each item you submit for possible publication.

We also need model rocketry cartoons and riddles for the magazine, so send in those articles, etc. now, and every month. Contributions become the property of Estes Industries and will not be returned. We pay for items used with merchandise certificates. The amount paid will be determined by our panel of judges.

National Association of Rocketry

This is the official model rocketry organization for sanctioning major contests, world records, and safety rules. They publish an excellent monthly magazine called American Spacemodeling. See page 2 for the address to write for membership information.

Official Information

Read the enclosed information letter very carefully. It tells you how to earn your first achievement awards. Follow the instructions exactly when applying for your awards. Keep all of this letter except the coupons as you use them. You will need the remainder of the letter later.

Official Chapters of the ESP

The Estes Space Program™ is structured so that you, as an individual, can progress toward becoming an Expert Rocketeer on your own and at your own speed. You need not belong to a local club to take advantage of the many membership benefits. If you belong to a club with an adult sponsor and sponsored by a recognized organization (local Scout troop, rocket club or Young Astronaut Program chapter sponsored by your school, etc.), your club may wish to earn awards together.

Thanks for joining the Estes Space Program™, let us know how you like it. We are doing our best to make it a great club for you. Help us by giving us your suggestions. Discuss the program with your hobby shop owners, too!

See you at the launch pad!

GLIDERS

For a really advanced model rocketry project, try launching a glider. Powering a small, light-weight glider up into the air with a powerful model rocket engine is a real challenge. You need a light, but strong, glider. The glider must create good lift, but not make the rocket go crooked at launch. The Crusader Swing-Wing™ will do a great job for you.

**CRUSADER
SWING WING
#1961**



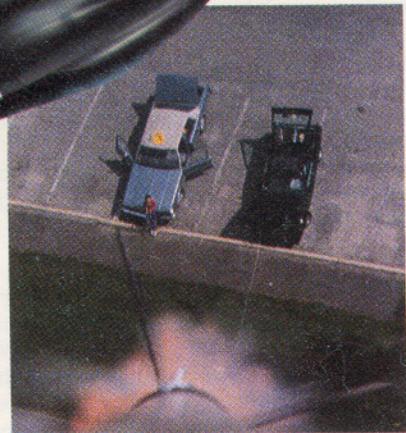
**HERCULES
#1377**



Model rockets come in a wide variety of sizes and types. Learn how to build and fly all of them. Here are a few examples of the great rockets you can build and fly.

**AERIAL
CAMERAS**

You can launch your own aerial surveillance camera! The Estes AstroCam 110™ takes great photos from high in the sky on Kodacolor 110 film. Yet this excellent camera and its Delta II launch vehicle are only Skill Level 2!



MODEL ROCKETRY CLUBS

By Michael Banks, Milford, OH

Sharing knowledge and activities with others is one of the most rewarding aspects of any hobby. This is especially true with model rocketry, which offers so much potential for competition and other group activities.



THE BENEFITS OF A CLUB

Perhaps the most important benefit of membership in a model rocketry club is the enthusiasm generated by contact with other rocketeers. Being able to compare notes on building and flying, sharing tips and advice, and participating in club launches and bull-sessions add a whole new dimension to the hobby for the individual rocketeer and for the club as a whole. Competition is a common club activity and serves as a test of skill and knowledge, in addition to being just plain fun!

Pooling of knowledge and resources by club members results in many benefits for rocketeers. Many rocketeers are experts in a particular area, and they are willing to share their knowledge with the club whether it's in the area of building and finishing or in more technical areas, such as aerodynamics or physics. Rocketeers can combine talents and material resources to undertake the design and construction of useful equipment such as multiple-pad launchers or sophisticated tracking devices. Group research projects impossible for individual rocketeers are practical for groups.

Model rocketry club members can participate in such activities as public demonstrations, field trips, and conventions.

Clubs are usually eligible for group discounts on model rocket kits and supplies from manufacturers and retailers. There are many less tangible, but equally valuable, benefits. Involvement in club activities improves "people" skills such as leadership, cooperation, and sportsmanship. There is camaraderie among model rocketeers that makes the effort of putting a club together very worthwhile.

HOW TO GET STARTED

Before you go to work organizing a club, find out if there is already one in your area. Ask around at local hobby shops. Write to the National Association of Rocketry (NAR), and ask for a listing of NAR Sections. If you're lucky, you'll find one nearby.

If you find that there is no model rocketry club in your area, the first thing you'll want to consider is how to get in contact with other rocketeers. Joining the NAR can be a big help, as this can put you in touch with rocketeers who live nearby, rocketeers who may want to form a club.

Hobby shops can be a good source of information about model rocketeers in your town. You may run into other rocketeers shopping for supplies, and they may know of still other rocketeers who would be interested in forming a club. The hobby shop owners or managers may let you leave an information sheet or poster about your new club in the store, in addition to putting you in direct touch with rocketeers. If you make posters or information sheets to leave or display at hobby shops and community bulletin boards, make them eye-catching, but practical. An illustration or two from a kit package, or hand-drawn, will be enough to catch the attention of rocketeers. A simple heading, such as "Model Rocket Club" should appear in large letters, followed by your name and telephone number and/or address.



Potential members may also be found at local high schools and colleges. Check with school administrators and science teachers to see if the school has a science or model rocketry club. Many schools have one or both.

These methods, combined, will bring out all sorts of rocketeers within a few weeks.

Once you have brought together a sufficient number of rocketeers (five or more is a good start), you should have an organizational meeting. This can be held at someone's home, or at a local rec hall, civic center, church, etc. The purpose of this meeting should be to establish the name of the club, its areas of interest, how it will be organized, and to let the members get to know one another. You may wish to have a very formal organization, with a club constitution and bylaws, etc. It is best to work with as little formality as possible so that the club can concentrate on planning and carrying out its activities. If you become too preoccupied with the trappings of organization, you'll find that you have very little time and energy left for fun!



Most clubs require a President, who will act as the group's organizational leader (not a dictator!), and sometimes as the group's spokesperson. A Vice-President can assist the President. The club should also have a Treasurer who will collect dues, keep track of the club's treasury, disburse funds as necessary, and report to the membership on same. All of these officers should be elected by the membership, usually for one-year terms. You may also wish to have a club Secretary to keep track of the club's meetings and events, organize the club calendar, and to attend to any correspondence necessary. The officers of the club may also appoint committees to handle such things as establishing a club launch range, recruiting new members, obtaining, or constructing club equipment, etc. In general, the club membership should vote on any proposed activity, spending from the treasury, or projects.

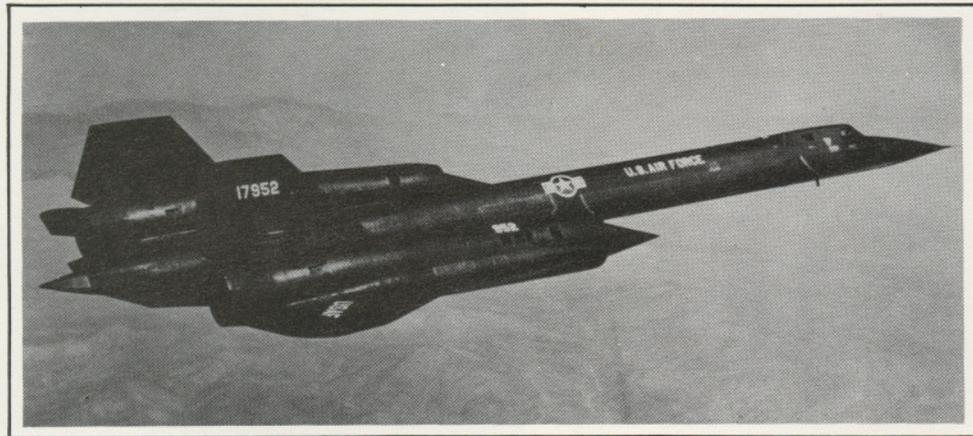
ACTIVITIES

The activities of a model rocketry club should center around club meetings and launches. Meetings can be held with any frequency, but one meeting per month is usually enough to handle any club business and planning. Club launches should occur more frequently--every week or two. Sometimes, club meetings can be combined with flying sessions. Once every month or two, you may wish to hold a club competition. If you're part of the NAR or in contact with other clubs in your region, you can sponsor a meet. Demonstration launches can be timed to coincide with club flying sessions, or can be scheduled separately.

Demonstration launches are, by the way, a good way to recruit new members. Demos, as they are called, can be arranged through local hobby shops. Talk with a hobby shop owner and ask if he would like to sponsor a demo. You will usually find store owners very interested in doing this, and you'll receive a lot of support in the form of arranging a flying site, advertising, and so forth. If you get a go-ahead for a demo, be ready to plan the entire event carefully. Schedule twenty minutes to an hour of launch-and-commentary, and be sure to have plenty of club members on hand to answer questions from the spectators, in addition to handling range duties. Keep the program moving.

SR-71 BLACKBIRD

By Ron McClaren, Project Engineer,
Estes Research and Development



Perhaps the fastest aircraft ever designed, the Lockheed SR-71 "Blackbird" provides information vital to our national security. Flying reconnaissance missions around the globe, their sophisticated radar, infrared cameras, and other top secret devices study the terrain below. Flying at altitudes of more than 80,000 feet and speeds of over Mach 3 they remain out of sight throughout their missions, showing up only as fast-moving traces on the radar screens of the countries below, and perhaps occasionally revealing their presence as a sonic boom. In 1981 an SR-71 made news when the North Koreans attempted but failed to shoot it down with a missile. During the Vietnam war years, the Blackbirds were targets on numerous occasions, but were never hit.

It is a reflection on their phenomenal performance that the many intelligence and surveillance tasks across the globe can be accomplished with so few aircraft flying so infrequently. The Blackbirds, so named for their midnight-blue thermally emissive finish, are incorporated as a single squadron into the 9th Strategic Reconnaissance Wing based at Beale Air Force Base in California. The total number of aircraft has never been publicly disclosed, but is certainly more than 30 and has been augmented at least once. Unlike combat aircraft, which usually move about the world in strengths of a squadron, the SR-71's are unarmed and deployed in ones and twos as needed. Each Blackbird clocks up a mere 200 hours a year flying time, and most of that is to keep its crews proficient.

Planning for such an aircraft began more than 25 years ago. When Francis Gary Powers was shot down over the Soviet Union in a U-2, it became obvious that we needed another aircraft to outwit potential enemies. The SR-71 design team was led by

C. L. "Kelly" Johnson, one of the most famous U.S. designers who built the world's first aircraft capable of sustained flight at Mach 2 (the Lockheed F104). He and his engineers at Lockheed's Advanced Development Projects ("Skunk Works") set out to build a Mach 3 reconnaissance/interceptor aircraft. They faced three principle challenges: Kinetic heating, fuel consumption, and aerodynamic drag.

The surface temperature of any airplane rises as it goes faster, increasing rapidly over Mach 2 as a result of friction generated between its skin and the air molecules traveling over it. Traditional aluminum alloys cannot be used above Mach 2.2 because the equilibrium temperature of 248°F causes them to weaken dangerously. This meant that at over Mach 3 there would be environmental conditions never before encountered and skin temperatures averaging 550°F. So the Lockheed team was obliged to use titanium. Though strong, titanium is light. It has a great disadvantage. It is extremely hard to work with. Many machining and milling problems had to be solved.

Ninety-three percent of the Blackbird's frame is titanium. Surface temperatures at cruising speeds can range from 445°F at its aft midsection to 950°F near the engine exhausts. Right outside the crew's canopy (which is made of heat-resistant glass), temperatures as high as 640°F have been recorded. Inside, the pilot and reconnaissance system operator wear pressurized, astronaut-type suits. An air conditioning system keeps them in cool 60°F comfort.

The aircraft's fuel system cools the engine-bleed air for the air conditioner's compressor, acts as the hydraulic fluid for the engines afterburner actuators, and cools the tires and landing gear.

The aircraft has five fuselage integral tanks and integral wing tanks which are not lined and which leak fuel when the Blackbird is on the ground. Expansion of the metal during flight completes the seal on the tanks. Because of this fuel leak problem a special hydrocarbon fuel was developed with an extremely high flash point. A lighted match dropped on a spill won't set it ablaze. Because of the high speeds over

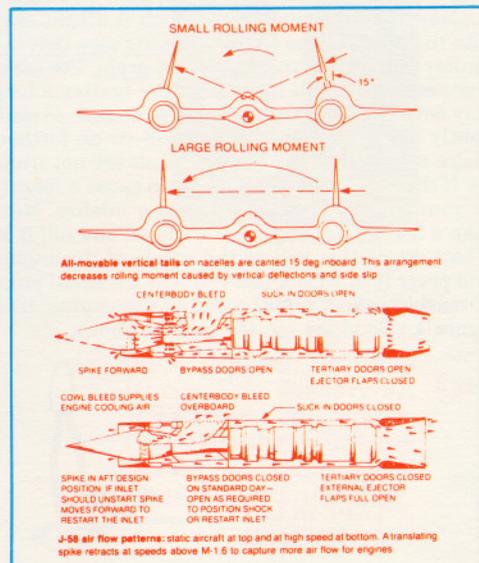


Photo Courtesy Lockheed - California Company

long periods of time, air-refueling by a KC-135 tanker is used to top off the fuel tanks after take-off.

Like kinetic heating, aerodynamic drag increases rapidly with speed. To keep kinetic heating as low as possible, the team went for the slimmest fuselage and the thinnest wings possible, blending the two in a new drag-reduction method known as wing-body integration. The engines are Pratt & Whitney Aircraft J-58's with a translating spike that retracts at speeds above Mach 1.6 to capture more airflow. As the speed increases to Mach 3 the engine produces only 18% of the thrust, the rest being generated by suction in the intake nozzles (54%) and from the special ejector nozzles at the rear of the nacelles (28%). The all-movable vertical tails on the nacelles are canted 15° inboard. This decreases the rolling movement caused by vertical deflection and side-slip.

The design team strove diligently to develop innovative answers to design problems, and the aircraft that emerged is a superb flying machine. In 1976 the SR-71's established six world records for speeds over a straight course (2193.16 mph) and for altitude in level flight (85,068.99 ft.). Because the Blackbird is so far advanced over any other aircraft now flying or being developed it is unlikely anything will come along to replace it in the near future.



IGNITERS AND THEIR USE

INTRODUCTION

An igniter is a device used to ignite a rocket engine. In model rocketry an igniter element is a strip of resistance wire with or without a coating of pyrotechnic material on it. In the system it performs like a resistor in an electrical circuit. As electricity passes through micro-clips connected to the igniter, the igniter begins to glow and give off heat. If there is a pyrotechnic material coating the wire, it is ignited, and is the last step in the ignition train.

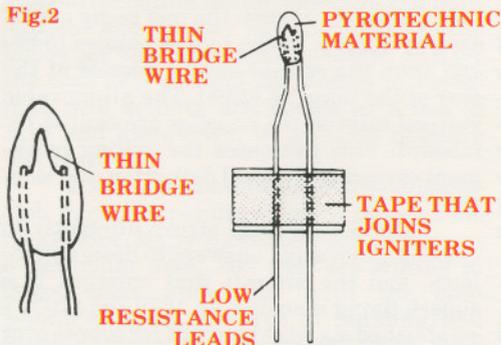
The Model Rocket Igniter (See figure 1.) consists of two special wires bridged by a different wire which is covered by a pyrotechnic material. The model rocket igniter will fire with very little current. (See figure 2.)

Fig.1



Igniters must be installed so that the coatings or wire itself is touching the dark-colored propellant grain. If the igniter is not touching the grain this could cause a misfire. Heat created by the igniter is not great enough to cross a gap between the igniter and propellant grain--there must be direct contact between the igniter and the propellant.

Fig.2



First separate the igniter you are going to use from the other igniters. With Estes Igniters just tear or cut the paper between any two igniters. Do not remove the paper from the igniter as this may result in cracking the pyrotechnic coating. Then take this cut strip and bend it in half. (See figure 3.) Now take the igniter and push it all the way into the nozzle of the engine, making sure that the igniter is touching the propellant grain. For some engines you may have to push the igniter a long way down, as when using a B8 type engine, so push gently down until the igniter will go no further. Make certain that the igniter's leads are not crossed. If the leads are crossed this can cause a "short" in your launch system and thus a misfire. Next take a 3/4" by 3/4" section of wadding and roll it in a ball. Place this ball in the nozzle of the engine and press it in with a pen cap. Place a small piece of masking tape over the end of the engine. (See figure 4.) Bend the igniter leads as shown.

Fig.3

IGNITER

NOTE:
TAPE IS LEFT
ON IGNITER



Adapted from an article by
Michael Del Vecchio, NAR #18815, in the
October 1978 Model Rocket News.

LAUNCHING

Now comes the climax of all your work--the launch. Three very important factors come into play here: 1) Make sure the wire connections between your micro-clips and launch system are not frayed. There should be no broken strands of wire. If there are broken strands of wire, cut off the micro-clips and reinstall by restripping the wire and attaching the micro-clips again. Use needle-nose pliers for this. Solder the wires in place if possible. 2) Clips should be clean and shiny. If they are not, then clean them by sanding the dirt off them with a small section of sandpaper or an emery board. 3) Place your clips as far up on the igniter (close to the nozzle) as possible. This is to make maximum use of your battery power. (See figure 5.)

If after all this you still cannot get your rocket off the ground, then check your batteries and launch system. For added information on this refer to your launcher's instructions or Model Rocket Launch Systems, #2811, 75¢, an Estes publication.

WHAT TO DO IN CASE OF A MISFIRE

If you have a misfire the following procedures should be followed:

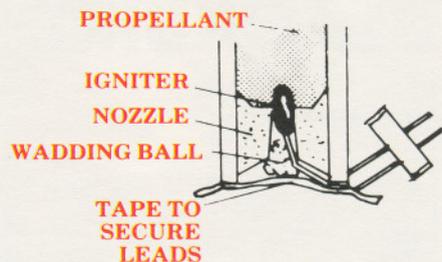
- 1) Remove the safety key from the launcher and wait one minute after releasing the launch switch.
- 2) Take the rocket off the launch pad and inspect the igniter.
- 3) If it is broken, replace it with a fresh one.
- 4) If it has fired, replace used igniter with a fresh one.
- 5) If it has not fired, then read the Launching section of this report again.
- 6) Begin Countdown again.

TIPS ON IGNITION AND LAUNCH SYSTEMS

- 1) When launcher is not in use, store its batteries in a refrigerator to conserve their power. Before use, take them out and warm them in the palms of your hands.
- 2) Make certain all connections in your launch system are good without frayed wires. Frayed wires cause a loss in power.
- 3) Use good alkaline batteries. Cheap batteries many times are not cheap because their shelf life is short and thus you may go through many batteries in a flying season. It pays to spend a little more at first and save in the long run.
- 4) If your continuity light flickers on and off, this means one of the clips is probably loose. Remove both clips and double the igniter wire leads over, then replace the clips. (See figure 5.)
- 5) If you have no light, try the procedure outlined in Step 4. If this fails, check your launch system and batteries.
- 6) If the continuity light is on before you press the launch switch, but your rocket does not lift off, and when you release the launch switch there is no longer a light, then the igniter probably fired. Follow the misfire procedures.
- 7) If the light is on before you press the launch switch, but your rocket does not lift-off and when you release the launch switch the light is still on, then there is probably a short. (Possibly your igniter wires are crossed.)
- 8) Be neat, clean, and careful. Remember--safety first!
- 9) Be sure to follow the HIA-NAR Model Rocketry Safety Code at all times.

IGNITER

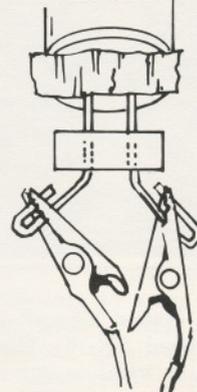
Fig.4



ENGINE

Fig.5

Fig.6



DO NOT APPROACH THE LAUNCH PAD WHILE THE SAFETY KEY IS INSERTED IN THE LAUNCHER.

IDEA BOX

Attach a snap swivel to each parachute after it is assembled. Attach the parachute to the nose cone using this snap swivel. This lets you change parachutes in a hurry if wind conditions change. Use a snap swivel on a streamer, also, for use on those windier days.
Contributed by Jason Neufeldt, Hood River, OR

After applying the decals to your model rocket, let them dry for 24 hours. Then spray the entire rocket with a light coat of Testor's Dull Cote or Gloss Cote. This protects the decals and the rocket.
Contributed by Todd Foss, Reedsburg, WI

Put a small sticker with your name, address, and telephone number on it inside the body tube of each of your rockets. A return address label with your phone number added is fine. This provides the finder of your rocket with your name and address so they can return it to you.
Contributed by Jeffrey Carr, Rochester, NY

AMERICA'S SPACESHIPS

Inclement weather offers plenty of opportunity for members to get together for building sessions and mini-seminars on building techniques, theory, etc. These are also good times for planning activities, as well as sprucing up club launch equipment.

If your club has more than a dozen members, you may want to put together a club newsletter. This can be a source of information for members who have missed meetings as well as providing a means for transferring knowledge and news about model rocketry. Newsletters can be as simple as a typewritten page or two, or more elaborate with illustrations. Often a newsletter can serve as tangible return for dues, and it gives a club a more solid identity. Newsletters can be traded among clubs, too, and you'll find that other clubs' newsletters provide a wealth of information.

Funding for a newsletter -- and other projects -- can come from members' dues, or from sponsors or donations. Sponsors for a club can be any type of church, civic, or youth group. A sponsor can be especially helpful if there are no adult members of the club. Sponsors can often obtain equipment and supplies for clubs, and can be helpful in helping a club find a regular launch site. Donations can be solicited from civic organizations or members of the business community if you make it clear that your club is open to all and is organized in support of a hobby activity. Many organizations are willing to support activities such as model rocketry, especially when a large project is involved, because of the benefits and good will generated. You will, by the way, find that it is much easier to get permission to use a public area such as a park or school ground as a launch site as a club than as an individual. Public or commercial buildings are often made available as meeting places for clubs at no charge. The major requirement that most business and civic organizations have for the use of facilities is that the activity be open to anyone in the community. Once you start looking, you'll find a number of potential sponsors and supporters for your club in your community, among them schools, banks, churches, and business and civic clubs.

Those are the basics of getting a model rocketry club up and running. Once you've gotten a few rocketeers together, you'll find that the club virtually runs itself, and that you'll never be at a loss for things to do or people to do them.

For more information on and ideas for model rocket clubs, check the following sources for additional ideas and assistance:

NAR Headquarters
182 Madison Drive
Elizabethtown, PA 15037

Estes Industries publications
#2815 Contest Guide
#2817 Club Guide
#2831 Projects in Model Rocketry

Modern rocketry was developed because people wanted to launch objects into space. The first amateur attempts were often disastrous, so model rocketry was invented. Model rocketry lets you launch high performance rockets safely.

The history of interest in man traveling in space goes back for hundreds of years. The most famous men in the history of early space theoretical research and the development of actual rockets are Konstantin Tsiolkovsky, Hermann Oberth, and Robert Goddard. Goddard invented the world's first liquid-fuel rocket. He flew it on March 26, 1926 in a field near Auburn, Massachusetts.

The history of the US space effort is exciting. Information on it can be found in many places. The Space Exploration merit badge booklet by the Boy Scouts of America includes part of it. This booklet also tells about the requirements for the badge. Building and launching a model rocket is one of the requirements.

YOU can recapture part of this history. If you find out about famous individual flights, you can recreate the flight on an anniversary date. This makes a great public demonstration. It is also excellent for a school or club project. Your local hobby shop may be willing to sponsor you, and maybe the manager can arrange some local TV and/or newspaper coverage!

Some of the famous rockets shown on this page plus many more are available as scale model kits from Estes.



Photo Courtesy NASA

GEMINI TITAN

The Gemini Titan launched Virgil "Gus" Grissom and John Young on the first successful US two-man-orbital mission on March 23, 1965.



"G.H. Stine Archives, used with permission."

MERCURY REDSTONE

On May 5, 1961 the Mercury Redstone rocket launched Alan Shepard, Jr. on the first American sub-orbital flight.

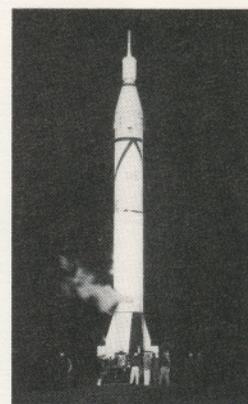


Photo Courtesy NASA

JUPITER-C

The first US satellite, Explorer 1, was launched on January 31, 1958 aboard the Jupiter-C. Dr. Wernher von Braun headed the team which made this historic launch.

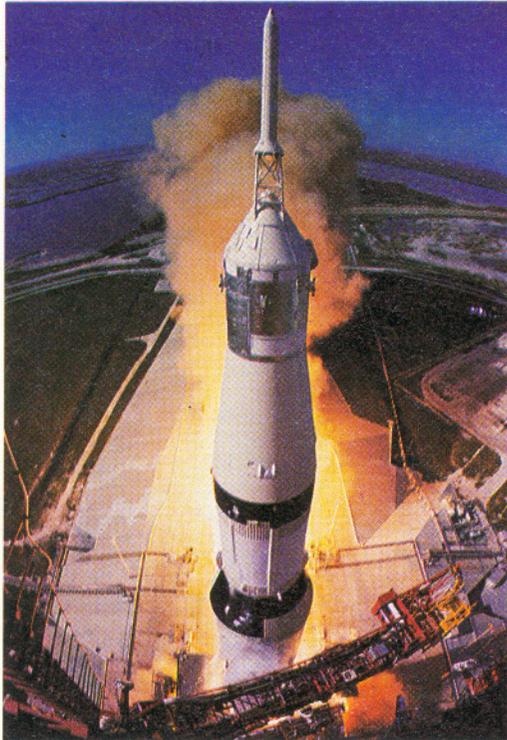


Photo Courtesy of NASA

SATURN V

This rocket launched all of the US Apollo craft which landed on the moon.



Photo and STS DATA Courtesy of NASA

SPACE SHUTTLE

The Shuttle is the workhorse of America's space launch fleet. When the Shuttles resume flights in 1988 they will carry astronauts, satellites, scientific experiment packages, space manufacturing systems, and other important cargo to orbit and back.

"G.H. Stine Archives, used with permission."

NIKE APACHE

This two-stage, solid propellant vehicle is one of the United States' smallest and most used scientific research sounding rockets. The first stage is a US Army Nike M5E1. The second stage Apache is produced by Morton-Thiokol. A maximum length of 28 feet, allows Nike Apache to be fired from a transportable launcher, even from aboard a ship! This enables other nations to use Nike Apache, too. Delivering a combined thrust of 51,000 pounds and carrying nominal payloads of 60 pounds. Nike Apache is used for space research 50-150 miles above Earth.

