



**BRIGHAM YOUNG UNIVERSITY – IDAHO**

**ENVIRONMENTAL, HEALTH & SAFETY**

**SAFETY DEPARTMENT**

**EXPERIMENTAL ROCKET MOTOR SAFETY**

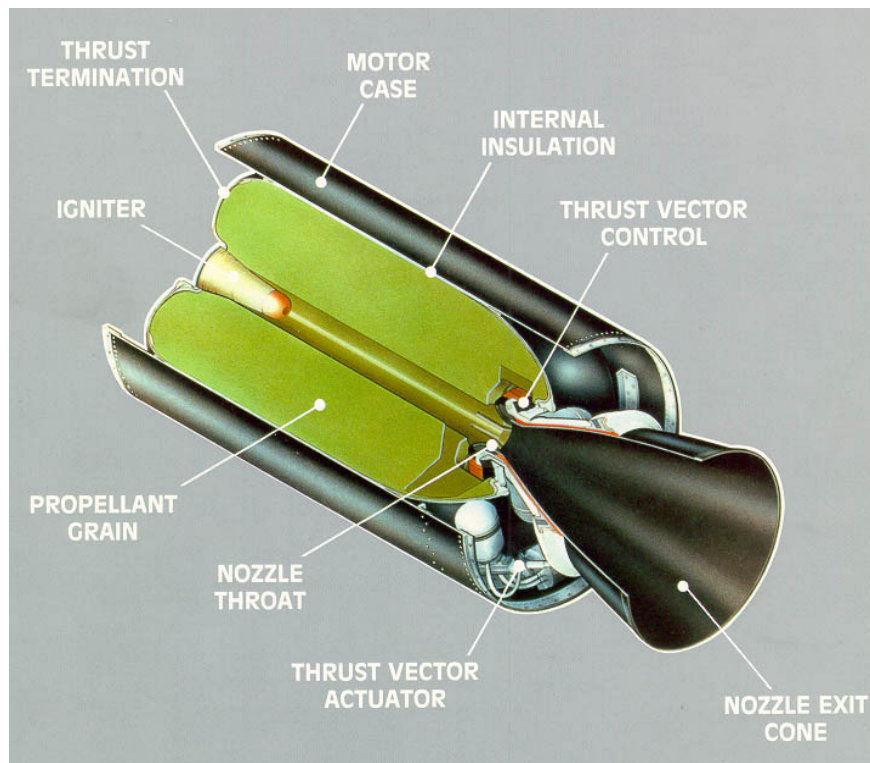
**EH-038-R00**

**LEFT  
BLANK**

## Table of Contents

Section	Page
1.0 Overview.....	1
2.0 Policy.....	1
3.0 Requirements.....	1
4.0 Purpose.....	1
5.0 Scope.....	1
6.0 Procedures.....	1
7.0 Responsibilities.....	4
8.0 Training.....	4
9.0 Monitoring.....	4
10.0 Appendices.....	4

Appendices	Page
Appendix A NAR Laws & Regulations.....	5
Appendix B NAR Model Rocket Safety Code.....	12
Appendix C NAR High Power Rocket Safety Code.....	14
Appendix D (Reserved).....	X



Brigham Young University-Idaho  
Compliance Area: Environmental Health & Safety  
Department Title: Safety Department  
Program Title: Rocket Team Program  
Program Number: EH-038

Page: ii  
Revision: 00  
Date Issued: April 2017

## **1.0 Overview**

The competition rocket program is a well-organized, safe, and legal activity under the laws and regulations of the Federal Government. There are, however, significant limitations and conditions on the activity which every member of the rocket team must understand and follow. Strick compliance with the law and cooperation with the university safety office has been a hallmark of the team towards a safe and successful launch.

## **2.0 Policy**

This program is designed to provide safety for all associated with the rocket team. It covers the safety practices to be followed along with the regulations and codes to be followed.

## **3.0 Requirements**

29 CFR 1910 – OSHA Safety Codes  
27 CFR 55 - ATF Explosive Codes  
18 U.S.C. 40 – United States Code – Importation, Manufacture, Distribution and Storage of Explosive Materials.  
14 CFR 101 – Federal Aviation Administration – Unmanned Rockets  
NFPA 1122 – Model Rockets  
NFPA 1125 – Manufacture of Model Rocket & High Power Rocket Motors  
NFPA 1127 – High Power Rockets

## **4.0 Purpose**

The purpose of this program is to ensure the safety of those participating in the propulsion portion of the rocket experience, both participants and observers. It is also designed to help maintain compliance with Federal, Stake, and Local regulations, codes, and laws.

## **5.0 Scope**

This program applies to all on the rocket team that are involved with the propulsion portion of the project. Including the faculty advisor and safety office personnel.

## **6.0 Procedures**

### **6.1 Manufacturing**

- 6.1.1 Due to the hazards related to the chemicals being used in the manufacture of the motors, it is required to assemble/mix the components in a fume hood that has been designated for this procedure.

- The inside of the fume hood and the table are to be covered with a plastic sheet to prevent staining of the equipment and aid in cleaning up following production.
- 6.1.2 Tools used for the production are to be constructed of a non-sparking material, or coated/painted to prevent sparking or other static charge transference.
- 6.1.3 All tools and equipment are to be carefully cleaned immediately following production to reduce the chances of rocket fuel hardening on the equipment and creating an explosive hazard.
- 6.1.4 Used plastid, disposable gloves, and papers are to be placed in a separate container to be disposed of in accordance with local regulations and codes. The proper disposal will be established by the Safety Office and followed by the team.
- 6.1.5 The manufactured fuel is to be immediately taken to the storage magazine to remain during the curing process, and then until it is further prepared for use, tested, or used in a launch.

## **6.2 Preparation for use**

- 6.2.1 Additional preparations will be required in order to use the fuel as a major component of the rocket motor.
  - The fuel is removed from the base mold by use of hand pressure on each side until the fuel grain comes loose.
  - The core is then removed by use of a hand press.
  - The fuel is then cut to the precise length to fit in the motor casing using the band saw.
  - All cuttings and shavings are collected and put in the box along with the processed fuel grains and all is returned to the ATF magazine for storage until used.
- 6.2.2 Fuel Test
  - The designated fuel is logged out of the magazine under the direction of the Safety Office.
  - The fuel is placed in the motor casing.
  - The testing equipment is placed in the testing area designated East of the magazine.
  - The motor is placed in the test reading / retention apparatus and secured.
  - The electronic test reading equipment and computer are set up ready to take the readings.
  - The igniter is placed in the motor – only one person should be in the immediate area at this time.

- All personnel are moved to a safe distance (approx. 50 – 100 feet from platform depending on the number of grains being tested.)
- When everyone is at a safe distance, the test may proceed.
- If a misfire takes place, no-one approaches the motor for at least 5 minutes. At this point the wire leads are to be twisted together to prevent static electricity setting off the charge. Only one person approaches the motor, removes and replaces the igniter then returns to the safe area and the test can proceed.
- If there is an explosion, be sure and watch where the fragments go so that they can be retrieved quickly.
- If the test goes well, wait at least 10 minutes for the motor to cool down before disassembling the equipment and cleaning up the area.

### 6.2.3 Launching

- Once the time and location has been approved by FAA & BLM, the launch can be scheduled.
- The motor can be assembled and transported to the launch site.
- The motor is usually the last item to be installed on the rocket.
- All personnel, rocket team and observers, are to clear the area to at least 500 feet, except for the person placing the igniter.
- Once the area is cleared the igniter is placed and the team member evacuates to a safe location before the countdown can take place.
- If there is a misfire, the same procedures are to be followed as for the motor test misfire.

## 6.3 Codes and Regulations

- 6.3.1 ATF – With the passage of the Safe Explosive Act (November 25, 2002) under Homeland Security, a permit is required to use and/or store Model and High Power Rocket Motors. 27 CFR 55.210
- 6.3.2 FAA – The Federal Aviation Administration has jurisdiction over airspace and permission must be acquired from them prior to any rocket launches. They will provide the window of time you will be allowed to launch. 14 CFR 101
- 6.3.3 OSHA – Standard industry regulations are to be followed when performing any work related to the manufacture and testing of any rocket components. That include any personal protective equipment needed to perform the task safely. 29 CFR 1910
- 6.3.4 NFPA – The National Fire Protection Association has compiled a guide to be followed when working with the High Powered Motors. NFPA 1122, 1125, & 1127

## **7.0 Responsibilities**

- 7.1 BYU-Idaho Safety Office is responsible for ensuring that the regulations are followed and the safety of the team is not compromised during manufacture, testing, storage, transportation, and final use of the rocket motors.
- The Safety Office maintains the ATF license and magazine for storage of the rocket motors.
  - The Safety Office ensures that the motors are manufactured safely and then transported to the magazine for storage.
  - A member of the Safety Office must be in attendance when motors are tested and/or used in a launch in accordance with regulations and university policy.
- 7.2 Faculty Advisors are to ensure that the rocket team members are properly trained. Advisors stand in for the Safety Office during competition and as necessary during initial testing.

## **8.0 Training**

- 8.1 The team leader has the responsibility to train the members of the team in the safe manufacture, testing, and use of the rocket motors, under the supervision of the Safety Office. This includes the following:
- Proper procedures for the manufacture and preparation of motor sections
  - Required personal protective equipment to be used
  - Safe distances from motor tests and launches.

## **9.0 Monitoring & Record Retention**

- 9.1 Magazine records are maintained at the magazine and are retained for the life of the project.
- 9.2 The program is maintained by the Safety Office and is reviewed at least once a year to insure compliance with current standards and procedures.

## **10.0 Appendices**



## **APPENDIX A**

# **NATIONAL ASSOCIATION OF ROCKETRY LAWS & REGULATIONS**

**by Trip Barber, NAR 4322**

- [Communications](#)
- [Launch Equipment](#)
- [Launch Sites](#)
- [Laws & Regulations](#)
- [Management](#)
- [Outreach](#)
- [Publicity](#)
- [Running Launches](#)
- [Section Activities](#)
- [Starting a New Section](#)

The hobby of sport rocketry is well recognized as a safe and legal activity under the laws and regulations of the Federal government and of every state. There are, however, significant limitations and conditions on the activity, which every hobbyist must understand and obey. Strict compliance with the law and cooperation with public safety officials has always been a hallmark of the National Association of Rocketry and its affiliated individuals and sections. It is vital to the future health of the Association and its credibility as a responsible spokesman for the hobby that we all remain fully informed of the applicable laws and set the example for the public in following them. This article summarizes those Federal or nation-wide laws and regulations, which the average hobbyist is likely to encounter; there are a few more (not mentioned here) that apply only to those few who are manufacturers, dealers, or amateur motor-makers. Some states and local jurisdictions also have more restrictive laws or ordinances, so it is wise to check with a local fire marshal prior to holding a new section's first public or organized launch event. The hobby of sport rocketry is divided into two general "classes", model rocketry and high-power rocketry. The dividing line between them is based on two factors: rocket motor characteristics, and rocket liftoff mass. Rockets using motors above the 'G' power class (or motors with an average thrust greater than 80 Newton's regardless of power class), having combined total impulse greater than 320 Newton-seconds, or having a liftoff mass above 1500 grams are always called "high power rockets". There are two foundations for the hobby's regulatory coverage: the Codes of the National Fire Protection Association (NFPA) and the Code of Federal Regulations (CFR). The NFPA is a non-governmental public-safety organization dedicated to writing safety codes and model laws for fire prevention. These Codes are recognized nationwide as the single authoritative public safety source for fire marshals; most (but not all) states and local jurisdictions adopt them unchanged—check with your local fire marshal about your area. Both the NAR and the Tripoli Rocketry Association (TRA) belong to the NFPA and participate in writing its codes governing sport rocketry safety. The Code of Federal Regulations is the multi-volume set of regulatory details produced by the various enforcement agencies of the Executive Branch that "flesh out" the implementation of laws passed by Congress. The CFR's have the force of law. As a result of decades of work by the NAR and manufacturers, special and fairly liberal rules for sport rocketry are specifically mentioned in numerous spots in the various

volumes of the CFR. This article is divided into sections based on specific regulatory topics. The applicable legal basis is noted in the discussion under each topic and all are listed in the references. [Launch safety](#) and its associated regulations and lessons-learned are covered in a whole section of the NAR website; this includes the NAR Safety Codes for [model rocketry](#) and [high power rocketry](#).

### **Safety Codes**

The NAR has two Safety Codes, one for model rockets and another for high-power rockets. The main differences are in the specified distances everyone must stand back from a launch, and in the extra rules for high power requiring user certification and compliance with FAA airspace rules. The NAR high-power and Tripoli Rocketry Association safety codes are virtually identical because both are based on the specific requirements for rocket construction and operation found in Chapter 2 of NFPA Code 1127 (High-Power Rocketry). The NAR model rocket safety code follows Chapter 2 of NFPA Code 1122 (Model Rocketry). NAR insurance does not cover accidents resulting from violations of the safety code, and such violations are illegal in states that have adopted the NFPA Codes as law. Minimum Ages There is no minimum age for purchasing or flying model rockets and most types of model rocket motors under Federal regulations or NFPA Codes, although most manufacturers recommend adult supervision for those under 10 years of age. Some states (such as California) and local jurisdictions have minimum age requirements for purchasing motors, particularly D and larger sizes. Motors above 'F' power class, and all motors that use metallic casings (including reloadables) regardless of power class, may only be sold legally to those 18 years of age or above. This is because while model rocket motors are specifically exempted from regulation under the Federal Hazardous Substances Act (FHSA) law by the Consumer Product Safety Commission (CPSC) under paragraph 1500.85(a)(8) of Title 16 of the CFR, larger or metallic motors are not exempted. The FHSA requires that non-exempted items such as these motors be classified as "banned hazardous substances", and such items may not legally be sold to minors. Under NFPA Code 1127, "high power motors"—motors above 'G' power class, and any motor whose average thrust is above 80 Newtons—may be sold to or possessed by only a "certified user" (see the "user certification" heading below). One requirement for becoming such a user is to be age 18 or older. User Certification NFPA Code 1127—and the safety codes of both the NAR and TRA—require that "high power motors" be sold to or possessed by only a certified user. This certification may be granted by a "nationally recognized organization" to people who demonstrate competence and knowledge in handling, storing, and using such motors. Currently only the NAR and TRA offer this certification service. Each organization has slightly different standards and procedures for granting this certification, but each recognizes certifications granted by the other. Certified users must be age 18 or older.

### **Explosives Permits**

Hobby rocket motors (including high power) no longer require a Federal explosives permit to sell, purchase, store, or fly. Certain types of igniters, and cans or other bulk amounts of black powder do require such permits. Under the Organized Crime Control Act of 1970 (Public Law 91- 452). A Federal Low Explosives User Permit (LEUP) from the Bureau of Alcohol, Tobacco, and Firearms (BATF) is required to purchase these items outside one's home state, or to transport them across state lines. These items, once bought under an LEUP, must thereafter be stored in a magazine that is under the control of an LEUP holder. A "Type 3" portable magazine

or “Type 4” indoor magazine (described under NFPA Code 495) is required, and it can be located in an attached garage. BATF must inspect such magazines.

Federal permits can be obtained from the BATF using their Form 5400.13/5400.16, available from the ATF Distribution Center, 7943 Angus CT., Springfield, VA 22153. These are issued only to U.S. citizens, age 18 and older, who have no record of conviction of felonies and who pass a background check conducted by the BATF. This check includes a personal interview by a BATF agent.

### **Launch Site Requirements**

The first requirement for any launch site is permission of the owner to use it for flying rockets! Use of land—even public property—without permission is usually illegal and always a bad way for a NAR member to demonstrate responsible citizenship. The NAR will issue “site owner” insurance to chartered sections to cover landowners against liability for rocket-flying accidents on their property— such insurance is normally required. The NAR safety codes and NFPA Codes establish some minimum requirements for the size and surroundings of launch sites. Model rocket launch sites must have minimum dimensions which depend on the rocket’s motor power as specified in Rule 7 of the model rocket safety code and its accompanying table. The site within these dimensions must be “free of tall trees, power lines, buildings, and dry brush and grass”. The launcher can be anywhere on this site, and the site can include roads. Site dimensions are not tied to the expected altitude of the rockets’ flights.

According to the high-power safety code, high-power rocket launch sites must be free of these same obstructions, and within them the launcher must be located “at least 1500 feet from any occupied building” and at least “one quarter of the expected altitude” from any boundary of the site. NFPA Code 1127 establishes further requirements for the high-power site: it must contain no occupied buildings, or highways on which traffic exceeds 10 vehicles per hour; and the site must have a minimum dimension no less than either half the maximum expected rocket altitude or 1500 feet, whichever is greater—or it must comply with a table of minimum site dimensions from NFPA 1127 and the high power safety code.

While model rocketry and high power rocketry, when conducted in accordance with the NAR Safety Codes, are legal activities in all 50 states, some states impose specific restrictions on the activity and many local jurisdictions require some form of either notification or prior approval of the fire marshal. It is prudent and highly recommended that before you commit to a launch site you meet with the fire marshal having jurisdiction over the site to make him aware of what you plan to do there and build a relationship with him just as you did with the land owner. The fact that NAR rocketry is recognized and its safety and launch site requirements are codified in Codes 1122 (Model Rockets) and 1127 (High Power Rockets) by the National Fire Protection Association (NFPA) will be a very powerful part of your discussion with any fire marshal. In those states which have adopted a law implementing all NFPA codes, either by adoption of NFPA Code 1 or the International Fire Code (IFC), then the NFPA Codes 1122 and 1127 on rocketry are specifically in effect state-wide unless overridden by a specific state or local law. The NFPA 1/IFC states are the following:

Alabama

Arkansas

Connecticut

Alaska

Colorado

Delaware

Brigham Young University-Idaho

Compliance Area: Environmental Health & Safety

Department Title: Safety Department

Program Title: Rocket Team Program

Program Number: EH-038

Page: 8

Revision: 00

Date Issued: April 2017

Florida	Mississippi	Rhode Island
Georgia	Missouri	South Carolina
Hawaii	Montana	South Dakota
Idaho	Nebraska	Tennessee
Illinois	Nevada	Texas
Indiana	New Hampshire	Utah
Iowa	New Jersey	Vermont
Kansas	New Mexico	Virginia
Kentucky	North Carolina	Washington (state)
Louisiana	North Dakota	West Virginia
Maine	Ohio	Wisconsin
Maryland	Oklahoma	Wyoming
Massachusetts	Pennsylvania (specifically	
Michigan	adopted NFPA 1122 &	
Minnesota	1127)	

### **Airspace Clearance**

The Federal Aviation Administration (FAA) has jurisdiction over the airspace of the U.S. and whatever flies in it. Their regulations concerning who may use it and under what conditions are known as the Federal Aviation Regulations (FAR)—which are also called Title 14 of the Code of Federal Regulations (14 CFR). Chapter 1, Subchapter F, Part 101 of these regulations (14 CFR 101.1) specifically exempts model rockets that weigh 16 ounces or less and have 4 ounces or less of propellant from FAA regulation as long as they are “operated in a manner that does not create a hazard to persons, property, or other aircraft.” When operated in this safe manner, model rockets may be flown in any airspace, at any time, and at any distance from an airport—without prior FAA approval. Rockets larger than these specific limits—i.e. all high-power rockets—are referred to as “unmanned rockets” by the FARs and are subject to very specific regulations. Such rockets may not be flown in controlled airspace (which is extensive in the U.S. even at low altitudes and includes all airspace above 14,500 feet), within 5 miles of the boundary of any airport, into cloud cover greater than 50% or visibility less than 5 miles, within 1500 feet of any person or property not associated with the operation, or between sunset and sunrise. Both NFPA Code 1127 and the NAR high-power safety code require compliance with all FAA regulations. Deviation from these FAR limits for unmanned rockets requires either notification of or granting of a “waiver” by the FAA. Such a waiver grants permission to fly but does not guarantee exclusive use of the airspace. The information required from the flier by the FAA is detailed in section S 101.25 of the FAR (14 CFR 101.25). If the rockets are no more than 1500 grams with no more than 125 grams of propellant, no notification of or authorization by the FAA is required. Larger rockets require a specific positive response from the FAA Regional Office granting a waiver before flying may be conducted; and the waiver will require that you notify a

specific FAA contact to activate a Notice to Airmen 24 hours prior to launch. The waiver is requested using FAA Form 7711-2, available from any FAA office or the FAA website. This form must be submitted in triplicate to the nearest FAA Regional Office 30 days or more in advance of the launch, and it is advisable to include supplemental information with it, including copies of the Sectional Aeronautical Chart with the launch site marked on it and copies of the high-power safety code. The FAA charges no fee. Ignition Safety The NAR safety codes and the NFPA Codes both require that rockets be launched from a distance by an electrical system that meets specific design requirements. Ignition of motors by a fuse lit by a hand-held flame is prohibited, and in fact both NFPA Codes prohibit the sale or use of such fuses. All persons in the launch area are required to be aware of each launch in advance (this means a PA system or other loud signal, especially for high-power ranges), and all (including photographers) must be a specified minimum distance from the pad prior to launch. This “safe distance” depends on the power of the motors in the rocket; the rules are different for model rockets and high-power rockets. Both the field size and the pad layout at a rocket range—particularly a high-power range—must take into account and support the size of the rockets that will be allowed to fly on the range.

For model rockets, the “safe distance” depends on the total power of all motors being ignited on the pad: 15 feet for 30 N-sec or less and 30 feet for more than 30 N-sec. For high-power rockets, the distance depends on the total power of all motors in the rocket, regardless of how many are being ignited on the pad, and on whether the rocket is “complex”, i.e. multistaged or propelled by a cluster of motors. The distance can range from 50 feet for a rocket with a single ‘H’ motor to 2000 feet for a complex rocket in the ‘O’ power class. These distances are specified in a table in NFPA Code 1127 and the NAR high-power safety code.

### **Motor Certification**

Both NAR safety codes and both NFPA Codes require that fliers use only “certified” motors. This certification requires passing a rigorous static testing program specified in the NFPA Codes. The NAR safety codes and insurance require that NAR members use only NAR certified motors; and since the NAR currently has a reciprocity agreement with TRA on motor certification, this means that TRA- certified motors also have NAR certification. The NFPA Codes recognize certifications granted by any “approved testing laboratory or national user organization”, but only the NAR and TRA can provide this service in most parts of the country. The California Fire Marshal has his own testing program for motors in that state. Motors made by private individuals or by companies without proper explosives licenses, and motors not formally classified for shipment by the U.S. Department of Transportation, are not eligible for NAR certification and may not be used on an NAR range. Shipping of Motors Sport rocket motors generally contain highly flammable substances such as black powder or ammonium perchlorate, and are therefore considered to be hazardous materials or explosives for shipment purposes by the U.S.

Department of Transportation (DOT). There are extensive regulations concerning shipment in the DOT’s section of the CFR—Title 49, Parts 170-179. These regulations cover packaging, labeling, and the safety testing and classification that is required prior to shipment. These regulations are of great concern to manufacturers and dealers, and there are severe penalties for non-compliance. Basically, it is illegal to send rocket motors by UPS, mail, Federal Express, or any other common carrier—or to carry them onto an airliner—except under exact compliance with these regulations. The reality of these regulations, and the shippers’ company regulations, is that it is virtually impossible for a private individual to legally ship a rocket motor of any size. Transportation of motors on airlines is very difficult to do legally and should be avoided if at all

possible. It takes weeks of advance effort with the airline, and in the post-September 11 world is probably not even worth attempting.

### **Insurance**

Most property owners, whether government bodies or private owners, will demand the protection of liability insurance as a precondition to granting permission to fly sport rockets on their property. The NAR offers such insurance to individual fliers, to chartered NAR sections, and to flying site owners. Individual insurance is automatic for all NAR members. It covers only the insured individual, not the section or the site owner. Under the current underwriter this insurance runs for a 12 month period, coincident with NAR membership.

Sections are insured as a group for a year; remember that section insurance is coincident with the section charter and expires on April 4 each year. Site owner insurance is available to all active sections for free. Each site owner insurance certificate covers only a single site (launch field or meeting room).

NAR insurance covers only activities that are conducted in accordance with the NAR safety code using NAR-certified motors. It provides \$5 -million aggregate liability coverage for damages from bodily injury or property damage claims resulting from sport rocket activities such as launches, meetings, or classes and \$1 million coverage for fire damage to the launch site. It is “primary” above any other insurance you may have.

### **References:**

NFPA Code 495, Explosives Materials Code, National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.

NFPA Code 1122, Code for Model Rocketry. NFPA Code 1127, Code for High Power Rocketry.

Code of Federal Regulations, Title 14, Part 101, Federal Aviation Regulations by the FAA for unmanned rockets.

Code of Federal Regulation, Title 16, Part 1500.85(a)(8), Consumer Product Safety Commission exemption for model rockets.

Code of Federal Regulations, Title 27, Part 55, Bureau of Alcohol, Tobacco, and Firearms regulations.

Code of Federal Regulations, Title 49, Parts 170-177, Department of Transportation hazardous material shipping regulations.

Model Rocket Safety Code, National Association of Rocketry.

High Power Rocketry Safety Code, National Association of Rocketry.

## Related Documents:

<a href="#">Arizona Modroc Law</a>	PDF	May 24, 2014, 11:37 pm	30 KB
<a href="#">California Health &amp; Safety Code (Rockets)</a>	PDF	May 24, 2014, 11:37 pm	357 KB
<a href="#">California Modroc Regs</a>	PDF	May 24, 2014, 11:37 pm	27 KB
<a href="#">Colorado ModRoc Law</a>	PDF	March 7, 2016, 12:44 am	66 KB
<a href="#">Connecticut Modroc Code</a>	PDF	May 24, 2014, 11:37 pm	11 KB
<a href="#">Federal Aviation Regulations on Rockets</a>	PDF	May 24, 2014, 11:37 pm	19 KB
<a href="#">Georgia ModRoc Law-2010</a>	PDF	May 24, 2014, 11:37 pm	13 KB
<a href="#">Georgia ModRoc Regs</a>	PDF	May 24, 2014, 11:37 pm	37 KB
<a href="#">Kansas ModRoc Law</a>	PDF	May 24, 2014, 11:37 pm	24 KB
<a href="#">Maine Rocketry Law</a>	PDF	May 24, 2014, 11:37 pm	21 KB
<a href="#">Michigan Modroc Law</a>	PDF	May 24, 2014, 11:37 pm	20 KB
<a href="#">Nevada Modroc Law</a>	PDF	May 24, 2014, 11:37 pm	10 KB
<a href="#">Nevada ModRoc Regulations</a>	PDF	May 24, 2014, 11:37 pm	58 KB
<a href="#">New Jersey Model Rocketry Act and Regulations</a>	PDF	May 24, 2014, 11:37 pm	30 KB
<a href="#">NM ModRoc Law</a>	PDF	May 24, 2014, 11:37 pm	48 KB
<a href="#">Ohio Modroc Law</a>	PDF	May 24, 2014, 11:38 pm	12 KB
<a href="#">Oregon Modroc Law</a>	PDF	May 24, 2014, 11:38 pm	14 KB
<a href="#">Pennsylvania Rocketry Regulations</a>	PDF	May 24, 2014, 11:38 pm	12 KB
<a href="#">Rhode Island Modroc Law (2010)</a>	PDF	May 24, 2014, 11:38 pm	23 KB
<a href="#">Shipping Rocket Motors</a>	PDF	May 24, 2014, 11:38 pm	57 KB
<a href="#">Summary of Modroc Regulations (Estes, 2012)</a>	PDF	May 24, 2014, 11:38 pm	22 KB
<a href="#">Texas Modroc Law</a>	PDF	May 24, 2014, 11:38 pm	15 KB
<a href="#">Washington Modroc Law</a>	PDF	May 24, 2014, 11:38 pm	27 KB
<a href="#">West Virginia Modroc Law</a>	PDF	May 24, 2014, 11:38 pm	13 KB
<a href="#">CAFireworksHandbook2011</a>	PDF	May 24, 2014, 11:40 pm	1 MB
<a href="#">North Dakota Modroc Law (Apr 2007)</a>	PDF	May 24, 2014, 11:40 pm	13 KB

## **APPENDIX B**

# **NATIONAL ASSOCIATION OF ROCKETRY**

## **MODEL ROCKET SAFETY CODE**

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](#), 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.

LAUNCH SITE DIMENSIONS

<b>Installed Total Impulse (N-sec)</b>	<b>Equivalent Motor Type</b>	<b>Minimum Site Dimensions (ft.)</b>
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

Revision of August, 2012

**APPENDIX C**  
**NATIONAL ASSOCIATION OF ROCKETRY**  
**HIGH POWER ROCKET SAFETY CODE**  
EFFECTIVE AUGUST 2012

1. Certification. I will only fly high power rockets or possess high power rocket motors that are within the scope of my user certification and required licensing.
2. Materials. I will use only lightweight materials such as paper, wood, rubber, plastic, fiberglass, or when necessary ductile metal, for the construction of my rocket.
3. Motors. I will use only certified, commercially made rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer. I will not allow smoking, open flames, nor heat sources within 25 feet of these motors.
4. Ignition System. I will launch my rockets with an electrical launch system, and with electrical motor igniters that are installed in the motor only after my rocket is at the launch pad or in a designated prepping area. My launch system will have a safety interlock that is in series with the launch switch that is not installed until my rocket is ready for launch, and will use a launch switch that returns to the “off” position when released. The function of onboard energetics and firing circuits will be inhibited except when my rocket is in the launching position.
5. 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.
6. Launch Safety. I will use a 5-second countdown before launch. I will ensure that a means is available to warn participants and spectators in the event of a problem. I will ensure that no person is closer to the launch pad than allowed by the accompanying Minimum Distance Table. When arming onboard energetics and firing circuits I will ensure that no person is at the pad except safety personnel and those required for arming and disarming operations. I will check the stability of my rocket before flight and will not fly it if it cannot be determined to be stable. When conducting a simultaneous launch of more than one high power rocket I will observe the additional requirements of NFPA 1127.
7. Launcher. I will launch my rocket from a stable device that provides rigid guidance until the rocket has attained a speed that ensures a stable flight, and that is pointed to within 20 degrees of vertical. If the wind speed exceeds 5 miles per hour I will use a launcher length that permits the rocket to attain a safe velocity before separation from the launcher. I will use a blast deflector to prevent the motor’s exhaust from hitting the ground. I will ensure that dry grass is cleared around each launch pad in accordance with the accompanying Minimum Distance table, and will increase this distance by a factor of 1.5 and clear that area of all combustible material if the rocket motor being launched uses titanium sponge in the propellant.
8. Size. My rocket will not contain any combination of motors that total more than 40,960 N-sec (9208 pound-seconds) of total impulse. My rocket will not weigh more at liftoff than

one-third of the certified average thrust of the high power rocket motor(s) intended to be ignited at launch.

9. Flight Safety. I will not launch my rocket at targets, into clouds, near airplanes, nor on trajectories that take it directly over the heads of spectators or beyond the boundaries of the launch site, and will not put any flammable or explosive payload in my rocket. I will not launch my rockets if wind speeds exceed 20 miles per hour. I will comply with Federal Aviation Administration airspace regulations when flying, and will ensure that my rocket will not exceed any applicable altitude limit in effect at that launch site.
10. Launch Site. I will launch my rocket outdoors, in an open area where trees, power lines, occupied buildings, and persons not involved in the launch do not present a hazard, and that is at least as large on its smallest dimension as one-half of the maximum altitude to which rockets are allowed to be flown at that site or 1500 feet, whichever is greater, or 1000 feet for rockets with a combined total impulse of less than 160 N-sec, a total liftoff weight of less than 1500 grams, and a maximum expected altitude of less than 610 meters (2000 feet).
11. Launcher Location. My launcher will be 1500 feet from any occupied building or from any public highway on which traffic flow exceeds 10 vehicles per hour, not including traffic flow related to the launch. It will also be no closer than the appropriate Minimum Personnel Distance from the accompanying table from any boundary of the launch site.
12. Recovery System. I will use a recovery system such as a parachute in my rocket so that all parts of my rocket return safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket.
13. Recovery Safety. I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places, fly it under conditions where it is likely to recover in spectator areas or outside the launch site, nor attempt to catch it as it approaches the ground.

MINIMUM DISTANCE TABLE

Installed Total Impulse (Newton-Seconds)	Equivalent High Power Motor Type	Minimum Diameter of Cleared Area (ft.)	Minimum Personnel Distance (ft.)	Minimum Personnel Distance (Complex Rocket) (ft.)
0 — 320.00	H or smaller	50	100	200
320.01 — 640.00	I	50	100	200
640.01 — 1,280.00	J	50	100	200
1,280.01 — 2,560.00	K	75	200	300
2,560.01 — 5,120.00	L	100	300	500
5,120.01 — 10,240.00	M	125	500	1000
10,240.01 — 20,480.00	N	125	1000	1500
20,480.01 — 40,960.00	O	125	1500	2000

Note: A Complex rocket is one that is multi-staged or that is propelled by two or more rocket motors