

**NATIONAL ASSOCIATION OF ROCKETRY**

**UNITED STATES MODEL ROCKET SPORTING CODE**



**July 2022 EDITION**  
*(Supersedes all prior editions)*

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## THE SPORTING CODE

**The United States Model Rocket Sporting Code (USMRSC) or Sporting Code, provides a standard set of rules by which NAR members may compete with one another on the basis of skill, ability, and expertise. The NAR Contest and Records Committee (the Contest Board) through its national chairman and regional representatives manage and administer the Sporting Code.**

NAR members who wish to compete are encouraged to contact an individual or local NAR section that sponsors sanctioned rocketry competition. NAR members needing help locating or contacting an NAR section in their area can obtain assistance consulting the NAR section list - <http://www.nar.org/find-a-local-club/> or by emailing NAR Headquarters - <http://www.nar.org/about-nar/organization-contacts/>.

Changes to the Sporting Code may be made by the Board of Trustees, the Contest Board, or the Rule Change Process (RCP) which is managed by the Rules Revisions Subcommittee. At a minimum, the Contest Board shall publish all changes to the Sporting Code on NAR.org, along with the date on which they take effect.

Members who would like to serve as Regional Contest Chairs or serve on the Rules Revisions Subcommittee should contact the National Contest Board Chairman.

Because the Sporting Code cannot address all the outcomes of competition, disputes and protests regarding the rules are inevitable. Whenever possible, competitors should exercise common sense, fair play, and sportsmanship in an attempt to reach a solution.

To support the continued advancement of model rocketry, the National Association of Rocketry supports competition as an activity that emphasizes sportsmanship and patience; construction and flying skills; safety and education, and creativity and innovation.

This edition of the Sporting Code replaces all previous versions and is effective July 31, 2021. Changes from the previous version are highlighted in yellow.

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## **NAR CONTEST BOARD DIRECTORY**

Click on this link to view the NAR Organization Contacts webpage and a complete list of the Contest Board and their contact information:

<http://www.nar.org/about-nar/organization-contacts/>

# MODEL ROCKET SAFETY CODE

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

Installed Total Impulse (N-sec)	Equivalent Motor Type	Minimum Site Dimensions (ft)
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

# GENERAL

## 1 DEFINITIONS

### 1.1 Glossary of Definitions

A Glossary containing the official definitions of words and acronyms used in the Sporting Code is provided in Appendix A - Glossary.

### 1.2 Model Rocket

A model rocket is an aero-model that is propelled into the air by means of a model rocket motor; without the use of aerodynamic lifting forces overcoming gravity; that includes a device for returning it safely to the ground in a reusable condition; and that contains no parts likely to create a hazard. Model rocket motors and recovery system protectors or wadding, if present, do not constitute portions of a model rocket.

### 1.3 Model Rocket Motor

A model rocket motor is a reaction motor produced by a commercial manufacturer using pre-loaded combustible solid propellant as fuel or a rocket motor designed to be reloaded with commercially manufactured combustible solid propellant grains or modules.

### 1.4 Headings

Section and subsection headings are to aid in referencing, and the communication regarding, rules in the Sporting Code. Their inclusion or omission is not considered a part of these rules.

### 1.5 Rounding

When scoring must be rounded, the following schedule shall be followed:

- < 0.5 is rounded down
- => 0.5 is rounded up

## 2 GENERAL

### 2.1 Scope

The United States Model Rocket Sporting Code shall govern the design, construction, and operation of all model rockets and model rocket motors used in conjunction with:

- All competition sanctioned by the National Association of Rocketry (NAR), and
- All attempts to establish or surpass United States Model Rocket Performance Records.

**2.1.1** The United States Model Rocket Sporting Code may be used as a guide for supporting **non-sanctioned competition** activities of individuals and sections.

- The event rules contained herein may be used as is or tailored to meet the needs of the group competing.
- To facilitate points scoring for determining event, competition division and meet awards, the points award schedule described in Rule 13.2.4 - NARAM may be used.
- The provision to tailor the rules is not authorization to affect a change that would result in unsafe operation of a model rocket, model rocket motors or the launch range.

### 2.2 Safety Code

The Model Rocketry Safety Code of the NAR shall be the general safety criteria to be followed in the interpretation and administration of this United States Model Rocket Sporting Code. This Safety Code shall not be overridden by the Sporting Code. Any changes to the Safety Code applies immediately to the Sporting Code.

### 2.3 FAI Rules

The United States Model Rocket Sporting Code shall not be construed to amend or otherwise serve as a substitute for the Sporting Code of the Federation Aeronautique Internationale (FAI) for the purposes of establishing or surpassing world model rocket performance records. Competitors who wish to attempt such records should obtain a copy of the current FAI Sporting Code.

### **3 MODEL ROCKET SPECIFICATIONS**

#### **3.1 Compliance**

A model rocket must comply with all specifications in this section and the Model Rocket Safety Code before, during, and after flight.

#### **3.2 Gross Launching Mass**

The gross launching mass of a model rocket, including model rocket motor or motors, must not exceed 1,500 grams.

#### **3.3 Propellant**

No more than a total of 125 grams of solid propellant materials may be contained in its model rocket motor(s) at the moment of launch.

#### **3.4 Stages**

There must be no more than three consecutively fired stages. The staged configuration of the model is considered to be the state of the model at the instant of first motion on the launcher.

#### **3.5 Reusability**

A model rocket must be so constructed as to be capable of more than a single flight; and must be provided with a means for retarding its descent to the ground so that its structure may not be substantially damaged, and so that no hazard is created to persons and property. If a model descends in more than one unattached part, each part must conform to the above specification.

#### **3.6 Materials**

Construction of the airframe must be of wood, paper, rubber, plastic, or other similar materials consistent with the Model Rocket Safety Code.

#### **3.7 Stability**

Design and construction must include suitable means for providing stabilizing and restoring forces necessary to maintain a substantially true and predictable flight path. If required by safety officers or judges, the builder of the model must present data demonstrating that their model meets this requirement.

#### **3.8 On-Board Ignition System**

A model rocket possessing an autonomous ignition system (e.g., for initiation of any energetic function) must be provided with a safety switch or other device capable of preventing actuation of the system until immediately prior to the launch.

#### **3.9 Dethermalizer**

A model rocket equipped with a dethermalizer or other device designed to operate via combustion (e.g., a cotton fuse or wick) must be designed so that ignition of the device presents no imminent hazard to the person igniting the device. In addition, the model rocket must be designed so that the device is extinguished as soon as possible after performing its function (e.g., by inclusion of a snuffer tube).

### **4 MODEL ROCKET MOTOR STANDARDS**

#### **4.1 Definition**

Model Rocket motors must meet the requirements of the NAR Standards and Testing Committee and NFPA 1122.

#### **4.2 Limits**

A single solid propellant model rocket motor must not contain more than 125 grams of propellant, and must not produce any more than 160.00 Newton-seconds of total impulse.

#### **4.3 Contest Approval**

All motors used in a model rocket in NAR sanctioned competition, or for the purpose of establishing a United States Model Rocket Performance Record, must be listed in the NAR Certified/Combined Motor List found on NAR.org as holding NAR Contest Approval.

#### **4.4 Alterations**

A model rocket motor must not be altered in any manner that changes its dimensions and/or its performance characteristics. No material may be permanently affixed to the motor.



#### 4.5 Classification

A model rocket motor is assigned a motor classification based on its mean sea level total impulse when tested at a temperature of 20 degrees Celsius. A motor becomes NAR certified when its test data is accepted by the NAR Standards and Testing Committee. NAR certified model rocket motor classifications are as follows:

Motor Class	Total Impulse (N-sec)
1/8A	0.00 – 0.3125
1/4A	0.3126 – 0.625
1/2A	0.626 – 1.25
A	1.26 – 2.50
B	2.51 – 5.00
C	5.01 – 10.00
D	10.01 – 20.00
E	20.01 – 40.00
F	40.01 – 80.00
G	80.01 – 160.00

**Note:** All motor classes listed above will be recognized for certification purposes regardless of current commercial availability.

#### 4.6 Published Values

The total impulse values published in the NAR Certified/Combined Motor List found on NAR.org will be the values used in all NAR sanctioned competition and for United States Model Rocket Performance Record attempts.

#### 4.7 Total Impulse

When multiple motors are used in a single entry (e.g., clustering and staging), the total impulses of the individual motors must be summed to compute the total impulse of the configuration and to determine the impulse class of an event for which the entry qualifies. Only those motors actually intended to ignite and produce useful thrust are to be included in this total.

#### 4.8 Acceptance

Only model rocket motors that are currently and readily available commercially, and meet the requirements of Rule 4.1 - Definitions, through Rule 4.3 - Contest Approval, and Rule 4.5 - Classification, through 4.7 - Total Impulse, shall be accepted for NAR contest approval.

#### 4.9 Contest Use

NAR sanctioned competition allows the use of all contest approved motors for which the total impulse of the motor is appropriate for the event and in compliance with state and local laws. Booster stage, single stage, and upper stage motors may be used in locations other than their primary intended stage.

## 5 LAUNCHING REQUIREMENTS

#### 5.1 Range Safety Officer

During all operations concerned with the launching and flight of model rockets, all authority for the safety of flying field operations shall be vested in a Range Safety Officer (RSO) who must be an NAR member eighteen (18) years of age or older. If the RSO leaves the flying field, he/she must relinquish his/her duties and responsibilities to an RSO who must also be a member of the NAR eighteen (18) years of age or older.

#### 5.2 Flying Field

The flying field shall be an area whose shortest dimension is no less than one-fourth (1/4) the anticipated maximum altitude of the rockets to be flown. The flying field should not contain or be adjacent to high voltage lines, major highways, multi-story buildings, or other obstacles. The launching location must be no closer than 10 meters to the boundaries of the flying field.

#### 5.3 Safety Check

All model rockets presented for operation at a flying field may be permitted or denied flight by the Range Safety Officer (RSO) or Safety Check Officer (SCO) on the basis of his/her judgment with respect to safety.

#### 5.4 Launching Device

A launching device or mechanism must be used that restricts the entry in its pitch axis until sufficient flight velocity is attained for safe, predictable flight. Recommended launching devices are a steel launch rod, tower, rail, or piston.

## 5.5 Launcher Height

No entry may be launched with its aft most part more than 2 meters above the ground.

## 5.6 Momentum

A launching device must not impart to the entry any velocity or change of momentum except that caused by the model rocket motor(s) contained in the entry.

## 5.7 Ignition

Ignition of an entry must be conducted by remote electrical means from a distance as required by the Model Rocket Safety Code, and must be fully under the control of the competitor or Launch Control Officer (LCO) launching the entry. All persons in the vicinity of a launch must be advised that a launch is imminent before an entry may be ignited. A minimum five-second audible countdown must be given before ignition and launch of an entry. A competitor will always be allowed to use their own launching device, and to launch at the time of their choice, within limits set by the RSO.

# 6 SANCTIONED COMPETITION

## 6.1 NAR Contest Board

The NAR Contest Board will sanction competition to be conducted in accordance with the rules set forth in the United States Model Rocket Sporting Code.

## 6.2 Sanction

Application for sanction of an NRC launch or Record Trial must be made to the NAR Regional Contest Board at least 48 hours in advance of the start time of the launch. Sections and individuals are encouraged to schedule NRC launches earlier whenever possible. Application for a launch sanction shall be made electronically at [NAR.org](http://NAR.org). An NAR member eighteen (18) years of age or older, who will serve as the Contest Director, must submit the application. All NAR sanctioned launches will be automatically posted to the [NAR Launch Calendar](#) on NAR.org.

## 6.3 Contest Year

### 6.3.1 The Contest Year

Begins the day after NARAM concludes and ends on the last day of NARAM of the following year.

### 6.3.2 NRC Year and Qualification Flying

Begins the day after NARAM concludes and ends on June 30 of the following year.

## 6.4 Classes

### 6.4.1 National Rocketry Competition

The National Rocketry Competition (NRC) shall be a competition in which individuals and teams qualify to compete at the National Association of Rocketry Annual Meet (NARAM) for Event Specialist Award (ESA) and National and Reserve Champion awards.

### 6.4.2 NARAM - NAR Annual Meet

NARAM shall be held each year. NARAM will be held at a time and place and with entry requirements determined by the NAR Contest Board.

### 6.4.3 Record Trial

A Record Trial is conducted for the purpose of providing members an opportunity to establish or surpass official United States model rocket performance records. Any number or combination of events may be flown. The sanction form shall include any limitations for that Record Trial, e.g. altimeter only altitude, field or motor limitations. In a Record Trial, an NAR member duly entered in the meet may have as many opportunities as time and weather permit to make a record attempt.

## 6.5 Time

All NRC launches and Record Trials shall be scheduled to operate over no more than three consecutive days, or except as stated in Rule 6.6 - Suspending Competition. NARAM shall be the number of days specified by the NAR Contest Board.

## 6.6 Suspending Competition

An NRC or NARAM Contest Director may suspend competition for reasons of safety (i.e., threatening weather/lightning.)

## **6.7 Results**

The NAR member who serves as the Contest Director for a sanctioned launch shall forward a Contest Manager file of the results to the NAR Regional Contest Board within seven (7) days following completion of the launch. If an unusual question arises, the Contest Director may request a ruling on the matter from the NAR Contest Board. In this case, the Contest Director should make every effort to include complete and impartial details on the situation.

## **6.8 Rejection**

The NAR Contest Board may refuse to accept the results if evidence is presented that the sanctioned launch was not conducted within the scope or intent of the United States Model Rocket Sporting Code.

## **6.9 Deadline**

The NRC Scoreboard results shall be made final by the Contest Board and shall be posted on [NAR.org](http://NAR.org) at least fourteen days prior to the opening day of NARAM.

## **6.10 Advisory Rulings**

In cases where a competitor is uncertain of the application of a rule contained in the United States Model Rocket Sporting Code, he/she may ask for a ruling by the Regional Contest Board Chairman. The Regional Contest Board Chairman may rule or pass the request to the National Contest Board Chairman. This process should proceed in a timely manner to allow competitor's time to react to the ruling.

# **7 CONTEST OFFICIALS**

## **7.1 Contest Director**

A Contest Director shall be a member of the NAR, at least eighteen (18) years of age or older. He/she shall apply for contest sanction; be responsible for all contest material; ensure that the competition is arranged and functions in accordance with the Sporting Code, and report the results of the competition to the Contest Board. The Contest Director appoints range crew.

## **7.2 Range Safety Officer**

A Range Safety Officer (RSO), who is a NAR member and is eighteen (18) years of age or older, shall preside over application of the rules, safety, and launch range operations in accordance with the Sporting Code. In no case, may the Contest Director or any other official override a safety ruling of the RSO. The duties of the Range Safety Officer and the Contest Director may be combined.

## **7.3 Safety Check Officer**

The Contest Director may appoint a NAR member to be a Safety Check Officer. The Safety Check Officer must be qualified to rule in accordance with the United States Model Rocket Sporting Code.

## **7.4 NARAM Judges**

The Contest Director shall appoint teams of judges for any event requiring static judging (e.g., Scale, Plastic Model Conversion). At least one member of each team of judges must be a member of the NAR at least eighteen (18) years of age or older. Non-NAR member judges are allowed.

## **7.5 Trackers and Timers**

The Contest Director may appoint any capable person as a tracker or timer. Any glasses or aids necessary for that person to have normal vision must be worn. Any person not having correctable vision (e.g., cannot obtain a driver's license due to vision) is not eligible to time or track.

## **7.6 Conduct**

A contest official considered by any member of the Contest Board, Board of Trustees, or other contest official to be impaired by alcohol or drugs, or demonstrating poor sportsmanship will be removed from his/her position and may be expelled from the meet.

## **7.7 Conflict**

No competitor may serve as a contest official where he/she would rule on his/her own contest entry.

# **8 COMPETITORS**

## **8.1 Entering Competition**

All competitors entering model rockets and competing in NAR sanctioned competition must be members of the NAR in good standing. The Contest Director or his/her designee may ask competitors for verification of their NAR Sporting License. Newly joined NAR members who have not yet received their NAR Sporting License and wish to compete in sanctioned competition shall be recorded as pending.

## 8.2 Conduct

The Contest Director may disqualify any competitor from an event or from the entire meet on the grounds of failure to practice or observe reasonable safety measures, published or otherwise; for poor sportsmanship; for failure to abide by the orders of the Range Safety Officer or contest officials; whose ability to safely fly model rockets is, in the opinion of the Contest Director or Range Safety Officer, impaired by alcohol or drugs.

## 8.3 Competition Divisions

The Competition Divisions are as given in the following schedule:

A Division	Individuals and Teams, ages 0 – 14
B Division	Individuals and Teams, ages 15 – 22
C Division	Individuals ages 23 years old and older
D Division	Teams ages 23 years old and older

**8.3.1** The division in which an NAR member will compete during a Contest Year is determined by the member's age/status as of the start of the Contest Year.

**8.3.2** NAR members may compete individually and/or as a member of a team in accordance with Rule 8.4.1.

**8.3.3** Teams must compete in the division of the oldest member.

## 8.4 Teams

Two or more NAR members may enter competition as a team. Teams must be registered with the NAR Contest Board. Membership of a team cannot be changed during the Contest Year. Such a change must be registered as a different team. Team entries shall be prepared for flight by one or more members of the team, except if they are to be proxy-flown under the provisions of Rule 8.5 - Proxy. Entry blanks must contain the name and the number of the team. Any records established are credited to the team.

### 8.4.1 Restrictions

No NAR member may enter a sanctioned launch as both an individual and as a team member. No NAR member may enter a sanctioned launch as a member of more than one team. Neither of these restrictions applies at a Record Trial.

## 8.5 Proxy

A competitor entered in sanctioned competition may have an entry proxy-flown by an NAR member of the same or younger competition division.

### 8.5.1 Restrictions

Proxy flights are NOT allowed when flying:

- Radio controlled models
- Spot Landing events

Proxy flights are NOT allowed when flying for:

- Event Specialist Awards
- National Championship Awards
- United States Model Rocket Performance Records

### 8.5.2 Official Duties

Competitors having official duties at the contest may have entries proxy-flown for them.

## 8.6 Section Competition

Section competition is open to all NRC competitors who belong to an NAR section. All NAR sections may compete for both the NRC and the NAR section Championship.

### 8.6.1 Section Affiliation

Competitors must decide prior to their first NRC launch of the contest year if they will be competing for a NAR section. Section affiliation cannot be changed after the competitor's/team's first NRC launch of the contest year in which the competitor/team makes an official flight.

#### 8.6.1.1 Individual Competitors

For individual competitors, your section affiliation is declared in "Section 1" of your NAR member profile (see example below.)

#### 8.6.1.2 Teams

A team's section affiliation is declared when a team registers on the Team Registration page of the NAR website.

## YOUR PROFILE

[Upload a New Photo](#)

Prefix:

\* First Name:

\* Last Name:

Suffix:

\* Address:

**Section 1**

Section 2

## 9 ENTRIES

### 9.1 Total Impulse Limit

No entry in sanctioned competition may be powered by a motor or combination of motors exceeding 125 grams of total propellant. The maximum total impulse, in accordance with the Model Rocket Safety Code, must not exceed 320.00 Newton-seconds.

### 9.2 Ejected Motors

Unless allowed by the rules of a specific event, if a motor is ejected at a sanctioned competition and if that motor does not have a streamer or parachute attached, the flight is disqualified.

### 9.3 Flight Characteristics

During the powered phase of flight, spinning of the entry is permitted only around the roll axis. Entries that spin or loop around the pitch axis or yaw axis under power must be disqualified.

### 9.4 NAR Number

Each entry must carry, legibly displayed upon its exterior surface as the entry appears in flight readiness, the competitor's name or NAR license number. In the case of a team entry, the entry must carry the team name or team number.

## 9.5 Safety Check

Each entry must pass a safety inspection given by the Safety Check Officer (SCO) before each flight to ascertain that it will be safe in its operation and meet the standards of the Sporting Code. This inspection may include any launching device and auxiliary equipment provided by the competitor to assist the launch.

### 9.5.1 Motors

The flight card shall contain the make and complete designation of the motor on the competitor's flight card. (e.g. AeroTech G40-10W)

## 9.6 NARAM Minimum Entries

An entry must make an official flight before points can be awarded in the event.

## 9.7 Substitution of Entries

Unless disallowed by the rules for a specific event, substitution of entries between official flights in an event is allowed. When the rules for a specific event disallow substitution between official flights, only recovery devices and lost or damaged parts necessary to make the entry flight worthy may be changed or replaced for subsequent flights. In these circumstances, a replacement for a lost or damaged part must be similar to the part that it replaces.

## 9.8 Simultaneous Events

Two or more competition events may not be flown simultaneously by the same entry on the same flight.

## 9.9 Construction

Models not requiring construction are permitted in competition. However, for entries that require construction, the competitor must ensure that he/she has completely constructed the model rocket(s) he/she is using in competition. Materials and designs may be obtained from any source, including kits.

## 9.10 Impound

To ensure adherence to the Sporting Code, the Contest Director and/or RSO have the authority to require that any entry having made an official flight shall be returned and impounded for a reasonable length of time for inspection. The impounding of an entry must be requested during or immediately after the flight in question. If the entry or the part requested for impound cannot be returned to the officials within a reasonable time, the entry may be disqualified.

## 9.11 Radio Control

**Radio control safety is the responsibility of the competitor.** Frequency control regulations must be obeyed if implemented at the flying site. Radio control of an entry is not considered human intervention with regard to catching or cushioning of any model required to land naturally. Unless otherwise specified by the rules of that event, any entry may be radio controlled. The Contest Director can prohibit the use of Radio Control at NARAM in any event or for the entire meet and this restriction shall be stated in all associated printed material and electronic postings. Entries that are to be radio controlled must be controlled or guided by the builder or a builder of the entry.

## 9.12 FAI Events

Except for rocket glider, entries flown in the FAI class of an event, must comply with the following construction requirements of the FAI Sporting Code, Section 4, Volume SM - Space Models for that event:

**9.12.1** The minimum length of the enclosed airframe of the entry must be 500 millimeters and at least 50 percent of this airframe length must have a minimum diameter of 40 millimeters in the launch configuration.

**9.12.2** In events where multi-staging is allowed, the booster stage must deploy a recovery device; the upper stage must be at least 18 millimeters in diameter over at least 75 percent of its length, and any upper stage boat tails must be at least 18 millimeters in diameter.

## **10 OFFICIAL FLIGHT**

### **10.1 Official Flight Requirements**

A flight is official if any part of the entry leaves the launcher under a motor's thrust phase; except in the case of a catastrophic failure according to the provisions of Rule 11.5 - Catastrophic Failure. All entries that do not leave the launcher subsequent to motor ignition must not be considered as having made an official flight unless they are disqualified by the RSO for safety reasons. If the power pod or motor of a Boost Glider entry disengages and proceeds into the air under power without the glider portion, the attempt must be considered a disqualified official flight. An entry that does not ignite enough motors to be in the proper total impulse class as per Rule 4.6 - Published Values, must not be considered as having made an official flight unless its flight is disqualified for other reasons.

### **10.2 Number of Flights**

Unless otherwise specified in the rules for a specific event, time and weather permitting each competitor shall be given an opportunity to make two official flights in each event per sanctioned NRC launch. A limitation shall not apply at Record Trials. **Unless otherwise specified in the rules for a duration event, a competitor's official score is the sum of the durations achieved on all official flights.**

### **10.3 Special Conditions**

When deciding on the number of flights that competitors are allowed in an event, the Contest Director shall carefully consider whether time and/or weather may require limitations on the event(s). The Contest Director must make every effort to announce how many flights will be allowed in the event(s) before the start of official flights.

However, if circumstances arise where it is necessary to enact a limitation after official flights have been made, all competitors must adhere to the new limits regardless of how many official flights they may have made.

If limitations have been placed on one or more events, the Contest Director must select only those qualified flights a competitor made under the new limitation. The Contest Director must then choose the competitor's best single qualified flight as his/her official flight in that event.

For example, if a Parachute Duration event must unexpectedly be limited to one flight per competitor, and a competitor has already made two flights, in order for the Contest Director to score the event, he/she must first select only the flights that the competitor(s) returned (since in a single-flight Parachute Duration event, the one flight must be returned.) If one or more competitor has returned two flights, the Contest Director must select the better of the two competitor's flights as his/her official flight for scoring purposes.

### **10.4 Return of Inaccessible Models**

When a competitor cannot make a required return of his/her entry from an inaccessible place where recovery would pose a personal hazard to the competitors, but can point it out to an official, the official may score the entry as having been returned. The Contest Director must state prior to the start of competition what distance limits officials may travel. This rule may be superseded by the rules of a specific event.

### **10.5 Recording of Returns**

When the rules for a specific event require a return of the entry, it is the responsibility of the competitor to ensure that the officials have noted on their flight card that the entry has been returned.

## **11 DISQUALIFICATIONS**

### **11.1 Scope**

Due to flight characteristics, an entry may be disqualified for a specific flight, however, it is not necessarily disqualified for the entire event.

### **11.2 Safety Related**

Any entry that in the opinion of the Range Safety Officer was not considered safe in operation may be disqualified. In no case, may any official override a safety ruling of the RSO.

### **11.3 Non-Safety Related**

The Range Safety Officer and/or contest officials may disqualify any entry that does not comply with the Sporting Code.

### **11.4 Scoring**

In the event of a disqualification, a flight shall be scored as zero (0) in the case of events where an entry's total score is the result of the sum of the performance of two or more flights. This rule may be superseded by the rules of a specific event. A disqualified flight may not be considered as a return in any event where a return is required.



### **11.5 Catastrophic Failure**

A model rocket experiencing a catastrophic failure (CATO) shall not be disqualified. The flight may or may not be considered an official flight if the Range Safety Officer rules the entry performed a safe and stable flight and complied with the competition rules (e.g., a glider glided).

**11.5.1** The competitor will in this situation have the option of having such a flight ruled as either official or unofficial. If the entry did not meet these requirements, then it must be ruled an unofficial flight.

**11.5.2** The competitor must inform the applicable contest official of his/her decision to accept or reject the flight as an official flight prior to any subsequent flight by the competitor in that event. The competitor must be permitted to substitute another entry. In the case of craftsmanship events; the substitute must be of the same prototype and scale as the original, and it is not required to exhibit the craftsmanship and detail of the original.

### **11.6 Recording Data**

An entry that has been disqualified shall have its performance data recorded even though the flight may not at that time be considered official. In the event an entry's disqualification is reversed; the entry's performance data shall be considered official.

### **11.7 Correctable Conditions**

Disqualifications for static conditions of an entry are not permitted and the competitor shall correct the condition prior to the official flight. If the contest officials do not discover a condition until during or after the flight is made, such as flying with the wrong motor type, the flight will not be considered official.

## **12 DISPUTES AND PROTESTS**

### **12.1 National Rocketry Competition (NRC) Disputes**

In the event of a dispute at an NRC sanctioned launch, the competitor shall inform his/her Regional Contest Board Chairman of the dispute for resolution. The Regional Contest Board Chairman must render a decision within three (3) days.

### **12.2 NARAM Protests**

RSO decisions related to safety cannot be protested by a competitor or team, or overridden by the Contest Director or Contest Board per Rule 7.2 - Range Safety Officer.

#### **12.2.1 Filing a Protest**

A protest shall be a written report detailing an action or decision in question and shall include the names of any competitors and/or officials involved. A protest will be considered only when a competitor or team delivers the protest in writing and accompanied by \$20.00 cash, to the Contest Director, a member of the Contest Board or its representative.

#### **12.2.2 Protest Fee**

Filing a protest shall cost the competitor or team \$20.00 cash. If the protest is upheld, the protest fee must be returned to the competitor. If the protest is denied, the protest fee must accompany the contest results and be forwarded to the NAR Contest Board Chairman.

#### **12.2.3 The Ruling Body**

A minimum of three members of the Contest Board shall decide protests. All sides of a protest shall have the right to be heard by members of the NAR Contest Board. No Contest Board member may rule or vote on a decision that could alter the award of contest points to his/her own entry. All decisions of the Contest Board are final.

#### **12.2.4 Time**

The Contest Board shall give to the Contest Director and all parties involved in a protest, a written statement of their decision within 24 hours of the protest's delivery to the Contest Director, a member of the Contest Board, or its representative. If a protest occurs on the last day of the contest, a decision shall be rendered by the end of the day.

#### **12.2.5 Final Contest Results**

The Contest Board's protest ruling must be included with the contest results.



## **13 COMPETITION AND CHAMPIONSHIPS**

### **13.1 National Rocketry Competition (NRC)**

#### **13.1.1 Number of Events**

The NRC shall be made up of six (6) events selected from Rule 13.1.4 - NRC Events List. These six events shall be part of the official events for NARAM.

#### **13.1.2 Event Selection**

NRC events will be selected as follows:

- The Contest Board shall select four (4) NRC events.
- The NARAM Contest Director shall select two (2) NRC events.
- The same NRC event and motor class cannot be flown in consecutive years.
- In the event a NARAM Contest Director is not selected by July 1, the Contest Board shall select all six(6) NRC events.
- At the discretion of the Contest Board, different NRC events may be selected for different competition divisions.

#### **13.1.3 Announcement**

The NRC will be announced on NAR.org, on or before July 1 by the Contest Board Chairman.

#### **13.1.4 NRC Events List**

- 1/4A-A Parachute Duration
- 1/4A-B Streamer Duration
- 1/4A-B Helicopter Duration
- 1/4A-A Boost Glider Duration
- 1/4A-B Rocket Glider Duration
- B-C Egg Lofting Duration
- 1/2A-B Altitude
- A-B Payload Altitude
- B-C Egg Lofting Altitude
- C-D Dual Egg Lofting Altitude

#### **13.1.5 Adherence**

NRC events shall be flown under the specific event provisions of the Sporting Code.

#### **13.1.6 Qualification**

The only events that qualify a competitor to compete for the title of National Champion or for an Event Specialist Award are those selected for the NRC.

#### **13.1.7 Event Acceptance**

All NRC events may be flown at a sanctioned NRC launch. Non-NRC events may be flown at an NRC launch but only NRC results will be accepted by the Contest Board.

#### **13.1.8 Sanctions**

**13.1.8.1** All NRC flights shall be conducted at launches sanctioned by the NAR Contest Board and sponsored by either a NAR chartered section, or NAR member eighteen (18) years of age or older. All NRC launches shall be listed on the NAR Contest Calendar at nar.org once sanctioned.

**13.1.8.2** There shall be no limit to the number of NRC launches a NAR member eighteen (18) years of age or older or section may sanction in a contest year.

**13.1.8.3** There shall be no limit to the number of NRC sanctioned launches a competitor may enter in a contest year.

#### **13.1.9 NRC Minimum Personnel**

Flying one or more NRC events requires a minimum of two NAR members- one or more of which is 18 years of age or older.

#### **13.1.10 Scoreboard**

**13.1.10.1** The NRC Contest Director shall post competitor scores to a cumulative, member accessible, results 'Scoreboard' maintained by the Contest Board on NAR.org.

- 13.1.10.2** The results Scoreboard shall reflect the best score attained by a competitor in an NRC event. Posted results will be considered preliminary until verified by the Regional Contest Board.
- 13.1.10.3** A competitor's best score also determines his/her position or 'rank' in relation to all other competitor results in an NRC event.

### **13.1.11 Results**

- 13.1.11.1** Results must be reported to the appropriate Regional Contest Board Chairman by the Contest Director for verification and must include data for pending performance records.
- 13.1.11.2** Based on the sum of two (2) flights, a competitor that can achieve as his/her official score a NRC maximum for that NRC duration event, will receive a rank of one (1) in that event.
- 13.1.11.3** Scores must be posted to the Scoreboard by the Contest Director within 7 days of the completion of the NRC sanctioned launch.
- 13.1.11.4** At the close of the NRC (June 30<sup>th</sup>), the final results of the NRC determine the eligibility for a competitor to compete for and win an Event Specialist Award and/or National Championship. In case of a tie, duplicate places shall be awarded and all numerical places will be awarded as though there had been no tie. (Ex. 1, 2, 2, 3, 4...)
- 13.1.11.5** **National Rocketry Competition Awards** - The top 10 or top 10% of competitors in each division, after the close of the NRC on June 30<sup>th</sup>, will be recognized for their performance on the NAR.org website, in the E-Rocketeer, and in the official journal of the NAR.
- 13.1.11.6** **Event Specialist Award (ESA)** - To compete for an ESA at NARAM, competitors in each competition division must:
- Select one or more of the NRC events
  - Post qualified flights in each of the competitor's selected NRC events on the Scoreboard
  - Qualify by finishing in the top 10 or top 10% of the NRC event(s) the competitor selects.
- There is no limit to the number of ESA's for which a competitor may qualify.
- 13.1.11.7** **National Championship** - To compete for a National Championship at NARAM, competitors in each competition division must:
- Post qualified flights in all of the NRC events on the Scoreboard
  - Finish in the top 10 or top 10%, whichever is greater, of the NRC events based on a competitor's combined Scoreboard rank
  - A competitor's "combined Scoreboard rank" is the sum of the competitor's NRC event ranks.

### **13.2 NARAM**

- 13.2.1** NARAM must present at a minimum the NRC events. The NRC events shall not be flown in a multi-round format.
- 13.2.2** NARAM competition is open to all registered flyers.
- 13.2.3** Competitors that meet the requirements of 13.1.11.7 are automatically qualified through the NRC to compete for National Champion awards and shall have their points credited only towards these awards.

**13.2.4** All competitors begin NARAM with zero points. Points will be awarded per the following schedule for performance in each event as determined by place:

- 1<sup>st</sup> – 25 points
- 2<sup>nd</sup> – 20 points
- 3<sup>rd</sup> – 17 points
- 4<sup>th</sup> – 14 points
- 5<sup>th</sup> – 12 points
- 6<sup>th</sup> – 10 points
- 7<sup>th</sup> – 8 points
- 8<sup>th</sup> – 6 points
- 9<sup>th</sup> – 4 points
- 10<sup>th</sup> – 2 points
- Flight Points – 1 point

**13.2.5** In case of a tie, duplicate places shall be awarded and all numerical places will be awarded as though there had been no tie. (Ex. 1, 2, 2, 3, 4...)

### **13.3 NARAM Awards**

#### **13.3.1 Event Specialist Awards (ESA)**

**13.3.1.1** Event Specialist competition is open to NARAM competitors who have qualified for an ESA per Rule 13.1.11.6.

**13.3.1.2** For each NRC event, the ESA is given to the ESA-qualified contestant in each division with the highest score at NARAM.

#### **13.3.2 National Championship Awards**

**13.3.2.1** National Championship competition is open to NARAM competitors who have qualified for National Championship per Rule 13.1.11.7.

**13.3.2.2** National Championship points are calculated for each contestant as the sum of points awarded per Rule 13.2.4 for all NARAM events.

**13.3.2.3** National Champion awards shall be given for 1st and 2nd place in each division.

**13.3.2.4** In the event of a tie for 1st or 2nd place, the competitor who has the most 1st place event finishes wins. If a tie still exists, then the competitor who has the most 2nd places finishes wins, etc.

#### **13.3.3 Meet Awards**

**13.3.3.1** Meet competition is open to NARAM competitors who did not qualify for National Championship per Rule 13.1.11.7.

**13.3.3.2** Meet Championship points are calculated for each contestant as the sum of points awarded per Rule 13.2.4 for all NARAM events.

**13.3.3.3** Meet Champion awards shall be given for 1st and 2nd place in each division.

**13.3.3.4** Ties for Meet Champion awards are handled according to Rule 13.3.2.4.

**13.3.3.5** Event Champion awards shall be given for 1st through 3rd places in each division and each event, with duplicate awards given in the case of ties.

### **13.4 Reporting Scores at NARAM**

**13.4.1** All points are awarded per Rule 13.2.4 - NARAM.

**13.4.2** At NARAM, results shall be posted in each of the following categories:

- Events
- Event Specialist Awards
- Meet Champions
- National Champions
- Section National Champion

### **13.5 Section Championship Awards**

Two classes of section championship awards shall be recognized.

1. NRC Section Champion awards shall be given for first and second place during the contest year.
2. Section National Champion awards shall be given for first and second place at NARAM.

### **13.5.1 NRC Section Championship**

Points will be awarded in two categories, performance points and participation points. The two shall be added together to determine the NRC section score for the contest year.

#### **13.5.1.1 NRC Section Performance Points**

Based on a competitor's NRC Scoreboard rank, performance points shall be awarded per section 13.2.4 and 13.2.5.

#### **13.5.1.2 NRC Section Participation Points**

Sections may earn additional points towards a section championship:

1. Based on the total number of NRC launches a NAR Section sponsors during the contest year.
2. Based on the total number of a section's members qualifying in each of the NRC events.

##### **13.5.1.2.1 Section NRC Launch Points**

A section will be awarded 10 points for each NRC launch. There is no limit to the number of NRC launches that a section may sponsor. Launch points will be awarded to a section when a qualified flight, in at least one NRC event, has been displayed on the NRC Scoreboard.

##### **13.5.1.2.2 NRC Qualifier Points**

A section will be awarded 5 points for each NRC event in which a section member qualifies. For example, if a section member qualifies in six NRC events, the section is awarded 6 x 5 or 30 points. If a section member qualifies in only one event, the section is awarded 5 points.

#### **13.5.1.3 NRC Recognition**

The top ten or 10% of sections accumulating the most points after the close of the NRC on June 30<sup>th</sup>, will be recognized for their performance on the NAR.org website, in the E-Rocketeer, and in the official journal of the NAR.

### **13.5.2 Section National Championship at NARAM**

**13.5.2.1** The top ten sections or 10% of sections, whichever is greater, on the NRC scoreboard at the end of the NRC contest year (June 30<sup>th</sup>) shall qualify to compete for the Section National Championship at NARAM.

**13.5.2.2** For a contestant to compete for a section at NARAM, the contestant must have competed for that section during the NRC. Contestants who did not compete in the NRC or competed in the NRC as independents are not eligible to compete and earn points for a NAR section at NARAM. See section 8.6.

**13.5.2.3** All sections shall begin NARAM with a score of zero.  
A section's score shall be computed by adding all of the points earned at NARAM by the section members competing at NARAM for the section.

**13.5.2.4** In case of a tie, duplicate places shall be awarded and all numerical places will be awarded as though there had been no tie. (Ex. 1, 2, 2, 3, 4...).

#### **13.5.2.5 Section National Championship Awards**

The Section National Championship award shall be given for first and second place to the two sections accumulating the most points at NARAM.

## **14 UNITED STATES MODEL ROCKET PERFORMANCE RECORDS**

### **14.1 Eligibility**

Performance records may be set at any sanctioned launch, in any event and motor class, unless judging is required, or a limited score is the goal. For example, performance records may be set in Altitude or Parachute Duration, but not in Scale Altitude, Spot Landing, or Precision Payload. Proxy entries are not eligible for performance records per Rule 8.4 - Teams.

### **14.2 Categories**

Performance records must be awarded separately for each competition division. Within each competition division, separate performance records must be awarded for:

#### **14.2.1 Radio Control**

Entries using radio control to provide active guidance per Rule 9.11 -Radio Control.

#### **14.2.2 Free Flight**

All entries that are not radio-controlled.

#### **14.3 Return**

The entry must be returned to ensure compliance with all rules for the event. Rule 10.4 - Return of Inaccessible Models does not apply.

#### **14.4 Surpassing**

Attempts to surpass an existing performance record must exceed the current value.

#### **14.5 Submission**

The Contest Director must review all flight results to determine if any new performance records were set. If so, the flight card and competitor entry form must be sent to the NAR Records Subcommittee for review. Individual competitors may also submit copies of their flight card(s) and entry form, provided the Contest Director signs the forms.

The submitted data must include the following items:

- Competitor's name
- Division
- Event and motor class
- Date
- New record value
- Altimeter make & model (if used)
- Altimeter data file
- Motor manufacturer and designation

#### **14.6 Certification**

The NAR Records Subcommittee may request any additional substantiating data it deems necessary to certify a new record. The NAR Records Subcommittee has the right to disallow any record claim, regardless of the data submitted, if the record attempt is found to have been made unfairly or falsely reported.

### **15 PROVISIONAL COMPETITION**

#### **15.1 Author**

Any NAR member or section may author a new event concept.

#### **15.2 Standards**

New event concepts submitted to the NAR Contest Board for consideration must meet the standards of the Safety Code. In addition, they should be designed so that they can be flown at sanctioned launches.

#### **15.3 Form**

Rules for new event concepts must be formatted as for any established event in the Sporting Code.

#### **15.4 Postal Competition**

New event concepts must be tested for merit using a postal competition format. Postal competition requires the following:

- Event rules are distributed electronically at NAR.org.
- There must be no less than a 60-day competition window for flying any new event concept and it must start no less than 30 days from rule distribution or announcement.
- Upon close of the competition window, results must be published electronically on NAR.org no more than 14 days after close of the competition window.
- There will be no less than two competition windows for a new event concept.

#### **15.5 Improvement**

During postal competition, NAR members and sections are encouraged to suggest rule changes for the purpose of testing the event for suitability before submission. Competitors are encouraged to suggest changes that may eliminate loopholes or make the event more interesting.

#### **15.6 Submission**

New event concepts must be submitted to the NAR Contest Board Chair in electronic form; including rules and all postal competition results and member feedback.

#### **15.7 Adoption**

For a new event concept to be adopted, it must meet the requirements of Rules 15.2 - Standards, and 15.3 - Form. The Contest Board must vote to accept or reject the submission for inclusion in the next Sporting Code

revision. Results of the vote must appear in both the E-Rocketeer and NAR.org no more than 90 days after date of submission.

**15.8 NARAM**

A new event concept may not be included at NARAM until it has qualified under Rule 15.7 - Adoption; except by a special ruling of the NAR Contest Board.

**16-19 Reserved for future rules**

# ALTITUDE COMPETITION

## 20 ALTITUDE DATA

### 20.1 Scope

Electronic altimeters shall be used for all altitude events.

### 20.2 Electronic Altimeters

Only commercially available altimeters approved by the NAR Contest Board and publicly announced as approved at least 30 days before any contest where they are used may be used in competition. These altimeters may not be altered or modified in any manner, including use of power sources that are outside the voltage range published by the altimeter manufacturer. To be approved by the Contest Board an altimeter must meet the following requirements:

- Uses barometric measurement techniques to record flight apogee altitude above launch pad altitude based on the formula for conversion of pressure to altitude in the International Civil Aviation Organization or US Standard Atmospheres.
- Uses a digital integrated pressure sensor with at least 16 bits of resolution in its digital conversion of pressure measurement.
- Recalculates launch pad pressure altitude by sampling local pressure at least once per minute after activation and before launch.
- Has resolution of 1 meter or better in readout.
- Has accuracy of 1 percent of recorded altitude or 2 meters, whichever is greater, across an operating range of no less than 4000 meters in flight altitude above sea level, 0 to 50 degrees Celsius in launch site temperature, and 750 to 1050 millibars in launch site ambient pressure.
- Has a sampling rate of 10 per second or greater.
- Employs processing functions to reject false short-duration launch or apogee altitude transients that may be created by wind gusts or the pressure transients of ejection events.
- Provides a readout of apogee from the most recent flight.
- Is capable of being placed in a preflight state of readiness to record new flight data and report this new data post-flight. This state must be audibly or visibly verifiable.

The altimeter must be fully enclosed within the rocket body through apogee. Any attempt to deliberately produce excessively high altitude readings, by use of devices such as venturis is prohibited.

#### 20.2.1 Approved Altimeter List

The Contest Board approves altimeters for use in NAR competition. Follow this link for a list of approved altimeters:

<https://www.nar.org/contest-flying/u-s-model-rocket-new-sporting-code/appendices/appendix-e-altimeters-approved-for-contest-use/>

#### 20.2.2 Check-In Procedure

The model of the altimeter will be noted on the competitor's flight card. The safety check officer may request the "owner's manual" for the altimeter if any questions arise concerning its operation or post flight readout.

#### 20.2.3 Temperature Compensation

The ambient temperature at the launch site shall be recorded on the competitor's flight card in degrees centigrade rounded to the nearest whole number. This temperature shall be recorded prior to each flight. A competitor's recorded altitude must be corrected for the effect of ambient air temperature by multiplying the uncorrected altimeter reading by a factor of  $(273.15 + T)/288.15$  where T is the ambient temperature in degrees Celsius.

#### 20.2.4 Returns Procedure

The altimeter must be returned for data verification. The Returns official and competitor should agree on the altimeter raw data. If the Returns official and the competitor cannot agree of the raw data, an additional official shall be called upon to resolve the disputed data. The altimeter's raw data shall be recorded on the flight card. Any other specific event rules may also apply.

If the altimeter cannot be returned or fails to report an altitude, the flight will not be considered an official flight unless the flight is disqualified on other grounds.

Alternately, at the option of the competitor, he/she may choose to consider the flight as an official flight with an altitude of zero; in which case the flight cannot place but is eligible for flight points at NARAM; except in an event where the score is composed of several factors, in which case the flight must be scored as having an altitude of zero..

#### 20.2.5 Performance Records with Altimeters

Altitude records may only be set using a recording altimeter. After the flight, if a record is suspected the altimeter data will be downloaded by the competitor and reviewed by a contest official. If the data reveals that the peak altitude is attributable to an ejection event or other flight anomaly, that peak or anomaly will not be used to determine the recorded altitude. The maximum altitude excluding the anomalous peaks will be reported.

If the maximum altitude occurs more than five seconds after the ejection event (due to thermals or other anomaly), only the peak altitude prior to ejection (excluding sudden peaks or anomalies as described above) will be reported.

If the altimeter data is, in the opinion of the contest official, significantly inconsistent with the observed flight, the altimeter data will be disallowed. The decision by the contest official on the interpretation of the altimeter data is final.

## 21 ALTITUDE

### 21.1 Scope

Altitude comprises twelve events open to any model rocket. The purpose of this competition is to achieve the highest altitude.

### 21.2 Classes

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Altitude are established:

Motor Class
1/8A
1/4A
1/2A
A
FAI A
B
FAI B
C
D
E
F
G



## 22 PAYLOAD ALTITUDE

### 22.1 Scope

Payload comprises seven events open to model rockets that carry one or more standard NAR payloads of given mass and dimensions to as high an altitude as possible and to recover the payload. The standard NAR payload is intended to represent an instrument package whose dimensions and mass cannot be modified, but must be accepted as a design constraint.

### 22.2 Staging

If the entry is staged, the payload(s) must be totally enclosed in the uppermost stage of the entry.

### 22.3 Payload Specifications

The standard NAR payload is a sealed non-metallic cylinder containing fine sand, with a mass of no less than 28.0 grams. This cylinder must be a minimum of 17.0 millimeters in diameter, and a minimum of 60.0 millimeters in length. No holes may be drilled into it, no changes made in its shape, and no material may be affixed to it.

### 22.4 Enclosed Payloads

The standard NAR payload(s) carried in an entry –

- must be totally enclosed and contained within the entry,
- must not separate from the entry in flight
- and must be removable from the entry

### 22.5 Return

Following the flight, the competitor must present his/her entry as recovered and, in the presence of an official, must remove the payload(s). If the official cannot examine the payload(s), the entry must be disqualified. Rule 10.4 - Return of Inaccessible Models does not apply. If the competitor removes the payload(s) in the absence of officials, the entry must be disqualified. The official may require that the payload(s) be rechecked and must disqualify the entry if it no longer complies with Rule 22.3 - Payload Specifications.

### 22.6 Classes

This event is divided into classes based upon the permissible total impulse of the motor(s). The following classes of Payload are established:

Motor Class	Payloads Carried
A	1
B	1
C	1
D	1
E	2
F	3
G	4

## 23 EGG LOFTING ALTITUDE

### 23.1 Scope

Egg Lofting Altitude comprises six events open to model rockets that carry, as a totally enclosed payload, one raw egg intended to simulate carrying an astronaut to as high of an altitude as possible and recover the payload without damage.

### 23.2 Stages

If the entry is staged, the egg must be totally enclosed in the uppermost stage of the entry.

### 23.3 Eggs

Eggs must be raw and have a mass of not less than 57 grams and not more than 63 grams, and be no more than 45 millimeters in diameter. Prior to flight each egg must be uniquely marked, and the mark must be recorded on the competitor's flight card. A competitor shall not be required to use an egg that has been previously lofted by another competitor. No material may be affixed to the egg (e.g., glue or tape).

#### 23.4 Return

Following the flight, the competitor must present his/her entry as recovered and, in the presence of an official, must remove the egg. If the shell of the egg is broken or cracked, the entry must be disqualified. If the official cannot examine the egg, or the competitor removes the egg in the absence of officials, or breaks the egg in the process of removing it, the entry must be disqualified. Any entry that is caught or cushioned prior to landing must be disqualified. Rule 10.4 - Return of Inaccessible Models does not apply.

#### 23.5 Classes

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Egg Lofting Altitude are established:

Motor Class
B
C
D
E
F
G

## 24 DUAL EGG LOFTING ALTITUDE

#### 24.1 Scope

Dual Egg Lofting Altitude comprises five events open to model rockets that carry, as a totally enclosed payload, two raw eggs intended to simulate carrying two astronauts to as high of an altitude as possible and recover the payload without damage.

#### 24.2 Stages

If the entry is staged, the eggs must be totally enclosed in the uppermost stage of the entry.

#### 24.3 Eggs

Eggs must be raw and have a mass of not less than 57 grams and not more than 63 grams, and no more than 45 millimeters in diameter. Prior to flight each egg must be uniquely marked, and the mark must be recorded on the competitor's flight card. A competitor shall not be required to use an egg(s) that has been previously lofted by another competitor. No material may be affixed to the egg(s) (e.g., glue or tape).

#### 24.4 Return

Following the flight, the competitor must present his/her entry as recovered and, in the presence of an official, must remove the eggs. If the shell of the egg(s) is broken or cracked, the entry must be disqualified. If the official cannot examine the eggs, or the competitor removes the eggs in the absence of officials, or breaks the eggs in the process of removing them, the entry must be disqualified. Any entry that is caught or cushioned prior to landing must be disqualified. Rule 10.4 - Return of Inaccessible Models does not apply.

#### 24.5 Classes

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Dual Egg Lofting Altitude are established:

Motor Class
C
D
E
F
G

## 25 SUPERROC ALTITUDE

### 25.1 Scope

Superroc Altitude comprises ten events open to single-stage model rockets whose body length is no less than the minimum specified in Rule 25.6- Classes for the motor class of the event. The purpose of this competition is to achieve the highest altitude with the longest possible rocket, while avoiding structural failure of the airframe.

### 25.2 Structural Failure

An entry that separates, folds, or has a structural failure prior to ejection must be disqualified.

### 25.3 Separation

An entry is allowed to separate into two or more unattached parts after ejection, provided that each part satisfies the provisions of Rule 3.5 - Reusability.

### 25.4 Safety

Entries must satisfy the provisions of Rule 1.2 - Model Rocket.

### 25.5 Scoring

Superroc Altitude must be scored as follows: the length of an entry to the nearest centimeter, as measured from the tip of the nose cone to the end of the motor nozzle, up to the maximum length for that category, must be awarded as static points. If an entry has more than one motor, the length must be measured to the motor nozzle closest to the tip of the nose cone. No additional points are awarded for any length beyond the maximum. The altitude of the model measured in meters, must be awarded as flight points. The static points and flight points obtained must be multiplied to determine the score. The competitor achieving the highest score must be declared the winner. When posting, printing, or maintaining contest results or performance records, an entry's altitude in meters must be shown with its composite score.

### 25.6 Classes

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Superroc Altitude are established:

Motor Class	Minimum Length (centimeters)	Maximum Length (centimeters)
1/8A	12	25
1/4A	25	50
1/2A	50	100
A	75	150
B	100	200
C	125	250
D	150	300
E	175	350
F	200	400
G	225	450

## 26 CLUSTER ALTITUDE

### 26.1 Scope

Cluster Altitude is comprised of six events open to single-stage model rockets. The purpose of this competition is to achieve the highest altitude.

### 26.2 Returns

Following an official flight, the part of a Cluster Altitude entry that contains the motors shall be returned as recovered to verify that all motor cases have been retained. An ejected motor case shall result in a disqualification.

### 26.3 Ignition

Air starts are prohibited.

### 26.4 Partial Ignition

Partial cluster ignition must be deemed an official flight unless disqualified for other safety reasons by the RSO.

## 26.5 Classes

The following six classes of Cluster Altitude are established:

Class Name
1/8A x 2 Motor
1/4A x 2 Motor
1/2A x 3 Motor
A x 4 Motor
B x 5 Motor
C x 6 Motor

## 27 PRECISION ALTITUDE

### 27.1 Scope

Precision Altitude comprises three events open to any model rocket. The purpose of this competition is to accurately predict the altitude that an entry will attain.

### 27.2 Classes

The three classes of Precision Altitude are:

#### 27.2.1 Predicted Altitude

The minimum altitude prediction allowable is 100 meters. The competitor must predict in meters the altitude to which their entry will be flown. A competitor at a meet must record their altitude prediction on the flight card prior to any official flight.

#### 27.2.2 Set Altitude

The Contest Director must set the target altitude when the meet is sanctioned. This value must appear in the sanction form and all appropriate contest information. The target altitude must be a multiple of 5 meters between 100 and 300 meters.

#### 27.2.3 Random Altitude

The Contest Director must randomly select the target altitude just prior to when the event is flown, by random selection. The target altitude must be a multiple of 5 meters between 100 and 300 meters.

### 27.3 Practice

Practice flights are not allowed on the day the event is flown.

### 27.4 Number of Flights

Entries must be allowed only one official flight in Precision Altitude. If no altitude data is available, any re-flight must be made by the same entry, and no changes in configuration, motor type, or prediction must be allowed.

### 27.5 Control

The entry must not be radio controlled or contain any device whose purpose is to control the altitude of the entry.

### 27.6 Scoring

Precision Altitude Competition must be scored as follows: the entry's achieved altitude must be divided by its target altitude, and the result multiplied by 100. This figure must then be rounded to the nearest 0.1%. If the result is greater than or equal to 100, subtract 100 from it; otherwise, subtract it from 100. The competitor whose score comes closest to zero is declared the winner.

## 28-29 Reserved for future events

# DURATION COMPETITION

## 30 TIMING DATA

### 30.1 Timers

In all events for which a time-of-flight value must be scored, one or more timers with stopwatches shall be stationed in a timing area(s) adjacent to the range head and shall not leave the designated timing area(s) in order to keep the entry in sight.

NARAM will provide one timer for each contest flight. Additional timers may be provided by the meet or the contestant. Timer(s) may not use optical aids other than sunglasses and/or eyeglasses to correct to normal vision.

### 30.2 Conflict of Interest

A timer must not time his/her own entry.

### 30.3 Stopwatches

**30.3.1** Stopwatches used for timing must have a minimum resolution of 1/10<sup>th</sup> second; must have (at a minimum) start, stop, and reset capabilities. If a stopwatch is stopped, it must be capable of being restarted without being reset.

**30.3.2** A stopwatch with split-time or lap accumulate capabilities (i.e., one which continues to record time internally after being stopped; and which can display at any time, the total elapsed time) may be used for competition, provided that if it is used to time one entry, it must be available for use to time any other entry.

### 30.4 Timed Interval

All entries must be timed from the instant of first motion on the launcher until the entry or portion to be scored for time of flight touches the ground or is stopped by a ground-based object. If the entry drifts out of sight in the sky, each timer(s) must stop their watches individually when they lose sight of the entry. As specified in Rule 1.2 - Model Rocket, motors, recovery system protectors, and wadding are not to be timed.

### 30.5 Separation

Unless specifically allowed by the rules of that event, no timed entry may separate into two or more unattached parts, or eject its motor.

### 30.6 Visual Interference

If an entry drifts behind an object and is not clearly visible, the timer(s) must stop their watch(es). Sufficient time shall be given to enable the entry to reappear and the timer(s) to restart their watch(es). Stopping and restarting of a stopwatch may occur as needed during the course of an entry's flight.

### 30.7 Recording Data

Data must be recorded to the accuracy of the stopwatch for all timed flights, including those flights that may be disqualified. This permits the timing data to be available in case the disqualification ruling is later reversed.

### 30.8 Averaging

To arrive at an entry's official score:

1. Compute the average of all recorded stopwatch timing data per Rule 30.7 - Recording Data. Do not round the timing data before averaging.
2. Round the resulting average data (time) to the nearest whole number of seconds.
  - Fractions of a second **less** than 0.5 must be rounded **down** to the next lower second.
  - Fractions of a second **equal to or greater** than 0.5 must be rounded **up** to the next higher second.

### 30.9 Return

Unless otherwise specified by the rules of the event or for reason of safety per Rule 9.10 - Impound, the competitor need not return an entry to a contest official.

### **30.10 Malfunction**

When a malfunction of a stopwatch or a timer occurs such that any elapsed time measurement is not available, the elapsed time(s) recorded by the remaining timer(s) must be used as the official time. When all stopwatches or timers malfunction, the flight will not be considered an official flight unless the flight is disqualified on other grounds. Alternately, at the option of the competitor, he/she may choose to consider the flight as an official flight with a time of zero; in which case the flight cannot place but is eligible for flight points at NARAM; except in an event where the score is the sum of several factors, in which case the flight must be scored as having a time of zero.

### **30.11 NARAM Multi-Round Events**

Any of these events may be flown as a multi-round event at NARAM:

- Parachute Duration
- Streamer Duration
- Helicopter Duration
- Boost Glider Duration
- Rocket Glider Duration
- Flex Wing Boost Glider Duration

#### **30.11.1 Number of Flights/Rounds**

A multi-round event is comprised of three flights or rounds. Each competitor is allowed three official flights in a multi-round event- one flight in each round. Should there be a tie for first place after three rounds are completed, there shall be a one fly-off round to break the tie.

#### **30.11.2 Number of Models**

For the purpose of making a flight in the first three rounds, a competitor may enter no more than two (2) entries except as stated in Rule 11.5 - Catastrophic Failure. In the event of a tie after three (3) rounds are completed and a fly-off is held, one (1) additional entry may be entered.

#### **30.11.3 Maximum Time**

The official duration of each flight must be calculated as follows: if the duration achieved exceeds the maximum time limit defined for that flight, the entry must be awarded the maximum time limit; otherwise the entry must be awarded its achieved duration in seconds. Timers may stop timing the flight after it has achieved the maximum time per Rule 30.6 - Visual Interference.

#### **30.11.4 Scoring**

Multi-round events must be scored as follows: the official durations achieved by the competitor on their initial three official flights in the event must be summed. If there is no tie for first place, then the competitor achieving the highest score is the winner. If there is a tie, competitors for first place must be given the opportunity to make an additional official flight (fly-off) to determine the winner. The fly-off round will have no maximum time limit. Second through tenth places must be distributed first among the other competitors in the fly-off, and then among any other competitors having made qualified flights, on the basis of total computed score.

#### **30.11.5 Return**

The entries in multi-round duration events need not be returned to the officials except as required by Rules 9.10 - Impound and/or 30.11.2 - Number of Models.

## **31 PARACHUTE DURATION**

### **31.1 Scope**

Parachute Duration comprises seven events open to single-stage entries containing one or more parachutes for recovery purposes. The purpose of this competition is to achieve the longest flight duration time.

### **31.2 Qualification**

Some portion of the parachute must protrude out of the entry and into the airflow to aid in recovery for the flight to be considered qualified.

### 31.3 Classes

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Parachute Duration are established:

Motor Class	Multi-Round Maximum	NRC Maximum
1/8A	40 sec	
1/4A	60 sec	180 sec
1/2A	120 sec	360 sec
A	180 sec	540 sec
FAI A	300 sec	
B	240 sec	
C	300 sec	

## 32 STREAMER DURATION

### 32.1 Scope

Streamer Duration comprises eleven events open to single-stage entries that contain a single streamer as the only recovery device. The purpose of this competition is to achieve the longest flight duration time.

### 32.2 Streamer Specifications

A streamer is a continuous plane of identical cloth, plastic film, or paper; has a length-to-width ration of 5:1 or greater; may be folded and/or creased; it may not be cut, slit, punched, and or perforated. The streamer and model must be connected by only a single line or cord, attached at the narrow end of the streamer. That end of the streamer may include a stiffener and/or a yoke if desired.

#### 32.2.1 FAI Streamers

For FAI class streamer duration, the streamer must have a length-to-width ratio of 10:1 or greater.

### 32.3 Assembly

Several pieces of material may be joined into a single streamer. All such joints must be parallel to the narrow axis of the streamer. All pieces of the streamer must consist of identical material.

### 32.4 Qualification

Some portion of the streamer must protrude out of the entry and into the airflow to aid in recovery for the flight to be considered qualified.

### 32.5 Classes

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Streamer Duration are established.

Motor Class	Multi-Round Maximum	NRC Maximum
1/8A	20 sec	
1/4A	30 sec	90 sec
1/2A	60 sec	180 sec
A	120 sec	360 sec
FAI A	180 sec	
B	180 sec	540 sec
C	240 sec	
D	300 sec	
E	300 sec	
F	300 sec	
G	300 sec	

## 33 HELICOPTER DURATION

### 33.1 Scope

Helicopter Duration comprises eleven events open to any single-stage model rocket that uses autorotation as the sole means of recovery. The purpose of this competition is to achieve the longest flight duration using an auto-rotating recovery system.

### 33.2 Autorotation

Each entry must be decelerated during descent by its auto-rotating recovery device. The resulting autorotation must be around the vertical axis. An entry that descends nose first, or flips over during descent is permitted.

### 33.3 Recovery

Recovery devices employing flexible (e.g., plastic film or cloth) surfaces are prohibited. Entries using a recovery system that is designed to act (or that actually acts) in a manner similar to a parachute, a rigid inverted bowl, or similar techniques are specifically excluded from this competition.

### 33.4 Qualification

The entry must make a minimum of one complete rotation around its vertical axis during the recovery portion of the flight to be considered qualified.

### 33.5 Classes

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Helicopter Duration are established:

Motor Class	Multi-Round Maximum	NRC Maximum
1/8A	20 sec	
1/4A	30 sec	90 sec
1/2A	60 sec	180 sec
A	120 sec	360 sec
FAI A	180 sec	
B	180 sec	540 sec
C	240 sec	
D	300 sec	
E	300 sec	
F	300 sec	
G	300 sec	

## 34 BOOST GLIDER DURATION

### 34.1 Scope

Boost Glider Duration comprises ten events open to any model rocket, one portion of which returns to the ground in stable, gliding flight supported by aerodynamic lifting surfaces that sustain that portion against gravity. If the entry is staged, the gliding portion must be part of the uppermost stage. The entry may separate into multiple pieces; only the gliding portion is timed and needs to be returned per Rule 30.9 - Return. Entries whose gliding surfaces are made of flexible materials (e.g., plastic film or cloth) are prohibited from this event. The purpose of this competition is to achieve the longest flight duration time.

### 34.2 Qualification

During the recovery portion of the flight, the entry's gliding portion must achieve a minimum of a 1:1 glide ratio at some point to be considered qualified.

### 34.3 Disqualification

The glider must not be deployed during the motor's thrust phase- otherwise the entry must be disqualified for pod separation. Non-gliding portions of the entry may deploy parachutes and/or streamers for recovery purposes. However, any gliding portion of the entry that descends with parachute and/or streamer recovery device(s) intentionally attached must be disqualified.

### 34.4 Classes

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Boost Glider Duration are established:

Motor Class	Multi-Round Maximum	NRC Maximum
1/8A	30 sec	
1/4A	45 sec	135 sec
1/2A	90 sec	270 sec
A	120 sec	360 sec
B	240 sec	
C	270 sec	
D	270 sec	
E	300 sec	
F	300 sec	
G	300 sec	



## 35 ROCKET GLIDER DURATION

### 35.1 Scope

Rocket Glider Duration comprises eleven events open to any single-staged model rocket that returns to the ground in stable, gliding flight supported by aerodynamic lifting surfaces which sustain it against gravity. Entries whose gliding surfaces are made of flexible materials (e.g., plastic film or cloth) are prohibited from this event. The purpose of this competition is to achieve the longest flight duration time.

### 35.2 Qualification

During the recovery portion of the flight, the entry must achieve a minimum of a 1:1 glide ratio at some point to be considered qualified.

### 35.3 Disqualification

Any entry that descends with parachute and/or streamer recovery device(s) attached must be disqualified. Any entry that separates into two or more unattached parts, or ejects its motor must be disqualified.

### 35.4 Classes

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Rocket Glider Duration are established:

Motor Class	Multi-Round Maximum	NRC Maximum
1/8A	30 sec	
1/4A	45 sec	135 sec
1/2A	90 sec	270 sec
A	120 sec	360 sec
FAI A	180 sec	
B	180 sec	540 sec
C	240 sec	
D	270 sec	
E	300 sec	
F	300 sec	
G	300 sec	

## 36 FLEX WING BOOST GLIDER DURATION

### 36.1 Scope

Flex Wing Boost Glider Duration comprises ten events open to any model rocket, one portion of which returns to the ground in stable, gliding flight supported by flexible aerodynamic lifting surfaces which sustain that portion against gravity. If the entry is staged, the gliding portion must be part of the uppermost stage. The entry may separate into multiple pieces; only the gliding portion is timed and needs to be returned per Rule 30.9 - Return. The purpose of this competition is to achieve the longest flight duration time.

### 36.2 Qualification

During the recovery portion of the flight, the entry's gliding portion must achieve a minimum of a 1:1 glide ratio at some point to be considered qualified.

### 36.3 Disqualification

Non-gliding portions of the entry may deploy parachutes and/or streamers for recovery purposes. However, any gliding portion of the entry that descends with parachute and/or streamer recovery device(s) intentionally attached must be disqualified.

### 36.4 Classes

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Flex Wing Boost Glider Duration are established:

Motor Class	Multi-Round Maximum
1/8A	30 sec
1/4A	45 sec
1/2A	90 sec
A	120 sec
B	180 sec
C	240 sec
D	270 sec
E	300 sec

F	300 sec
G	300 sec

## **37 EGG LOFTING DURATION**

### **37.1 Scope**

Egg Lofting Duration comprises six events open to single-stage model rockets that carry, as a totally enclosed payload, one raw egg intended to simulate carrying an astronaut. The purpose of this competition is to achieve the longest flight duration and recover the payload without damage.

### **37.2 Eggs**

Eggs must be raw and have a mass of not less than 57 grams and not more than 63 grams; and measuring no more than 45 millimeters in diameter. Prior to flight each egg must be uniquely marked and the mark must be recorded on the competitor's flight card. A competitor shall not be required to use an egg that has been previously lofted by another competitor. No material may be affixed to the egg (e.g., glue or tape).

### **37.3 Return**

Following the flight, the competitor must present his/her entry as recovered and, in the presence of an official, must remove the egg. If the shell of the egg is broken or cracked, the entry must be disqualified. If an official cannot examine the egg, or the competitor removes the egg in the absence of officials, or breaks the egg in the process of removing it, the entry must be disqualified. If an official cannot examine the egg, the entry will be disqualified. Any entry that is caught or cushioned prior to landing must be disqualified. Rule 10.4 - Return of Inaccessible Models does not apply.

### **37.4 Classes**

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Egg Lofting Duration are established:

<b>Motor Class</b>
B
C
D
E
F
G

### **37.5 Scoring**

Egg Lofting Duration must be scored as follows: The competitor whose model achieves the longest duration for a single flight is the winner.

## **38 DUAL EGG LOFTING DURATION**

### **38.1 Scope**

Dual Egg Lofting Duration comprises five events open to single-stage model rockets that carry as a totally enclosed payload, two raw eggs intended to simulate carrying two astronauts. The purpose of this competition is to achieve the longest flight duration and recover the payload without damage.

### **38.2 Eggs**

Eggs must be raw and have a mass of not less than 57 grams and not more than 63 grams; and measuring no more than 45 millimeters in diameter. Prior to flight each egg must be uniquely marked and the marks must be recorded on the competitor's flight card. A competitor shall not be required to use one or more eggs that have been previously lofted by another competitor. No material may be affixed to the egg(s) (e.g., glue or tape).

### **38.3 Return**

Following the flight, the competitor must present his/her entry as recovered and, in the presence of an official, must remove the eggs. If the shell of the egg(s) is broken or cracked, the entry must be disqualified. If the official cannot examine the eggs, or the competitor removes the eggs in the absence of officials, or breaks the eggs in the process of removing them, the entry must be disqualified. Any entry that is caught or cushioned prior to landing must be disqualified. Rule 10.4 - Return of Inaccessible Models does not apply.

### **38.4 Classes**

This event is divided into five classes based on the permissible total impulse of the motor(s). The following classes of Dual Egg Lofting Duration are established.

Motor Class
C
D
E
F
G

### 38.5 Scoring

Dual Egg Lofting Duration must be scored as follows: The competitor whose model achieves the longest duration on a single flight is the winner.

## 39 SUPERROC DURATION

### 39.1 Scope

Superroc Duration comprises ten events open to single-stage model rockets whose body length is no less than the minimum specified in 39.5 for the motor class of the event. The purpose of this competition is to achieve the longest flight with the longest possible rocket, while avoiding structural failure of the airframe.

### 39.2 Structural Failure

An entry that separates, folds, or has structural failure prior to ejection must be disqualified.

### 39.3 Safety

Entries must comply with the provisions of Rule 1.2 - Model Rocket.

### 39.4 Scoring

Superroc Duration must be scored as follows: the length of the entry to the nearest centimeter as measured from the tip of the nose cone to the end of the motor nozzle, up to the maximum length for that category, must be awarded as static points. If the entry has more than one motor, the length must be measured to the motor nozzle closest to the tip of the nose cone. No additional points are awarded for any length beyond the maximum. The achieved duration of the entry in seconds must be awarded as flight points. The static points and flight points obtained must be multiplied to determine the score. The competitor achieving the highest score must be declared the winner. When posting, printing, or maintaining contest results or performance records, an entry's time in seconds must be shown with its composite score.

### 39.5 Classes

This event is divided into classes based on the permissible total impulse of the motor(s). The following classes of Superroc Duration are established:

Motor Class	Minimum Length (centimeters)	Maximum Length (centimeters)
1/8A	12	25
1/4A	25	50
1/2A	50	100
A	75	150
B	100	200
C	125	250
D	150	300
E	175	359
F	200	400
G	225	450

## 40 PRECISION DURATION

### 40.1 Scope

Precision Duration comprises three events open to any single-staged model rocket. The purpose of this competition is to accurately predict the duration that an entry will achieve.

### 40.2 Classes

The three classes of Precision Duration are:

#### 40.2.1 Predicted Duration

The competitor must predict the duration in seconds that the entry will achieve. The competitor's prediction must be recorded on the flight card and given to the official(s) prior to any official flight by the competitor at the meet. The minimum duration prediction is 30 seconds.

#### **40.2.2 Set Duration**

The Contest Director must set the target duration when the meet is sanctioned. This target duration must appear on the sanction form and all appropriate meet information. The target duration must be no less than 30 and no more than 120 seconds in increments of 5 seconds.

#### **40.2.3 Random Duration**

The Contest Director must select the target duration just prior to when the event is flown, by random selection. The target duration must be no less than 30 and no more than 120 seconds in increments of 5 seconds.

#### **40.3 Practice**

Practice flights are not allowed on the day the event is flown.

#### **40.4 Number of Flights**

Entries must be allowed only one official flight in Precision Duration. In the case of a timer malfunction, any re-flight must be made by the same entry, and no changes in configuration, motor type, or prediction must be allowed.

#### **40.5 Control**

The entry may not be radio controlled. The entry must not contain a dethermalizer or other device whose purpose is to cause the entry to land after a predetermined amount of elapsed time. Any entry that is caught or interfered with prior to landing must be disqualified. Any entry that drifts out of sight of the timers while still in flight must earn only flight points.

#### **40.6 Scoring**

Precision Duration must be scored as follows: the achieved duration of the entry must be divided by the target duration, and the result multiplied by 100. This figure must then be rounded to the nearest 0.1%. If the result is greater than or equal to 100, subtract 100 from it; otherwise, subtract it from 100. The competitor whose score comes closest to zero is declared the winner.

#### **40.7 Return**

Return of the entry to the officials is not required except as stated in Rule 9.10 - Impound.

**41 – 49 Reserved for future events**

# CRAFTSMANSHIP COMPETITION

## 50 CRAFTSMANSHIP JUDGING

### 50.1 Judging

Craftsmanship events require static judging. The modeler shall provide to the judges as a component of their scale data packet a mission profile for their flight. The modeler need not perform all declared mission elements during a flight; for example, a model with a declared cluster operation may be flown with a single motor. Mission points will only be awarded for those operations documented in the scale data packet and performed during a given flight. If no mission is to be declared modeler should state this in the data packet. The same team of one or more judges must judge all craftsmanship entries in an event that are in the same competition division.

### 50.2 Insufficient Data

If an entry is found to lack sufficient data, the competitor will be allowed a reasonable amount of time to correct for the deficiency.

### 50.3 Conflict of Interest

A judge entered in an event shall not judge his/her own entry, or any entry in competition with it.

### 50.4 Viewing Period

It is recommended that the Contest Director set aside periods of time at which entries may be viewed by the competitors and guests. The intent of this practice is to stimulate interest in craftsmanship events in competitors who may not otherwise enter such events and improve the craftsmanship of those competitors who regularly do.

### 50.5 NAR Number

The competitor's name or NAR number is required to be on the model per Rule 9.4 - NAR Number.

### 50.6 Judging Condition

Entries must be judged in flight condition, with the exception that motor(s) and recovery system need not be present. Any clear plastic fins, launching lugs and fittings, and other exterior flight items must be attached to the entry during judging. Pop lugs are considered part of the launcher, not of the model. Nothing may be added to the entry, nor taken off the exterior of the entry, between judging and flight, except the motor(s) and recovery system(s). If unusual launching or recovery devices are to be used it should be so noted in the data presented.

### 50.7 Accidental Damage

Any damage to an entry while it is in the custody of the judges or meet officials must not be held against the competitor, and the competitor must have the opportunity to repair the entry without penalty.

### 50.8 Human Intervention

Craftsmanship entries are judged for flight damage; therefore, no human intervention (e.g., catching the entry or cushioning its landing) will be allowed between launch and touchdown. Alternately competitor's may choose to catch their entries. In this case, entries that are caught must be judged as if they had sustained maximum damage on landing, but will not be disqualified. If the intervention was accidental and/or inadvertent, in the opinion of the Range Safety Officer, the flight may be judged as having sustained maximum damage points or an unofficial flight at the option of the competitor. The competitor must inform the applicable contest official of his/her decision to accept or reject the flight as an official flight prior to any subsequent flight by the competitor in that event.

### 50.9 Lost Models

Craftsmanship entries that cannot be returned to the judges must be judged as if it had sustained maximum damage on landing, but will not be disqualified, except as per Rule 9.10 - Impound. Rule 10.4 - Return of Inaccessible Models will not apply.

## 51 SPORT SCALE

### 51.1 Scope

Sport Scale comprises three events open to any entry that closely resembles an existing or historical guided missile, rocket vehicle, or space vehicle, that has flown under rocket power. The purpose of this competition is to produce an accurate, flying replica of a real rocket powered vehicle that is judged for craftsmanship in construction, finish, and flight performance. Sport Scale differs from Scale in that the dimensions of the entry are not measured.

### 51.2 Classes

The following classes of Sport Scale exist:

#### **51.2.1 Sport Scale**

Entries may be any size.

#### **51.2.2 Peanut Sport Scale**

The entry may be a maximum of 30 centimeters in overall length or a maximum of 2 centimeters in body diameter. When judging this class, the increased difficulty of building a very small model should be considered.

#### **51.2.3 Giant Sport Scale**

The entry must be a minimum of 100 centimeters in overall length or a minimum of 10 centimeters in body diameter. Vehicles with significant outer assemblies or winged vehicles qualify if their length plus wingspan totals at least 100 centimeters or if their girth (as measured around in a plane perpendicular to the centerline of the model by a length of string around the components not including the fins or wings) totals at least 31.4 centimeters.

### **51.3 Exclusions**

Sport Scale entries of amateur rockets or missiles are specifically excluded from this event, except when the prototype is of obvious historical significance.

### **51.4 Non-Flying Prototypes**

Entries in Sport Scale may model a non-flying or inert vehicle if its configuration is representative of a historical vehicle configuration.

### **51.5 Plastic Models**

Entries that qualify for Plastic Model Conversion per Rule 56 - Plastic Model Conversion, are specifically excluded from this event. Parts from commercial plastic kits may be used on scale entries provided this is pointed out in the data presented with the entry for judging.

### **51.6 Kits**

Commercially available scale model rocket kits are acceptable for entry.

### **51.7 Data**

The competitor must supply data to substantiate his/her entry's adherence to scale in shape, color, and paint pattern.

### **51.8 Stages**

If the prototype is a multi-stage vehicle, the entry may be designed so that some or all of the upper stages are inoperable dummies. However, an entry of one or more of the upper stages of a multi-stage vehicle may not be entered without the operable lower stage(s) unless specific data is furnished to prove to the judges that the upper stage(s) have flown.

### **51.9 Transparent Fins**

Transparent fins are allowed for the purpose of stabilizing an entry. The transparent fins and their attachment must be judged for craftsmanship along with the entry.

### **51.10 Judging**

Entries must be judged for static points in the following manner: Scale-like qualities are to be judged from a distance of at least one meter from the model. Judges may then closely examine the model to judge it for craftsmanship.

### **51.11 Flight**

An entry that does not make a safe, stable flight must be disqualified. Any flight including re-flights that are missing significant component(s) (i.e.; booster pods, fins, transitions, escape towers, payload sections, nose cones), must be disqualified. Any flight including re-flights may fly missing small surface details (i.e. non-functional lugs, antennas, landing pads/wheels, etc.), this will be scored as damage.

Models may not separate into multiple parts prior to departure from the launch guide.

### **51.12 Static Judging**

#### **51.12.1 Similarity of Outline: 200 points**

The competitor is required to submit data to substantiate his/her entry's visual resemblance to the prototype. Minimum allowable data consists of:

- A line, tone, or color drawing; or

- One or more clear photographs, halftones, or photo-reproductions of the prototype, sufficient to show the outline and general configuration of the prototype modeled.

#### **51.12.2 Finish, Color, and Markings: 200 points**

The competitor should submit data to substantiate his/her model's fidelity to the prototype. Such as:

- One or more clear photographs, halftones, or photo-reproductions, including at least one in color. The number of these submitted should be sufficient to substantiate additional views of the model on which the color pattern and markings differ significantly.
- Other published pictorial representations, such as a color painting, or a drawing from a magazine.
- A detailed written description and/or drawing (which may be created by the competitor), from verifiable source, of the color scheme and markings, accompanied by a drawing of the prototype on which the color scheme and markings described have been included.

Any entry not accompanied by data substantiating the finish, color, and markings of the prototype must be given zero points for Finish, Color and Markings.

#### **51.12.3 Degree of Difficulty: 100 points**

Points must be awarded according to the difficulty experienced by the competitor in building the model and adapting it for flight. Consideration should be given to whether the entry was built from a kit. Points should be awarded for parts and details that were individually constructed by the competitor. To facilitate judging, the competitor should point out difficult assemblies or construction problems in his/her data.

#### **51.12.4 Craftsmanship: 300 points**

Points will be awarded for neatness, care in construction, craftsmanship of details, and quality of finish. Consideration should be given to the invisibility of body seams and wood grain, and the accurate reproduction of curved lines and edges. The finish should be free of fingerprints, brush strokes, runs, or other unintentional blemishes, and the paint pattern should be well defined.

### **51.13 Flight Characteristics: 300 points**

#### **51.13.1 Mission: 200 points**

Mission points are awarded for the entry's appropriate and scale-like operation of the prototype during flight. Examples of such operations are staging, simulated cloud seeding, operation of electronic payload, and smoke ejection. Any such operation that does not comply with the safety standards set forth in the Sporting Code shall be disqualified. The RSO is the only official who may rule on the safety of the entry's operation.

#### **51.13.2 General Flight: 100 points**

General flight points are awarded for proper operation of the entry during flight, including launch, lack of misfires, stability, recovery, and lack of damage on landing. No consideration should be given to staging or scale-like flight characteristics, as they are covered under mission points. However, if the general flight performance of the entry is adversely affected by the failure of one or more of these aspects, general flight points may be deducted.

#### **51.14 Damage**

Damage must be judged cumulatively with each flight, assessed from the judged condition of the entry to the condition presented to the judge post-flight. Damage caused by catastrophic failure must not be counted against the entry's flight points.

#### **51.15 Scoring**

Sport Scale must be scored as follows: the entry's static points are added to its flight points. The competitor receiving the highest score is the winner.

## **52 SCALE**

### **52.1 Scope**

Scale comprises a single event open to any model rocket that is a true scale model of an existing or historical guided missile, rocket vehicle, or space vehicle, that has flown under rocket power. The purpose of this competition is to produce an accurate, flying replica of a real rocket powered vehicle that is judged for craftsmanship in construction, finish, and flight performance.

### **52.2 Exclusions**

Prototypes of amateur rockets or missiles are specifically excluded from this competition, except when the prototype is of obvious historical significance.



### 52.3 Non-Flying Prototypes

Entries in Scale may model a non-flying or inert prototype if its configuration is representative of a historical vehicle configuration.

### 52.4 Plastic Models

Entries that qualify for Plastic Model Conversion per Rule 56 - Plastic Model Conversion, are specifically excluded from this event. Parts from commercial plastic kits may be used provided this is pointed out in the data presented with the entry for judging.

### 52.5 Kits

Commercially available scale model rocket kits are acceptable for entry only if accompanied by additional substantiating data other than that contained in the kit. The competitor must be responsible for ascertaining the correct scale qualities of the kit, and must present satisfactory evidence that the entry is to the correct scale.

### 52.6 Serial Numbered Prototype

The competitor should model one particular serial-numbered prototype (or round), except in the case where the prototype is in such extensive mass production that no single individual vehicle can be singled out for entry. However, the competitor must make every reasonable attempt to model a specific prototype, since any generalization may detract from his/her score.

### 52.7 Data

The competitor must supply data to substantiate his/her entry's adherence to scale in dimension, shape, color, and paint pattern.

### 52.8 Stages

If the prototype is a multi-stage vehicle, the entry may be designed so that some or all of the upper stages are inoperable dummies. However, an entry of one or more of the upper stages of a multi-stage vehicle may not be entered without the operable lower stage(s) unless specific data is furnished to prove to the judges that the upper stage(s) has been flown.

### 52.9 Transparent Fins

Transparent fins are allowed for the purpose of stabilizing an entry. The transparent fins and their attachment must be judged for craftsmanship along with the entry.

### 52.10 Flight

An entry that does not make a safe, stable flight must be disqualified. Any flight including re-flights that are missing significant component(s) (i.e.; booster pods, fins, transitions, escape towers, payload sections, nose cones), must be disqualified. Any flight including re-flights may fly missing small surface details (i.e. non-functional lugs, antennas, landing pads/wheels, etc.), this will be scored as damage.

Models may not separate into multiple parts prior to departure from the launch guide.

### 52.11 Static Judging

#### 52.11.1 Scale Data: 50 points

Points must be awarded for data that exceeds the minimum requirements; however, data will be judged on quality, not quantity. All data presented should apply to the particular prototype that is being modeled. Minimum allowable data consists of:

- Scale factor
- Overall length
- Significant body diameter(s)
- Nose cone length
- Fin length and width (if applicable to the prototype)
- Length of transition pieces (if applicable)
- Color pattern (documented either in writing or by photographs)
- One clear photograph, halftone, or photo-reproduction
- For at least all required dimensions listed above, both the actual (prototype) dimensions and the scaled (model) dimensions presented in a table or on a drawing

Dimensional data must be from an accurate source, such as magazines, books, the prototype manufacturer's specifications or data sheets, and so on. Dimensions for which explicit data cannot be found may be calculated by proportioning drawings or photos; dimensions obtained in this manner must be so identified in the data. Drawings prepared by the competitor to facilitate judging must be accompanied by substantiating data or drawings. Photographs from any source are acceptable. The photograph requirement may be satisfied by reproductions of pictures from books and other printed material. In addition, the competitor should make an effort to include in a table or drawing, any



additional dimensions (both prototype and scaled) that he/she has tried to scale. Points may be deducted if the scale data is not pertinent to the prototype. An entry must be judged against the data presented.

**52.11.2 Accuracy of Major Dimensions: 200 points**

Major dimensions include those required per Rule 52.11.1 - Scale Data, as well as dimensions of sub-assemblies, location of details, location of paint pattern, and so on. At least five dimensions must be checked for accuracy. The judges must measure the model dimensions to a tolerance of +/-0.5 millimeters. Points must be deducted according to the percentage of deviation from the scale dimensions. Model features so small that they cannot be measured should appear scale-like.

**52.11.3 Accuracy of Color and Markings: 100 points**

The color, surface finish, and texture of the entry should conform to the data and photographs. Lettering and insignia, if applicable, should be scaled and properly reproduced. Paint patterns should be properly proportioned.

**52.11.4 Appearance of Details: 50 points**

Details such as antennas, rivets, cover plates, bolts, prototype imperfections, and so on that appear in the data should be present and accurately scaled.

**52.11.5 Craftsmanship: 300 points**

Points will be awarded for neatness, care in construction, craftsmanship of details, and quality of finish. Consideration should be given to the invisibility of body seams and wood grain, and the accurate reproduction of curved lines and edges. The finish should be free of fingerprints, brush strokes, runs, or other unintentional blemishes, and the paint pattern should be well defined.

**52.11.6 Degree of Difficulty: 200 points**

Points must be awarded according to the difficulty experienced by the competitor in building the model and adapting it for flight. Consideration should be given to whether the entry was built from a kit. Points should be awarded for parts and details that were individually constructed by the competitor. To facilitate judging, the competitor should point out difficult assemblies or construction problems in his/her data.

**52.12 Flight Characteristics: 300 points**

**52.12.1 Mission: 200 points**

Mission points are awarded for the entry's appropriate and scale-like operation of the prototype during flight. Examples of such operations are staging, simulated cloud seeding, operation of electronic payload, and smoke ejection. Any such operation that does not comply with the safety standards set forth in the Sporting Code must be disqualified. The RSO is the only official who may rule on the safety of the entry's operation.

**52.12.2 General Flight: 100 points**

General flight points are awarded for proper operation of the entry during flight, including launch, lack of misfires, stability, recovery, and lack of damage on landing. No consideration should be given to staging or scale-like flight characteristics, as they are covered under mission points. However, if the general flight performance of the entry is adversely affected by the failure of one or more of these aspects, general flight points may be deducted.

**52.13 Damage**

Damage must be judged cumulatively with each flight, assessed from the judged condition of the entry to the condition presented to the judge post-flight. Damage caused by catastrophic failure must not be counted against the entry's flight points.

**52.14 Scoring**

Scale must be scored as follows: the entry's static points added to its flight points. The competitor receiving the highest score is the winner.

**53 SCALE ALTITUDE**

**53.1 Scope**

Scale Altitude comprises six events open to any model rocket that is a true scale model of an existing or historical guided missile, rocket vehicle, or space vehicle, that has flown under rocket power. The purpose of this competition is to produce an accurate, flying replica of a real rocket powered vehicle that is judged for craftsmanship in construction, finish, flight performance, and achieving the greatest possible altitude

### 53.2 Judging

An entry must comply with the rules of Scale per Rule 52 - Scale.

### 53.3 Scoring

Scale Altitude must be scored as follows: the entry's static points must be combined with its flight points and added to the entry's altitude in meters. The competitor achieving the highest score must be declared the winner.

#### 53.3.1 Flight

An entry that does not make a safe, stable flight must be disqualified. Scale altitude entries missing any items will receive an altitude score of 0 (zero).

### 53.4 Classes

This event is divided into classes based on the maximum permissible total impulse of the motor(s). The following classes of Scale Altitude are established:

Motor Class
1/8A
1/4A
1/2A
A
B
C

## 54 CONCEPT SPORT SCALE

### 54.1 Scope

Concept Sport Scale comprises a single event that is a variation of Sport Scale. The purpose of this competition is to produce a flying replica of either a fictional or a proposed, but un-flown rocket vehicle. Entries that qualify for Sport Scale per Rule 51 - Sport Scale, are excluded from this event.

### 54.2 Exclusions

Subjects excluded from this event:

- Vehicles from unpublished fiction and amateur films
- Science fiction or futuristic designs published by model rocketry manufacturers, publications, or organizations specifically for flying model construction
- Science fiction themed rocket kits that do not appear in actual works of science fiction or rockets in generic science fiction illustrations
- Generic illustrations of a class of proposed vehicle rather than a specific program
- Real prototypes that appeared in science fiction, unless so modified that they could not be flown in Sport Scale
- Amateur rockets and missiles, except when the prototype is of obvious historical significance

### 54.3 Plastic Models

Entries that qualify for Plastic Model Conversion per Rule 56 - Plastic Model Conversion, are excluded from this event.

### 54.4 Data

The competitor must supply data to substantiate the model's adherence in shape, color, and paint pattern. Data must derive from the work of science fiction or from an established aerospace professional, institution or company proposal.

For fictional prototypes, photos and art extracted from the work of science fiction, or from advertising or publicity for the work are acceptable. Photos and drawings of props used in filming of works of science fiction are acceptable. If the original work did not depict the vehicle in color, colors of contemporary vehicles may be used to suggest a scheme consistent with the original work.

For proposed prototypes, photos and drawings of models produced by an established aerospace professional, institution, or company is acceptable. If color or marking data is not available, the competitor may use document markings of a similarly proposed or flown design from the same era. Drawings or photographs depicting flying model kits are not acceptable.

#### **54.5 Flight**

If the entry does not make a safe, stable flight, it must be disqualified.

#### **54.6 Static Judging**

##### **54.6.1 Similarity of Outline: 200 points**

The competitor is required to submit data to substantiate his/her entry's visual resemblance to the prototype.

##### **54.6.2 Finish, Color, and Markings: 200 points**

The competitor should submit data to substantiate his/her model's fidelity to the prototype. Any entry not accompanied by data substantiating the finish, color, and markings of the prototype must be given zero points for Finish, Color and Markings.

##### **54.6.3 Degree of Difficulty: 100 points**

Points must be awarded according to the difficulty experienced by the competitor in building the model and adapting it for flight. Consideration should be given to whether the entry was built from a kit. Points should be awarded for parts and details that were individually constructed by the competitor. To facilitate judging, the competitor should point out difficult assemblies or construction problems in his/her data

##### **54.6.4 Craftsmanship: 300 points**

Points will be awarded for neatness, care in construction, craftsmanship of details, and quality of finish. Consideration should be given to the invisibility of body seams and wood grain, and the accurate reproduction of curved lines and edges. The finish should be free of fingerprints, brush strokes, runs, or other unintentional blemishes, and the paint pattern should be well defined.

#### **54.7 Flight Characteristics: 300 points**

##### **54.7.1 Mission: 200 points**

Mission points are awarded for the entry's appropriate and scale-like operation of the prototype during flight. Any such operation that does not comply with the safety standards set forth in the Sporting Code must be disqualified. The RSO is the only official who may rule on the safety of the entry's operation.

##### **54.7.2 General Flight: 100 points**

General flight points are awarded for proper operation of the entry during flight, including launch, lack of misfires, stability, recovery, and lack of damage on landing. No consideration should be given to staging or scale-like flight characteristics, as they are covered under mission points. However, if the general flight performance of the entry is adversely affected by the failure of one or more of these aspects, general flight points may be deducted.

#### **54.8 Damage**

Damage must be judged cumulatively with each flight, assessed from the judged condition of the entry to the condition presented to the judge post-flight. Damage caused by catastrophic failure must not be counted against the entry's flight points.

#### **54.9 Scoring**

Concept Sport Scale must be scored as follows: the entry's static points are added to its flight points. The competitor receiving the highest score is the winner.

## **55 CLASSIC MODEL**

#### **55.1 Scope**

Classic Model comprises a single event that emphasizes craftsmanship while remembering the historic legacy of model rocketry. The purpose of this competition is to produce a flying replica of a classic model rocket kit or published model rocket plan. The model must have been available for sale in kit form or published as a plan in a magazine or NAR Section newsletter prior to 1990 and the builder must provide documentation to support this. Models that are still in production can be entered in this event, including models that are reproductions of classic kits however, entries must be built and finished to represent a version of the model available for sale as a kit prior to 1990. The entry may be an up or down sized version of the original model.

#### **55.2 Exclusions**

Entries eligible per Rule 51 - Sport Scale, Rule 52 - Scale, Rule 53 - Scale Altitude, Rule 54 - Concept Sport Scale, and Rule 56 - Plastic Model Conversion are excluded from this event.

#### **55.3 Data**

The competitor must supply data to substantiate the model's adherence to shape, color, and paint pattern. Data must be derived from a catalog, package insert and/or the kit's instruction sheet.

#### **55.4 Judging**

Entries must be judged for static points in the following manner: Reproduction qualities are to be judged from a distance of at least one meter from the model. Judges may then closely examine the model to judge it for craftsmanship.

#### **55.5 Flight**

An entry that does not make a safe, stable flight must be disqualified. Any flight including re-flights that are missing significant component(s) (i.e.; booster pods, fins, transitions, escape towers, payload sections, nose cones), must be disqualified. Any flight including re-flights may fly missing small surface details (i.e. non-functional lugs, antennas, landing pads/wheels, etc.), this will be scored as damage.

#### **55.6 Static Judging**

##### **55.6.1 Similarity of Outline: 200 points**

The competitor is required to submit data to substantiate his/her entry's visual resemblance to the prototype.

##### **55.6.2 Finish, Color, and Markings: 200 points**

The competitor should submit data to substantiate his/her model's fidelity to the prototype. Any entry not accompanied by data substantiating the finish, color, and markings of the prototype must be given zero points for Finish, Color and Markings.

##### **55.6.3 Degree of Difficulty: 100 points**

Points must be awarded according to the difficulty experienced by the competitor in building the model and adapting it for flight. Consideration should be given to whether the entry was built from a kit. Points should be awarded for parts and details that were individually constructed by the competitor. To facilitate judging, the competitor should point out difficult assemblies or construction problems in his/her data

##### **55.6.4 Craftsmanship: 300 points**

Points will be awarded for neatness, care in construction, craftsmanship of details, and quality of finish. Consideration should be given to the invisibility of body seams and wood grain, and the accurate reproduction of curved lines and edges. The finish should be free of fingerprints, brush strokes, runs, or other unintentional blemishes, and the paint pattern should be well defined.

#### **55.7 Flight Characteristics: 300 points**

##### **55.7.1 Mission: 100 points**

Mission points are awarded for the entry's characteristics that mimic the operation of the classic rocket kit prototype during flight (i.e., clustering, staging, glide recovery).

##### **55.7.2 General Flight: 200 points**

General flight points are awarded for proper operation of the entry during flight, including launch, lack of misfires, stability, recovery, and lack of damage on landing. No consideration should be given to staging or prototype-like flight characteristics, as they are covered under mission points. However, if the general flight performance of the entry is adversely affected by the failure of one or more of these aspects, general flight points may be deducted.

#### **55.8 Damage**

Damage must be judged cumulatively with each flight, assessed from the judged condition of the entry to the condition presented to the judge post-flight. Damage caused by catastrophic failure must not be counted against the entry's flight points.

#### **55.9 Scoring**

Classic Model must be scored as follows: the entry's static points are added to its flight points. The competitor receiving the highest score is the winner

## **56 PLASTIC MODEL CONVERSION**

#### **56.1 Scope**

Plastic Model Conversion comprises a single event open to entries that have been assembled from plastic or resin model kits of guided missiles, rocket vehicles, space vehicles, or jets whose engines are in or spaced

apart to the rear of the fuselage. The entry must be one that the manufacturer did not produce as a model to be flown; and it must be modified for flight by the competitor. The purpose of this competition is to produce a flying model from a kit originally intended as a static model and that shows craftsmanship in construction, finish, and flight performance. The entry must be representative of the kit chosen, as designed by the manufacturer.

## **56.2 Construction**

Modifications necessary to convert the model for flight are allowed. However, the basic structure and configuration of the entry must be as designed by the manufacturer of the kit. Details may be obtained from other plastic kits, or constructed by the competitor. Components necessary to convert the model for flight may be made of any safe material and obtained from any source.

## **56.3 Transparent Fins**

Transparent fins are allowed for the purpose of stabilizing an entry. The transparent fins and their attachment must be judged for craftsmanship along with the entry.

## **56.4 Flight**

An entry that does not make a safe, stable flight must be disqualified. Any flight including re-flights that are missing significant component(s) (i.e.; booster pods, fins, transitions, escape towers, payload sections, nose cones), must be disqualified. Any flight including re-flights may fly missing small surface details (i.e. non-functional lugs, antennas, landing pads/wheels, etc.), this will be scored as damage.

## **56.5 Static Judging**

### **56.5.1 Craftsmanship: 500 points**

Points are awarded in the following categories:

- Neatness and care in construction: 150 points
- Craftsmanship of details: 100 points
- Degree and quality of finish: 100 points
- General appearance: 150 points

### **56.5.2 Degree of Difficulty: 300 points**

Points are awarded according to the difficulty experienced by the competitor in building the model, according to the following schedule:

- Asymmetries inherent in the model: 40 points
- Intricacy of paint pattern: 80 points
- Degree of detailing required: 80 points. This category includes such items as the number of external or visible internal components and details that had to be added or reconstructed individually by the competitor.
- Difficulty of stabilizing model: 50 points
- Difficulty of adapting the model for flight: 50 points

The judges should consider that entries exhibiting an equal degree of craftsmanship might have required unequal amounts of time and effort because of the uniqueness of the kit. To facilitate judging, the competitor should point out difficult assemblies or construction problems in a note to the judges.

## **56.6 Flight Characteristics: 300 points**

### **56.6.1 Mission: 200 points**

Mission points are awarded for the entry's appropriate and scale-like operation of the prototype during flight. Examples of such operations are staging, simulated cloud seeding, operation of electronic payload, and smoke ejection. Any such operation that does not comply with the safety standards set forth in the Sporting Code must be disqualified. The RSO is the only official who may rule on the safety of the entry's operation.

### **56.6.2 General Flight: 100 points**

General flight points are awarded for proper operation of the entry during flight, including launch, lack of misfires, stability, recovery, and lack of damage on landing. No consideration should be given to staging or scale-like flight characteristics, as they are covered under mission points. However, if the general flight performance of the entry is adversely affected by the failure of one or more of these aspects, general flight points may be deducted.

## **56.7 Damage**

Damage must be judged cumulatively with each flight, assessed from the judged condition of the entry to the condition presented to the judge post-flight. Damage caused by catastrophic failure must not be counted against the entry's flight points.

## **56.8 Scoring**

Plastic Model Conversion must be scored as follows: the entry's static points are added to its flight points. The competitor receiving the highest score is the winner.

**57 – 59 Reserved for future events**

## MISCELLANEOUS COMPETITION

### 60 SPOT LANDING

#### 60.1 Scope

Spot Landing comprises three events open to single-staged entries. The purpose of this competition is to land the entry so that the tip of its nose cone is closest to a predetermined spot on the ground.

#### 60.2 Classes

The three classes of Spot Landing are:

##### 60.2.1 Open Spot Landing

Any type of recovery allowed.

##### 60.2.2 Parachute Spot Landing

Each entry must fully and completely deploy a parachute, with dimensions no less than 15 square centimeters or 15 centimeters in diameter for recovery purposes.

##### 60.2.3 Streamer Spot Landing

Each entry must fully and completely deploy a streamer with dimensions not less than 25 millimeters by 300 millimeters.

#### 60.3 Control

The entry may not be remotely controlled or remotely guided.

#### 60.4 Recovery

Each entry must fully comply with Rule 3.5 - Reusability.

#### 60.5 Separation

An entry must not separate into two or more unattached pieces.

#### 60.6 Number of Flights

Each entry must be allowed only one official flight.

#### 60.7 Practice

Practice flights are not allowed on the day the event is flown.

#### 60.8 Scoring

Spot Landing must be scored as follows: the distance between the tip of the entry's nose cone (or motor nozzle if there is no nose cone) and the target spot must be measured by the officials in meters to the nearest centimeter. If the tip of the nose cone lands more than 50 meters from the spot, the entry shall not place, will receive flight points, otherwise, the entry must be given a score equal to its distance in meters, measured to the nearest centimeter. The competitor achieving the smallest score must be the winner.

#### 60.9 Flight Points

Any entry that lands such that it cannot be measured or found may only be awarded flight points.

### 61 PRECISION PAYLOAD

#### 61.1 Scope

Precision Payload comprises three events open to single-stage model rockets that totally enclose the specified payload(s) for each class. The purpose of this competition is to accurately predict both the altitude and duration that a model will attain while carrying a payload of given mass and dimensions and recovering the payload without damage.

#### 61.2 Payload Types

Precision Payload specifies two payload types:

- Standard NAR Payload, a non-metallic cylinder as described in Rule 22.3 - Payload Specifications.
- Fragile Payload, a raw egg as described in Rule 23.3 - Eggs.

#### 61.3 Entry Requirements

The entry shall not separate into multiple parts per Rule 30.5 - Separation. No controlling device may be used to regulate flight altitude or duration. A competitor may submit only one entry. In case of catastrophic failure, the competitor may enter a replacement entry per Rule 11.5 - Catastrophic Failure.

## 61.4 Classes

### 61.4.1 Precision Standard Payload

The entry must carry one totally enclosed standard NAR Payload to a target altitude of 150 meters and target duration of 40 seconds.

### 61.4.2 Precision Fragile Payload

The entry must carry one totally enclosed raw egg to a target altitude of 300 meters and target duration of 60 seconds.

### 61.4.3 Precision Dual Fragile Payload

The entry must carry two totally enclosed raw eggs to a target altitude of 500 meters and target duration of 90 seconds.

## 61.5 Scoring

Unless otherwise noted, altitude data per Rule 20 - Altitude Data, and timing data per Rule 30 - Timing Data apply. The score for each qualified flight must be 1,000 points minus the altitude and duration errors. The altitude error is the absolute difference between the recorded altitude and the target altitude in meters. The duration error is three times the absolute difference between the recorded duration and the target duration in seconds. The formula for computing a flight score is:

$$S = 1000 - \text{ABS}(TA - A) - 3 * \text{ABS}(TD - D)$$

Where:

- S is the score for the flight
- A is the flight altitude in meters
- TA is the target altitude in meters
- D is the flight duration in seconds
- TD is the target duration in seconds
- ABS (...) is the absolute value function

The score for the event must be the sum of the scores for up to two official flights. The highest event score is the winner.

## 61.6 Return

The entry must be returned after each flight to verify that the payload(s) were retained within the entry.

## 61.7 Disqualification

A contest official must inspect the payload(s) after each flight. If the official cannot examine the payload(s), the flight is disqualified. If the competitor removes the payload(s) in the absence of an official, the flight is disqualified. The official may require that the standard NAR payload(s) be rechecked and must disqualify the flight if it no longer complies with Rule 22.3 - Eggs. If the fragile payload(s) are broken or cracked, the flight is disqualified. Any entry that is caught or cushioned prior to landing must be disqualified.

# 62 RESEARCH AND DEVELOPMENT

## 62.1 Scope

Research and Development is open to any NAR member who is performing research (to include historical research), or engineering new developments, in which hobby rocketry plays a primary part. The purpose of this event is to stimulate new concepts, approaches, and ideas in:

- Advancing the state-of-the-art of hobby rocketry; or
- Using hobby rocketry as a research tool; or
- Preserving the history of hobby rocketry.
- Projects previously entered may not be accepted as an entry unless the competitor has demonstrated that significant new work has been done.

## 62.2 Proxy

This event may not be conducted by proxy, unless the Contest Director rules that special circumstances, such as illness, warrant special consideration.

## 62.3 Judging

Each entry in this event shall be judged by at least three judges. Although NAR membership is not a prerequisite for judging, all judges must demonstrate a working knowledge of the rules of the event, and be technically competent to judge the quality of the entries.



#### **62.4 Entries**

Research and Development entries must be submitted as a PDF file to the NAR website <http://www.nar.org/rd/> no later than two weeks prior to the opening of the contest.

Note: Every report must contain the elements below in some form to be considered a qualified entry. If the report concerns a book, data compilation, product design, etc., the elements below regarding development of these subjects are also required.

Each entry shall detail –

- The objective(s) of the work
- The approach taken
- The equipment used
- The facilities used
- The data collected
- The results obtained
- The conclusions drawn
- The money spent on the project (budget)
- Further work that would clarify or extend the results obtained.

Each entry shall also include –

- A brief summary of any related Research and Development report(s) previously entered by the author
- A summary of any previous research done on the entry's subject material which the competitor discovered while researching his/her subject.

#### **62.5 Summary**

Each Research and Development entry shall include a separate 250 - 300 word summary of the report. The NAR reserves the right to publish the summary.

#### **62.6 Oral Presentation**

The competitor should be prepared, if called upon by the judges, to make an oral presentation on his/her project. The oral presentation shall not exceed fifteen minutes. The presentation should cover briefly the material of the written report. During this presentation the competitor shall not be interrupted. No oral comments shall be made by anyone until the presentation is complete and the competitor asks for questions. At this time, the judges and members of the audience may question the competitor concerning his/her project for a time not to exceed ten minutes. The judges reserve the right to reduce the question and answer time limits.

#### **62.7 Required Presentation**

An oral presentation shall be required from those competitors being considered for the top places.

#### **62.8 Demonstration**

If required, the competitor must demonstrate his/her project in operation. Success or failure of the demonstration shall not affect the competitor's score, provided that the competitor gives a reasonable oral explanation of the deviation from expected performance.

#### **62.9 Safety**

If any entry does not fully comply with the safety standards set forth in this Sporting Code, the competitor must present to the RSO evidence that the entry is safe in operation. Research and Development demonstration flights must be approved by the RSO per Rule 5.1.

#### **62.10 Scoring**

Research and Development shall be scored as follows: the top ten (10) places will be awarded sequentially descending from first place (1, 2, 3, 4...10). All places shall be awarded without skipping places. In case of a tie, duplicate places shall be awarded, and all numerical places will be awarded as though there had been no tie. (Ex. 1, 2, 2, 3, 4...).

##### **62.10.1 Judging Criteria**

Research and Development competition shall be judged and points assigned as follows:

- Objectives & Hypothesis or Problem Statement: 0-20 points
- Design & Procedures or Engineering process: 0-20 points
- Data & Results or Problem Solution: 0-20 points
- Analysis & Conclusions or Project Evaluation: 0-20 points
- Oral Presentation: 0-10 points
- Report Presentation: 0-10 points

The entry with the highest number of points is the winner. Judges shall use the latest revision of the "R&D Judging Rubric" sheet to score the entries. The judges shall supply a copy of their final judging sheet to the competitor after judging is complete and places are announced.

Pts.	Evaluation Criteria	Excellent 17-20 points	Good 13-16 points	Fair 9-12 points	Poor 0-8 points
<b>20</b> score	<p><b>Science Type Project:</b></p> <ul style="list-style-type: none"> <li>Objectives</li> <li>Hypothesis</li> </ul> <p><b>Engineering Type Project:</b></p> <ul style="list-style-type: none"> <li>Problem Statement (<i>design criteria</i>)</li> </ul>	<p>-- Clearly stated &amp; well-written -- Appropriate for age division &amp; original -- Creative approach to problem solving</p> <p>I. Testable, clear, bounded hypothesis</p> <p>A. Clear, original problem statement that meets potential users' needs B. Clearly defined design criteria and goals</p>	<p>--Lacking in <b>1</b> area: clarity, appropriate level, or creativity</p> <p>I. Hypothesis present, but not completely testable</p> <p>A. Statement is <b>not</b> original B. Goals/criteria are measurable but <b>vague</b></p>	<p>--Lacking in <b>2</b> areas: clarity, appropriate level, and/or creativity</p> <p>I. Hypothesis incomplete or not testable</p> <p>A. <b>Incomplete</b> statement B. Goals/criteria are <b>poorly defined</b>/not measurable</p>	<p>--Poorly conceived or lacking in all <b>3</b> areas</p> <p>I. Hypothesis <b>missing</b> or poorly defined</p> <p>A. Statement <b>missing</b> or poorly defined B. Goals/criteria <b>missing</b></p>
<b>20</b> score	<p><b>Science Type Project:</b></p> <ul style="list-style-type: none"> <li>Design &amp; Procedures</li> </ul> <p><i>Experimental design &amp; implementation (hypothesis testing)</i></p> <p><b>Engineering Type Project:</b></p> <ul style="list-style-type: none"> <li>Engineering process</li> </ul> <p><i>(design &amp; prototype)</i></p>	<p>I. Exemplary, creative plan to support / refute hypothesis with valid testing II. Sequential experimental procedures are quantitatively and/or qualitatively listed, and connect hypothesis, data &amp; results III. Procedures are logical and repeatable IV. Sample sizes, number of trials are sufficient. Valid control group. V. All other variables are carefully controlled</p> <p>A. Design goals &amp; approach clearly stated &amp; reproducible, alternatives considered B. Design creative, schematics / software provided (as applicable), well labeled C. Assembly details or set-up instructions for device are clearly laid out D. Photos provided or prototype on display E. Materials used in appropriate ways</p>	<p>I. Sufficient plan to support / refute hypothesis with all other criteria met, <b>or</b> II. Exemplary plan and <b>3 of 4</b> other criteria for excellence met, <b>or</b> III. <b>Some</b> improvements needed throughout</p> <p>A. <b>3-4</b> of 5 criteria required for excellence are met <b>or</b> B. <b>Some</b> improvements could be made</p>	<p>I. Sufficient plan with <b>3 of 4</b> other criteria for excellence met, <b>or</b> II. Exemplary plan and <b>2 of 4</b> other criteria for excellence met, <b>or</b> III. <b>Major</b> improvements needed throughout</p> <p>A. <b>1-2</b> of 5 criteria required for excellence are met <b>or</b> B. Existing information is <b>incomplete</b>, or needs <b>major</b> improvement</p>	<p>I. Sufficient plan with <b>1-2 of 4</b> other criteria for excellence met, <b>or</b> II. Plan information is unclear / missing / insufficient, <b>or</b> III. Criteria II-V are <b>lacking</b> or grossly deficient</p> <p>A. Description of design &amp; implementation not included or <b>inadequate</b> to show how design works and/or if design meets requirements B. No engineering. Project was merely <b>tinkering</b>.</p>
<b>20</b> score	<p><b>Science Type Project:</b></p> <ul style="list-style-type: none"> <li>Data &amp; Results (<i>experimentation</i>)</li> </ul> <p><b>Engineering Type Project:</b></p> <ul style="list-style-type: none"> <li>Problem Solution</li> </ul> <p><i>(testing and redesign)</i></p>	<p>I. Experiments run are appropriate for hypothesis being tested II. Sufficient data. Repetition of experiments III. Correct &amp; appropriate statistical tests run</p> <p>A. Measures of performance/improvement have been made (including cost) B. Functionality is fully tested &amp; validated C. Records on testing are included D. Prototype was redesigned or potential design improvements were identified</p>	<p>I. <b>2</b> of the <b>3</b> criteria for excellence met II. <b>Some</b> improvements could be made</p> <p>A. Final design <b>works</b> but has not been fully tested B. <b>No advantage</b> over original C. <b>Some</b> improvements could be made</p>	<p>I. <b>1</b> of the <b>3</b> criteria for excellence met II. <b>Major</b> improvements required</p> <p>A. Final design does <b>not</b> meet end user's needs B. <b>No improvement</b> over original C. <b>Major</b> improvements required</p>	<p>I. <b>Incorrect</b> experiments and data analysis for hypothesis II. <b>Insufficient</b> data</p> <p>A. Little or <b>no</b> testing B. <b>No</b> records C. <b>No</b> redesigns</p>
<b>20</b> score	<p><b>Science Project:</b></p> <ul style="list-style-type: none"> <li>Analysis &amp; Conclusions</li> </ul> <p><b>Engineering Project:</b></p> <ul style="list-style-type: none"> <li>Evaluation</li> </ul>	<p>I. Status of the hypothesis is correctly and logically addressed, and stated in an unbiased manner (confirmed / refuted) II. Completeness of work and validity of conclusions are substantiated III. Discussion is insightful, demonstrates clear understanding of research project, broader subject &amp; suggested new work</p> <p>A. Significance, relevance, applications, utility, cost effectiveness, improvements, benefits and performance addressed</p>	<p>I. <b>2 of 3</b> criteria for excellence met, <b>or</b> II. <b>Some</b> improvements could be made</p> <p>A. <b>Some</b> evaluation areas not addressed</p>	<p>I. <b>1 of 3</b> criteria for excellence met <b>or</b> II. Overall information is <b>lacking</b> in quality and perspective</p> <p>A. <b>Many</b> evaluation areas not addressed</p>	<p>I. <b>No</b> discussion / conclusions provided</p> <p>A. <b>No</b> evaluation areas addressed</p>
<b>10</b> score	<p><b>Science+Engineering:</b></p> <ul style="list-style-type: none"> <li>Oral Presentation</li> <li>Report Presentation</li> </ul>	<p><b>(8-10 points)</b></p> <p>Exemplary understanding... – Research findings / design results – Ability to interpret graphs, statistics, etc... – Related background information – Project rational, details &amp; validity</p> <p>Exemplary report... -- Creativity, clarity, logic, interpretability, construction, writing, graphics, grammar -- All information directly relates to project</p>	<p><b>(5-7 points)</b></p> <p><b>Good</b> understanding... – Research findings – Ability to interpret graphs, statistics, etc. – Related background information</p> <p><b>Good</b> report -- Most information is appropriate, organized and easily accessible.</p>	<p><b>(3-4 points)</b></p> <p><b>Fair</b> understanding... – Research findings – Ability to interpret graphs, statistics, etc... – Related background information</p> <p><b>Fair</b> report ... -- Some information is appropriate, organized and easily accessible.</p>	<p><b>(0-3 points)</b></p> <p><b>Poor</b> understanding... – Cannot answer questions adequately and precisely – Does not incorporate display into interview – Unfamiliar with related background information</p> <p><b>Poor</b> report... -- Confusing, unorganized, incorrect or inappropriate information</p>

**62.11 Right to Publish**

By entering his/her Research and Development report, the author attests that it is his/her own work, and conveys to the NAR a non-exclusive right to publish the summary and/or the report in any NAR publication. The author remains free to publish or to allow publication of the summary or report anywhere else he/she may choose. If the report describes the development of or otherwise relates to a commercial product or publication, that product or publication remains the sole property of the author, and NAR may not reproduce or distribute it without permission.

**63 – 69 Reserved for future events**

## APPENDIX A: GLOSSARY

**Catastrophic Failure (CATO):** A failure that, in the opinion of the officials, is not due to or caused by improper design, construction, or preflight preparations of the model. This can include a malfunction of the model rocket motor, a model being run over by a car or stolen, an irreversible error by a meet official such as a lost flight card, or any occurrence beyond the control of a competitor. This does not include improper assembly of a reloadable motor. A flight experiencing a catastrophic failure may or may not be declared an official flight per Rule 11.4 - Catastrophic Failure.

**Competitor:** A NAR member or a team composed of NAR members entered in a competition.

**Entry:** A model rocket entered in sanctioned competition. A scale entry must also include its scale data to be an official entry.

**First Motion:** The instant at which a model begins to move upward under the thrust provided by a model rocket motor.

**Gross Launching Mass:** The mass of a model rocket in flight condition, including fully loaded motor(s), but not including launching devices or auxiliary equipment which does not become airborne with the model.

**Misfire:** Failure of a model to make an official flight when its launch is attempted. Failure to launch caused by a malfunction of a meet-provided launch system must not be considered a misfire.

**NAR Contest Board:** Refers to the National Contest Board of the National Association of Rocketry.

**Pitch Axis:** An imaginary reference line through a model about which the model might rotate. On a typical model rocket, this axis runs side-ways through the body at the center of gravity. Since a model rocket is usually symmetrical around the roll axis, the pitch and yaw axes are usually indistinguishable. On a typical glider, the pitch axis runs side-ways through the fuselage or boom in such a manner that if the model, during gliding flight, were to rotate about the pitch axis, its nose would move up or down.

**Pop/Fly-away Lug:** A launch lug or other fitting that guides the rocket during launch, but remains connected to the launcher, or falls from the model immediately after leaving the launcher.

**Proxy:** The authority to represent or act on behalf of someone else.

**Roll Axis:** An imaginary reference line through a model about which the model may rotate without changing its direction of travel. On a typical model rocket this axis runs down the length of the model, from the center of the nose cone through the center of the motor nozzle. On a typical glider, it runs down the fuselage or boom, from the nose to the tail, in such a manner that if the model, during gliding flight, were to rotate about its roll axis, one wing tip would rise while the other fell, and the model would bank to one side.

**Safety Ruling:** A ruling by a contest official denying an entry the opportunity to fly due to considered judgment that the model would be unsafe in flight. It is also a ruling that disqualifies a model which flies in an unsafe manner.

**Stage:** Any portion or portions of the model airframe containing one or more model rocket motors. An unpowered portion of the model is not considered a stage. Clustered motors that ignite at the same time, but may be contained in multiple airframe portions such as strap-on boosters that separate in flight (i.e., Delta, Soyuz), are considered to be one stage. Upper stages must involve ignition and separation from the airframe in order to count as an additional stage. Air-starting of one or more additional motors, which do not involve separation from the model, is not considered to be an additional stage.

**Static Conditions:** The state of an entry before an official flight.

**Yaw Axis:** An imaginary reference line through a model about which the model might rotate. On a typical model rocket, this axis runs sideways through the body at the center of gravity (see pitch axis). On a typical glider, the yaw axis runs vertically through the fuselage or boom in such a manner that if the model, during gliding flight, were to rotate about the yaw axis, its nose would move left or right.

## APPENDIX B: ABBREVIATIONS

### B.1 OFFICIALS and ORGANIZATIONS

CD	Contest Director
FAI	Federation Aeronautique International
LCO	Launch Control Officer
NAR	National Association of Rocketry
NARAM	National Association of Rocketry Annual Meet
NFPA	National Fire Protection Agency
RSO	Range Safety Officer
SCO	Safety Check Officer

### B.2 EVENTS

ALT	Altitude	PRA	Predicted Altitude
BG	Boost Glider Duration	PRD	Predicted Duration
CA	Cluster Altitude	PSC	Peanut Sport Scale
CM	Classic Model	PSL	Parachute Spot Landing
CSC	Concept Sport Scale	RD	Research and Development
DEA	Dual Egg Lofting Altitude	RDA	Random Altitude
DED	Dual Egg Lofting Duration	RDD	Random Duration
DFP	Dual Fragile Precision Payload	RG	Rocket Glider Duration
ELA	Egg Lofting Altitude	SC	Scale
ELD	Egg Lofting Duration	SCA	Scale Altitude
FPP	Fragile Precision Payload	SD	Streamer Duration
FW	Flex Wing Boost Glider Duration	SPP	Standard Precision Payload
GSC	Giant Sport Scale	SPSC	Sport Scale
HD	Helicopter Duration	SRA	Superroc Altitude
OSL	Open Spot Landing	SRD	Superroc Duration
PAY	Payload Altitude	SSL	Streamer Spot Landing
PD	Parachute Duration	STA	Set Altitude
PMC	Plastic Model Conversion	STD	Set Duration

### B.3 SCORING and DISQUALIFICATIONS

CAT	Catastrophic Failure (CATO)
DNF	Did Not Fly
DQ	Disqualified
EGG	Egg Broken
EJ	Ejected Motor
FP	Flight Points
IMP	Impound
LUB*	Loop Under Boost
LST	Lost by Timers
MAX	Maximum Time
NR	No Return
ND	No Data (altimeter data not available)
NC	Track Not Closed
NG	No Glide
NDP	No Deployment
NVB*	Non-Vertical Boost
PS*	Pod Separation (from glider while under power)
ROT	No Rotation
SEP	Separation
SHR*	Shred
SF	Structural Failure
TL	Track Lost
UNS*	Unsafe
UST*	Unstable

\* Indicates that this is considered a disqualification for safety reasons

## APPENDIX C: RETURN/SCORING GUIDE

Event	Applicable Section #	Return Required NRC*	Return Required NARAM*	Rule 10.4 Applies?	Scoring Method
Altitude	21	No	No	N/A	Best single qualified flight
Boost Glider Duration	34	No	Yes	Yes	Sum of qualified flights**
Classic Model	55	N/A	No	N/A	See 55.9
Cluster Altitude	26	N/A	Yes	No	Best single qualified flight
Concept Sport Scale	54	N/A	No	N/A	See 54.9
Dual Egg Lofting Altitude	24	N/A	Yes	No	Best single qualified flight
Dual Egg Lofting Duration	38	N/A	Yes	No	Best single qualified flight
Dual Fragile Precision Payload	61	N/A	Yes	No	See 61.5
Egg Lofting Altitude	23	Yes	Yes	No	Best single qualified flight
Egg Lofting Duration	37	Yes	Yes	No	Best single qualified flight
Flex Wing Glider Duration	36	N/A	Yes	Yes	Sum of qualified flights**
Fragile Precision Payload	61	N/A	Yes	No	See 61.5
Helicopter Duration	33	No	Yes	Yes	Sum of qualified flights**
Parachute Duration	31	No	Yes	Yes	Sum of qualified flights**
Payload Altitude	22	Yes	Yes	No	Best single qualified flight
Plastic Model Conversion	56	N/A	No	N/A	See 56.8
Precision Altitude	27	N/A	No	N/A	Only one official flight permitted
Precision Duration	40	N/A	No	N/A	Only one official flight permitted
Random Altitude	27	N/A	No	N/A	Only one official flight permitted
Random Duration	40	N/A	No	N/A	Only one official flight permitted
Research and Development	42	N/A	No	N/A	See 62.10
Rocket Glider Duration	35	No	Yes	Yes	Sum of qualified flights**
Scale	52	N/A	No	N/A	See 52.14
Scale Altitude	53	N/A	No	N/A	See 53.3
Sport Scale	51	N/A	No	N/A	See 51.15
Spot Landing	60	N/A	No	N/A	Only one official flight permitted
Standard Precision Payload	61	N/A	Yes	No	See 61.5
Streamer Duration	32	No	Yes	Yes	Sum of qualified flights**
Superroc Altitude	25	No	No	N/A	Best single qualified flight
Superroc Duration	39	N/A	Yes	Yes	Sum of qualified flights**
Multi-Round Duration	All MR Events	N/A	No	N/A	Sum of 3 (or more) flights

\* Any entry may require return if a safety or rule adherence question exists see Rule 9.10 - Impound

\*\* See Rule 10.1 - Official Flight Requirements

N/A Not Applicable

## APPENDIX D: Notice of Rulemaking Procedures

Changes to Appendix “D” of the United States Model Rocket Sporting Code (USMRSC) require a vote of the NAR Board of Trustees.

### Introduction

Model rocket competition in the United States is governed by the U.S. Model Rocket Sporting Code. The rules in the Sporting Code may be revised each year using the Rule Change Proposal (RCP) process. The NAR Contest Board oversees the RCP. The procedures published here explain how the RCP process works and how you can have a voice in the revision process. If you have questions about the RCP process, contact the NAR Rules Change Proposal Chair at [rulechanges@nar.org](mailto:rulechanges@nar.org)

To submit a Rule Change Proposal use the form located here: [RCP Submission Form](#)

### D.1- Purpose

The purpose of the Rule Change Proposal process is to assist the NAR Contest Board in accepting, managing, and implementing Sporting Code rule revisions using an open process that encourages member participation and feedback. It is the responsibility of the NAR Contest Board to provide U.S. Model Rocket Sporting Code standards and policies that will promote and develop competition model rocketry through member participation.

### D.2- General Considerations

**D.2.1** - There is no fee associated with submitting a rule change proposal.

**D.2.2** - Care should be taken to avoid RCP's that may generate rules that conflict or overlap with existing rules in the Sporting Code.

**D.2.3** - Accepted Regular type RCP's (see D.3.1.1) will be published in accordance with the RCP Cycle (see D.4) and a 60 day member comment period.

**D.2.4** - The author of a proposal may request the RCP Chair withdraw his/her proposal at any time prior to the final ballot being published.

### D.3- Types

There are two types of Rule Change Proposals: REGULAR and EMERGENCY

**REGULAR PROPOSALS** – May be filed by any NAR member. If adopted, the new rule(s) go into effect with the next edition of the Sporting Code (updated annually). If accepted by a vote of the membership, Regular proposals take one year to pass through the RCP process and go into effect.

**EMERGENCY PROPOSALS** – May be filed by any NAR member. Because of the greater length of time normally required to get a rule change proposal through the Cycle (see D4), there are alternate paths for faster revision if a situation dictates. **Upon approval**, Emergency proposals **may be put into effect very quickly**.

#### D.3.1- Type Definitions

##### D.3.1.1- REGULAR Rule Change Proposals

A Regular proposal is one which adds, modifies, or removes a rule from the Sporting Code and does not fit the definition of an Emergency RCP as determined by the RCP Committee.

The RCP Chair will review a Regular RCP to see that the intent is clearly stated and that the language and format is suitable for inclusion in the Sporting Code. A Regular RCP must not result in a change to the Sporting Code that creates a conflict with the Model Rocket Safety Code. If a Regular RCP affects more than one rule or event, then the author must clearly address in their submission, each of the changes to the Sporting Code required to implement the proposed rule change.

If a Regular proposal is **not** suitable for inclusion in the Sporting Code, the RCP Committee will return the proposal to the author by email along with an explanation of its deficiencies so that it may be corrected and resubmitted. An RCP which is accepted by the RCP Committee will be reviewed in a timely manner.



### D.3.1.2- Emergency Rule Change Proposal

Definition— An **Emergency** proposal must address:

- The need to expand on and/or clarify an existing rule
- A question of integrity and fairness
- A time-sensitive issue
- The potential for member injury, loss of life, or property damage.

The intent of an **Emergency** proposal is to add, modify, or remove an existing rule in order to maintain the integrity, fairness, and safety of competition by quickly modifying the Sporting Code.

An **Emergency** proposal may add, modify, or remove an existing rule in the Sporting Code at any time during the Cycle

An **Emergency** proposal must not result in a change to the Sporting Code that creates a conflict with the Model Rocket Safety Code.

The RCP Chair will review an **Emergency** proposal to see that the intent is clearly stated and that the language and format are suitable for inclusion in the Sporting Code.

If an **Emergency** RCP affects more than one rule or event, then the author must clearly address in their submission each of the changes to the Sporting Code required to implement the proposed rule change.

#### Approval

A group consisting of the RCP Chair, the Contest Board Chair and the NAR President reviews emergency proposals submitted to the RCP Chair. **Emergency** proposals may be approved by a 2/3 vote of this group. The Contest Board Chair designates the date on which an **Emergency** RCP type shall be made effective by publishing on the NAR website.

#### Rejection

With the approval of the author, an **Emergency** proposal, which does not receive majority approval, will be held by the RCP Chair for consideration as a Regular RCP in the normal one-year Cycle.

## D.4- Cycle

The RCP process operates on a one-year cycle which begins the day after NARAM ends. The following timeline describes the RCP Cycle and all pertinent action dates:

**D.4.1** - September 1 – Deadline for RCPs to be received by RCP Chair.

**D.4.2** - September 2 - October 31 – Period for RCP Chair to email acknowledgement of proposals received and accepted and proposals received and returned to authors with suggested corrections. **Proposals returned for correction must be resubmitted by November 1 in order to be included in the current Cycle.**

**D.4.3** - November 1 - December 14 – The period the RCP Chair has to prepare the Regular RCP's for NAR website publication.

**D.4.4** - December 15 - February 14 – Member comment period. The comment period closes at midnight, February 14, on the RCP Forum.

**D.4.5** - February 15 - March 31 – The period RCP authors have to amend their proposals based on member comments or leave as originally submitted. Amended proposals must be resubmitted by midnight, March 31.

**D.4.6** - April 1 - May 13 – The period that the RCP Chair has to construct the ballot.

**D.4.7** - May 14 – RCP ballots are published on the NAR RCP Forum to allow voting by the membership.

**D.4.8** - May 15 - June 15 – The period for Member voting. Deadline to submit your ballot to the RCP Forum is midnight, June 15.

**D.4.9** - June 16 – July 14 – The period that the RCP Chair has to tabulate and prepare the results for publication.

**D.4.10** - July 15 – Voting results published on the RCP Forum, Contest Rocketry Forum, and in the NAR Homepage News Section.

**D.4.11** - **First day after NARAM ends** – Approved RCP's go into effect for the new NRC/contest year.

## D.5- Preparation and Submission

Any NAR member may submit an RCP by completing the [Rule Change Proposal Form](#) at nar.org.

Upon receipt of a completed Rule Change Proposal form, the RCP Chair will check to see that the submitted proposal meets the following requirements:

**D.5.1** - All required fields have been filled out

**D.5.2** - The proposal is clearly written

If the submitted proposal **does not** meet the aforementioned requirements, the RCP Chair will return it to the author for correction within 10 days of receipt.

If the submitted proposal **does** meet the aforementioned requirements, the RCP Chair will email the author acknowledgment of receipt within 10 days of the proposal's acceptance and will forward the proposal to the RCP Committee for review.



When writing a Rule Change Proposal, the author should keep in mind the following considerations:

**Manufacturing** – Will current models or equipment become obsolete or made no longer competitive?

**Protests** – Will the rule change proposal add or remove a source of protests?

**Model Processing Time** – Will the rule change proposal tend to increase or decrease the time required to process models at a competition?

**Designs** – Will the rule change proposal give the builder more or less freedom of design?

**Contests** – Will the rule change proposal increase or decrease the time and effort required to conduct a competition?

**Current models** – Will a competitor be able to compete effectively with current models, or will a competitor have to build new ones? (See Manufacturing)

**Effect on Competition** – Will the rule change proposal encourage or discourage competition participation?

**Effect on Skill Level** – Will the rule change proposal encourage a modeler to develop new skills and construction techniques?

**Conflict or Overlap** – Will the rule change proposal conflict or overlap with other Sporting Code rules?

#### **D.6- Review Committee**

The committee shall consist of the RCP Chair and four members of the NAR in good standing. The committee shall be selected by the RCP Chair and approved by the NAR Contest Board Chair. The Contest Board Chair may remove and replace any one or more members of the Review Committee at a time of his/her choosing.

##### **D.6.1- Purpose**

A Rule Change Proposal accepted by the RCP Chair is forwarded to the RCP Review Committee. It is the purpose of the Review Committee to review each accepted RCP to ensure the "RCP Type" designation assigned by the author (on their submission form) is appropriate per the definition of each proposal type.

##### **D.6.2- Voting**

**Acceptance-** A simple majority vote of the RCP Committee members is required to accept an RCP for inclusion in the Sporting Code based on its logic and intent.

**Rejection-** A simple majority vote of the RCP Committee members is required to reject an RCP and return the proposal to the author by email along with an explanation of its deficiency so it may be corrected and resubmitted if the author so chooses.

#### **D.7- Voting and Vote Tabulation for Regular Rule Revisions**

The RCP Chair will send an electronic ballot to the membership.

The ballot shall contain a listing of all proposals. The ballot shall present each proposal's content as of midnight March 31- the last day proposals in the Cycle may be resubmitted with changes. Ballots will not include proposal comments from the December 15 - February 14 comment period (D.4.4).

The ballot shall state the deadline for voting per the Cycle (D.4.8).

Every NAR member is entitled to one vote. Only votes cast using the official electronic ballot will be tabulated. Ballots may be submitted only by NAR members in good standing. Electronic ballots will not be accepted after the deadline stated in the Cycle (D.4.8). The RCP Chair will tabulate the votes cast by the membership. Each proposal that receives 51% or greater "Yes" votes will be deemed to have been approved and will be included in the next published version of the Sporting Code.

#### **D.8- Updating the Sporting Code**

**D.8.1-** The Sporting Code will be amended to reflect all accepted REGULAR proposals effective the beginning of the new contest (NRC) year.

**D.8.2-** The Sporting Code will be amended to reflect all accepted EMERGENCY rules on the date the Contest Board Chair has designated they are to take effect.

#### **D.9- Changes to the Rule Change Proposal Process**

Changes to Appendix "D" of the USMRSC require a vote of the NAR Board of Trustees.

## APPENDIX E: ALTIMETERS APPROVED FOR CONTEST USE

The following altimeters are approved for contest use, per [Rule 20.2](#):

Model	Verifying “Zeroed”	Verifying Altitude	Records?
<b>Adrel &amp; North Coast Rocketry</b>			
ALT-BMP/Adrel MaxAlt	steady blink	read altitude	yes
Adrel DeployMax	steady blink	read altitude	yes
<b>Altus Metrum</b>			
Micro Peak	steady blink	altitude blink	yes
<b>FlightSketch</b>			
Comp	In phone app	read altitude	yes
Mini	In phone app	read altitude	yes
<b>Jolly Logic</b>			
Altimeter One	read “Ready”	read altitude	no
Altimeter Two	read “Ready”	read altitude	no
Altimeter Three	read “Recording”	read altitude	yes
<b>PerfectFlite</b>			
ARPA	steady beep	altitude beep	no
pNut	steady beep	altitude beep	yes
Stratologger (100 and CF)	steady beep	altitude beep	yes
FireFly	steady blink	altitude blink	no

### Notes

Verifying “zeroed”:

Steady beep: hear a uniformly repeated single beep

Steady blink: see a uniformly repeated single blink

Read zero: 0000 displayed on altimeter or connected device

Configuration beeps: Hear a repeated series of beeps indicating altimeter configuration

Verifying altitude:

Altitude beep: Hear a series of beeps indicating altitude

Altitude blink: See an LED blink indicating altitude

Read altitude: Read displayed altitude on altimeter or connected device

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