

National Association of Rocketry

United States Model Rocketry Sporting Code

2014 Edition



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ABOUT THE SPORTING CODE

Model Rocketry is an activity that emphasizes safety, education, and sportsmanship. Competition modeling develops patience and skill, and encourages creativity and innovation. The National Association of Rocketry provides support for competition modeling as an excellent means of encouraging these aspects of model rocketry, and thereby ensures the continued advancement of the hobby.

The United States Model Rocket Sporting Code (the "Pink Book") provides a standard set of rules by which NAR members may compete with one another on the basis of skill, ability, and expertise. The Sporting Code is administered by the NAR Contest and Records Committee (the "Contest Board") through its Regional and National Chairmen.

This edition of the Sporting Code replaces all previous versions and is effective as of July 1, 2013.

From time to time, the Contest Board may add or revise rules by publishing the changes in Sport Rocketry magazine and/or Model Rocketeer newsletter, along with the date on which they are to be effective. These rule changes should be clipped and saved in your copy of the Sporting Code, on pages marked "Published Amendments to the Sporting Code." There are a number of occurrences that can result in changes to the rules; including action by the Contest Board, suggestions from the membership carrying the signatures of three NAR members, and decisions reached through the protest and appeals process described in Rule 12. Additionally, the Rules Revisions Subcommittee and the Provisional Events Subcommittee work continually to improve the Sporting Code. Members who would like to contribute to the work performed by either of these subcommittees are welcome to contact the National Contest Board.

Since the rules of the Sporting Code cannot cover all possible eventualities of competition, disputes over the rules are inevitable. Whenever the rules prove insufficient, competitors can often reach a satisfactory resolution of a problem by exercising common sense, fair play, and sportsmanship. When necessary, interpretation of the rules may be made on the field by the Contest Jury. Serious disagreements can be resolved through the protest and appeals mechanism.

All NAR members are invited to join in sanctioned competition activity. Members who do not belong to a NAR section can obtain the name of a club in their area (or information on starting a new section) by writing to the NAR Section Activities Committee, in care of NAR Headquarters.

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SUMMARY OF CHANGES SINCE 2008 EDITION

Applied Changes from 2008-2009 RCP cycle:

RCP 2007-801 Total Impulse For Contest Events
Affected Rule 9.1

RCP 2007-802 Boost Glide and Flex Wing Duration, Only Return Glider
Affected Rules 36.1, 38.1

RCP 2007-803 Self Penalizing Clarification for Open Spot Landing
Affected Rules 60.3, 60.7.1, 60.7.2, 60.7.3

RCP 2008-804 Removed Requirement for Returning Judging Sheets to Modeler
Affected Rules 50.11, 53.15. Deleted Rules 51.4.1, 52.9, 54.8, 55.8, 63.13

RCP 2008-805 Recovery Requirement for Payload Event
Affected Rule 25.4

RCP 2008-806 Remove Option to Have Motor(s) Checked Post-Flight
Affected Rule 9.5

RCP 2008-807 Clarify Official Flight Requirements
Affected Rule 10.3

RCP 2008-808 Change the Name "Science Fiction and Future Sport Scale" to "Concept Sport Scale"
Affected Rule 56.1, Appendixes

Contest Board changed Rule 32.2 to correct conflict with Rule 11.9 (Helicopter Duration Flipping)

Approved Urgent Change

RCP 2006-202U Delete Requirement for Enclosed Recovery System
Affected Rule 21.3

Approved Urgent Change

RCP 2009-910 Maximum Launcher Height
New Rule 5.5

Added Provisional Events

P24 Super-Roc XL Altitude Competition
P25 Pee-Wee Payload Competition
P40 Payload Duration Competition
P41 Super-Roc XL Duration Competition
P57 Classic Model Competition

Applied Changes to Rulemaking Procedures

Revisions to Appendix F approved by Board of Trustees on March 12, 2010

Applied Changes from 2009-2010 RCP cycle:

RCP 2009-903 Clarify Wording of Concept Sport Scale
Affected Rule 56.1

RCP 2009-904 Clarify Wording of Other Scale Events
Affected Rules 50.1, 50.3, 51.1, 52.2, 53.1, 53.4, 54.1

RCP 2009-906 Altimeter Records
Affected Rules 14.10.4, 17.7, 17.8, 17.9

Applied Changes from 2010-2011 RCP cycle:

RCP 11-0404: Increase maximum propellant mass to 125g
Affected Rules 4.3, 9.1

RCP 11-0505: Define correctable condition as pertaining to an entry
Affected Rule 11.8, Appendix A

RCP 11-0808: Eliminate loophole in super-roc measurement
Affected Rules 21.5, 33.4

Applied Changes from 2011-2012 RCP cycle:

RCP 2011-0505: Make craftsmanship damage cumulative
Affected Rules: 50.15, 51.5, 52.8, 53.15, 54.8, 55.8, 56.8, P57.9

RCP 2011-0606: Remove the ability to skip places in R&D
Affected Rule: 63.12

RCP 2011-1212: Include motor and altimeter data in records
Affected Rule: 17.10

RCP 2011-2222: Clarify altimeter language
Affected Rule: 14.10

RCP 2011-2323: Add rules for altimeter placement
Affected Rule: 14.10

RCP 2011-2424: Include full text of regular RCP on ballot
Affected Rule: F.10

RCP 2011-3030: Display altitude in meters for Super Roc Altitude results
Affected Rule: 21.5

RCP 2011-3131: Display duration in seconds for Super Roc Duration results
Affected Rule: 33.4

RCP 2011-3434: Eliminate mission points from Classic Model flight scoring
Affected Rule: P57.7

Applied Changes from 2012-2013 RCP cycle:

RCP: 2013M-01: Allow each event at a contest to use a different tracking method
Affected Rule: 14.10

RCP: 2013M-06: Allow additional model to be entered for multiround flyoff
Affected Rule 15.12.2

Updated Appendix G to add Micro Peak

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MODEL ROCKETRY 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
1.25 – 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

1 DEFINITIONS

1.1 Model Rocket

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

1.2 Model Rocket Motor

Model rocket motor means 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 charges.

1.3 Glossary of Definitions

A Glossary containing the official definitions of key words (which appear in boldface on their first significant occurrence in the text of the rules) is provided in Appendix A.

1.4 Headings

Section and subsection headings are for the convenience of the reader. Their inclusion or omission is not considered a part of these rules.

2 GENERAL

2.1 Scope

This 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:

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

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. The Safety Code shall not be overridden by Sporting Code rules. Any changes to the Safety Code apply immediately to the Sporting Code.

2.3 FAI Rules

This 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. Modelers 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 Rocketry 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, shall in no event exceed 1,500 grams. See also Rule 9.11.

3.3 Propellant

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

3.4 Stages

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

3.5 Reusability

A model rocket shall be so constructed as to be capable of more than a single flight; and shall 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 shall be of wood, paper, rubber, plastic, or other similar materials consistent with the Safety Code.

3.7 Stability

Design and construction shall 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 Systems

A model rocket possessing a self-contained powered ignition system (e.g., for remote ignition of upper stages) must be provided with a safety switch or other device capable of preventing actuation of the system and resultant ignition until immediately prior to the launch.

3.9 Dethermalizer

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

4 MODEL ROCKET MOTOR STANDARDS

4.1 Definition

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

4.2 Reloadable Motors

Only reload kits that are presented in factory, new, unopened packages may be used. As part of the check-in procedure, the contestant must present the reloadable motor and reload kit for inspection to determine proper type and tampering. The type of reload kit, the motor case designation, and the letters "RMS" must be recorded on the flight card. The reload kit and motor case will then be returned to the contestant for normal prepping and check-in. In the case of multiple reloads in a single kit, the contestant will remove the required components from the kit for prepping and the remaining items in the kit will be impounded at check-in for further use and returned at the end of the competition.

4.3 Limits

A single solid propellant model rocket motor shall contain no more than 125 grams of propellant, and shall produce no more than 160.0 Newton-seconds of total impulse.

4.4 Certification

All motors used in a model rocket in NAR sanctioned competition, or for the purpose of establishing a United States Model Rocket Performance Record, shall be of a type currently holding NAR Contest Approval. No model rocket motor shall be flown at any NAR Sanctioned activity unless that motor holds current NAR Certification.

4.5 Alterations

A model rocket motor shall not be altered in any manner that changes its dimensions and/or its performance characteristics. No material shall be affixed to the motor in a permanent fashion (e.g., via glues or epoxies).

4.6 Classification

An NAR-certified model rocket motor is assigned a type classification based on its mean sea total impulse at a temperature of 20 degrees Celsius as determined in static tests conducted 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 continue to be recognized for certification purposes independent of current commercial availability considerations.)

4.7 Published Values

The total impulse values measured and published by the NAR Standards and Testing Committee shall be the values used in all NAR sanctioned competition and for United States Model Rocket Performance Record attempts.

4.8 Total Impulse

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

4.9 Contest Approval

NAR Contest Approval shall be granted only to model rocket motors that are currently and readily available commercially, and that also meet the requirements of Rule 4.1 through Rule 4.8.

4.10 Contest Use

All Contest Approved motors shall be permitted in any NAR sanctioned competition for which the total impulse of the motor is appropriate for the event and in compliance with state and local laws.

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 operations on the flying field shall be vested in a Range Safety Officer (RSO) who must be a Senior member of the NAR in good standing. Deputy Range Safety Officers who are Senior or Leader members of the NAR in good standing may have this authority delegated to them by the RSO, but this delegation of partial authority does not relieve the RSO of the overall responsibility and authority on the flying field. If the RSO leaves the flying field, he must relinquish his/her duties and responsibilities to a new RSO who must be a Senior member of the NAR.

5.2 Flying Field

The flying field shall have a ground 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 shall be no closer than 10 meters to the boundaries of the flying field.

5.3 Safety Check

All model rockets presented for operation on the flying field shall be permitted or denied flight by the Range Safety Officer or their duly authorized deputy on the basis of his/her considered judgment with respect to safety.

5.4 Launching Device

A launching device or mechanism must be used that shall restrict the horizontal motion of the model until sufficient flight velocity is attained for reasonably safe, predictable flight. A launch rod composed of approximately one meter of 1/8" diameter rod is suggested for light models and models using less than 20 Newton-seconds of impulse. For heavier or higher-powered models, a launch rod composed of approximately one meter of 3/16" or 1/4" diameter rod is recommended. A launching angle of less than thirty degrees from the vertical must be used.

5.6 Launcher Height

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

5.7 Momentum

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

5.8 Ignition

Launching or ignition of a model rocket must be conducted by remote electrical means from a distance as required by the safety code, and must be fully under the control of the person launching the model. All persons in the vicinity of any launching must be advised that a launching is imminent before a model rocket may be ignited or launched. A minimum five-second audible countdown must be given before ignition or launching of a model rocket. Contestants will always be allowed to use their own launchers, and to launch at the time of their choice, within limits placed by the RSO.

6 SANCTIONED COMPETITION

6.1 NAR Contest Board

The **NAR Contest Board** will sanction competition, which is conducted in accordance with the rules set forth in this United States Model Rocket Sporting Code. See Rule 6.8.

6.2 Contest Year

The Contest Year shall begin on July 1, end on June 30 of the following year, and include the National Meet immediately following.

6.3 Sanctions

Competition sanctioned by the NAR shall be classified as follows:

6.3.1 Section Meet

This is a competition among the members and guests of a chartered section of the NAR. Competition points awarded at a Section Meet may not be credited to a chartered section other than the section sponsoring the meet. Section Meets have a Contest Factor of 1.

6.3.2 Local Meet

This is a competition in which either:

- a) Two or more chartered NAR sections compete against one another; or
- b) Participation is open to all NAR members in a geographical area determined by the sponsor.

A Local Meet may be sponsored by either a chartered section of the NAR, or by an individual member of the NAR. Local Meets have a Contest Factor of 1.

6.3.3 Open Meet

This is a competition in which either:

- a) Two or more chartered NAR sections compete against one another; or
- b) Participation is open to all NAR members in a geographical area determined by the sponsor.

An Open Meet may be sponsored by either a chartered section of the NAR, or by an individual member of the NAR. No fewer than five **contestants** must be present. No more than 3/4 of the contestants may enter as members of the same chartered section of the NAR. Open Meets have a Contest Factor of 2.

6.3.4 Regional Meet

This is a competition that is both open to and attended by NAR members from a wide geographic region. A Regional Meet must satisfy one or more of the following criteria:

- a) The contestants represent two or more states;
- b) One or more contestants are represented from a distance of at least 50 miles from the site of the meet; or
- c) One or more contestants are represented from an area that is sufficiently large that the National Contest Board gives a Contest Director explicit approval to hold a Regional Meet.

A Regional Meet may be sponsored by either an NAR chartered section, or by an individual NAR member. No fewer than ten contestants, including proxy-flown contestants, must be represented. No more than 2/3 of the contestants may enter as members of the same chartered section of the NAR. The Contest Director may set a maximum number of contestants that are to be allowed at a Regional Meet. If such a limit is imposed, it must be stated on the Application for a Contest Sanction. Applicants shall not be denied the right to compete on any other basis, with the exception of previous misconduct as specified in Rule 11.4. Regional Meets have a Contest Factor of 3.

6.3.5 National Meet

Only one National Meet (NARAM) shall be held each year. The National Meet will be held at such time and place and with such entry requirements as shall be determined by the NAR Contest Board. The National Meet shall have a Contest Factor of 8.

6.3.6 Record Trial

This type of meet is conducted for the purpose of providing an opportunity and facilities for attempts to establish or surpass official United States and FAI model rocket performance records. No NAR contest points shall be awarded. Events to be flown must be indicated on the application for sanction. Any number or combination of events may be flown. 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 flight. Record Trials have no Contest Factor.

6.4 Time

All contests other than the National Meet must be scheduled on and completed within no more than three consecutive days, except as stated in Rule 6.5.

6.5 Suspending Competition

The Contest Director may suspend competition with the concurrence of a majority of the participating competitors present and may set a new date acceptable to a majority for the completion of the contest. The Contest Director shall advise the Regional Contest Board regarding the rescheduling of the contest, and the reasons therefore.

6.6 Weighting Factor

Each competition event has a Weighting Factor that shall also be used in determining the maximum number of competition events that can be sanctioned for a particular contest. Any number of competition events may be sanctioned for a contest, provided that the sum of the Weighting Factors of all the competition events sanctioned for the contest does not exceed the Total Weighting Factor allowed for its contest classification. The schedule of Total Weighting Factors permitted for each contest classification is as follows:

Event Type	Total Weighting Factors
Section Meet	40
Local Meet	40
Open Meet	60
Regional Meet	80
National Meet	Set by NAR Contest Board
Record Trial	No Limit

6.7 Contest Factor

Each competition classification (Rule 6.3) has a Contest Factor which shall be used in determining the maximum number of sanctioned contests in which an NAR member, team, or chartered NAR section may enter and compete during the Contest Year. No member, team, or section may officially enter a sanctioned contest and be awarded competition points if the Contest Factor of that contest, when summed with the Contest Factors of all the contests previously entered in the current Contest Year by the member, team, or section, would exceed 12 (twelve). The National Meet shall not be included in this total. A contestant, team, or section may withdraw from a meet at any time prior to its conclusion, upon presenting valid cause to the Contest Director, and that meet shall not count towards their Contest Factor sum for the Contest Year. In addition, a chartered NAR section may not sponsor more than five section and/or local meets during a Contest Year. A contestant, team, or section may not withdraw from a meet after its conclusion, or prior to its conclusion based on poor score as the valid cause.

6.8 Sanction

Application for sanction of a model rocket competition shall be made to the NAR Regional Contest Board at least thirty days in advance of the date of the competition, on the standard form Application for a Contest Sanction, which is available from the NAR Regional Contest Board. If necessary, a reproduction of the form may be used when none can be secured from the NAR.

The thirty-day advance notice requirement may be waived at the discretion of the NAR Regional Contest Board. The Senior Member of the NAR who will serve as the Contest Director must sign the application. The correct sanction fee must be included with the form mailed to the NAR Regional Contest Board. Contest Directors must obtain an adequate supply of contest forms, flight cards, etc. in advance of any competition, since this material will not be sent with the sanction for competition.

6.9 Results

The NAR Senior Member who serves as the Contest Director for a sanctioned competition must report the competition results to the NAR Contest Board on the standard forms, and must include all the competition entry blanks, flight cards, and other contest record materials used.* The report must be postmarked within fourteen days following the completion of the competition, but this requirement may be waived at the discretion of the NAR Regional Contest Board. 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. The NAR Contest Board may refuse to accept the results of a competition if all the contest record materials are not included, if the data is not legible or accurate, or if there has been an unreasonable delay in reporting results. All competition results shall be compiled and reported by the Regional Contest Board Chairman at least monthly. The National Contest Board Chairman shall compile and report current standings to the NAR webmaster at least monthly during the contest year. The NAR webmaster should post the current US Point Standings at least once a month during the contest year. Final official results for the year should be posted to the website no later than one month following the conclusion of NARAM.

6.10 Rejection

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

6.11 Deadline

In all cases, contest results must be in the hands of the NAR Contest Board at least fourteen days prior to the opening day of the National Meet.

* Contest results may be submitted electronically in ContestManager format, or other formats as approved by the Contest Board. Competition entry blanks must still be sent to the Contest Board. Flight cards for any new United States Model Rocket Performance Records should also be submitted.

6.12 Advisory Rulings

In cases where a modeler 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 so as to allow modelers time to react to the ruling.

7 CONTEST OFFICIALS

7.1 Contest Director

A Contest Director who is a Senior member of the NAR in good standing shall: apply for contest sanction; receive and be responsible for all contest material; ensure that the competition is properly arranged and functions within the intent and specifications of this United States Model Rocket Sporting Code; and report the results of the competition. The duties of the Contest Director and the Range Safety Officer may be combined. The Contest Director appoints the Range Safety Officer, Contest Jury, Judges, Trackers, and Timers.

7.2 Range Safety Officer

A Range Safety Officer (RSO) shall preside over the conduct of the competition in accordance with Rules 3 and 5. In no case may the Contest Director, Contest Jury, or any other official override a safety ruling of the RSO. Only the Contest Jury may relieve the RSO of his/her duties.

7.3 Safety Check Officer

The RSO may appoint Deputy Range Safety Officer(s) to function as Safety Check Officer. The Safety Check Officer shall be qualified to rule in accordance with Rule 5.3. The duties of the Safety Check Officer and the RSO may be combined.

7.4 Contest Jury

There shall be a Contest Jury of three persons for each contest. The Contest Jury is empowered to make all decisions concerning any interpretation of the Sporting Code and to decide any disputes and protests, except those decisions related to safety considerations in accordance with Rule 7.2. At least one jury member must be a Senior member of the NAR. The other jury members may be Senior, Leader, or Junior members of the NAR. The Contest Director may act as one of the jury members. The Contest Director shall appoint the Contest Jury prior to the first official flight. No juror shall rule or vote on any decision that could alter the award of contest points to his/her entry. Where a decision involving the entries of two jurors is involved, the ruling of the third juror shall be the determining factor. In the case of disputes, the ruling of two of the jurors present and acting shall be the determining factor. Any decision of the Contest Jury except for a safety ruling as stated in Rule 11.1 may be protested as described in Rule 12. The Contest Jury may not override a safety ruling of the RSO. No Contest Juror may be relieved of his/her duties by the Contest Director.

7.5 Judges

The Contest Director shall appoint teams of Judges for events requiring static judging (e.g., Research and Development, Scale, Plastic Model Conversion). At least half of the judges on each Judging Team must be members of the NAR, allowing for Guest Judges. At least one member of each team of Judges must be a Senior or Leader member of the NAR.

7.6 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 drivers license due to vision) is not eligible to time or track.

7.7 Fitness

No person may serve in any Contest Official position where the safety of a flight of a model rocket is concerned (RSO, Check-in, LCO) while under the influence of intoxicants. Anyone so caught will be removed from the position and may be expelled from the meet under the provision of Rule 11.4.

8 CONTESTANTS

8.1 Entering Competition

All contestants entering model rockets and competing in NAR sanctioned competition shall be members of the NAR in good standing. They are required to sign an official entry blank. The countersignature of a parent or guardian is required on the entry blank for minors, except for persons serving in the Armed Forces of the United States or students enrolled at the time in a college, university, or other institution of higher learning. Upon entering a competition, contestants must present for verification their NAR Sporting License to the Contest Director or his/her deputy, at the Contest Director's request.

8.2 Age Division

The Competition Divisions are as given in the following schedule:

A Division	7 – 13 years old
B Division	14 – 18 years old
C Division	19 years old and older
T Division	Registered NAR Teams

All divisions are to be flown separately at any sanctioned meet, unless they must be combined in accordance with Rule 9.6. The division in which an NAR member will compete during a Contest Year is determined by the member's age/status as of July 1, the start of the Contest Year. If the member turns 7 years of age during the contest year, he/she may compete after his/her 7th birthday.

8.3 New Members

Newly joined NAR members who have not yet received their Sporting License and wish to compete in sanctioned competition shall be recorded as pending. The Contest Director may require a pending member to show proof of his/her application for membership.

8.4 Proxy

A contestant properly entered in sanctioned competition may have his/her models flown by proxy by another NAR member, except in the following events:

Drag Race	Research and Development	Spot Landing
Radio Controlled Glider	Space Systems	
National Championship Awards	United States Performance Records	

Models that are to be radio controlled may not be proxy-flown. The builder of the model to be proxy-flown must furnish in writing evidence satisfactory to the Contest Director of his inability to be present. This statement shall be forwarded to the NAR Contest Board with the meet results. Contestants having official duties at the contest may have their models proxy-flown for them with the approval of the Contest Director. An entry shall not be proxy-flown by a member whose Competition Age Division is older than that of the contestant.

In the event that the Contest Director disallows a proxy entry, this decision may be protested to the Contest Jury under the provisions of Rule 12. If the Contest Jury rules against the contestant, the decision may be appealed to the NAR Contest Board. In this instance, the contestant shall be allowed to fly, pending the decision of the NAR Contest Board; but his/her flight records shall be kept separate and shall not be considered official until the NAR Contest Board rules in favor of the contestant, if it so rules.

8.5 Teams

Two or more NAR members may enter competition as a team. Teams must be registered with the NAR Contest Board each year. Team renewals are due July 1 of each Contest Year. Membership of a team cannot be changed during the Contest Year. Such a change must be registered as a different team. Teams shall compete for competition points in a separate Team Division. One or more members of the team shall prepare entries for flight, except if they are to be proxy-flown under the provisions of Rule 8.4. Entry blanks shall carry the number of the team, with all individual team members' names and license numbers listed. All points earned and records established are credited to the team. Points earned in team competition are not entered in the individual's record of contest points, and may be used only for the team. No NAR member may enter a meet as both an individual and as a team member, and no NAR member may enter a meet as a member of more than one team; however, neither of these restrictions shall apply at Record Trials.

8.6 Sections

Where a group of NAR members enter competition as a chartered NAR section, all members of the group shall be bona fide members in good standing of that section, as indicated by the section number on their NAR membership card. Entry blanks shall carry the name of the section to which the member's points are to be credited. An NAR member or team may not enter competition as a member of more than one section during the course of a single Contest Year unless such a change is applied for and approved by the NAR Contest Board; however, any NAR member or team may enter a competition as an Independent competitor regardless of actual section affiliation.

8.7 Fitness

No contestant may fly model rockets while under the influence of intoxicants. Anyone so caught will not be permitted to fly and may be expelled from the meet under the provisions of Rule 11.4.

9 ENTRIES

9.1 Total Impulse Limit

No entry in sanctioned competition, in any event where no maximum total impulse level is stated, shall be powered by a motor or combination of motors exceeding 125 grams of propellant in total. The maximum Total Impulse Level, in accordance with the Model Rocket Safety Code, shall not exceed 320 Newton-Seconds. The use of high-power motors in NAR Competition is expressly forbidden.

9.2 Ejected Motors

No entry in sanctioned competition shall eject its motor or motors in flight in such a manner that the spent motor casing or casings fall freely apart from the model. Ejected motor casings must descend with an attached and fully deployed streamer or parachute. The streamer area must be no less than 10 square centimeters for each gram of jettisoned mass; the parachute area must be no less than 5 square centimeters per gram of jettisoned mass. See Rule 9.10.

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 shall be disqualified.

9.4 NAR Number

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

9.5 Safety Check

Each entry shall pass a safety inspection given by the Safety Check Officer before each flight to ascertain that it meets the standards of this Sporting Code, and that it will be reasonably safe in its operation, in accordance with Rule 5.3. This inspection shall include any launching device and auxiliary equipment provided by the contestant to assist the launch.

The pre-flight safety inspection shall include a visual check of the markings on the motor(s) for proper impulse and delay.

9.6 Minimum Entries

At least two official entries in an event must be passed by the Safety Check Officer and must attempt to make official flights before points can be awarded in the event. This applies also where an event is flown in competition divisions; i.e., two entries for each division. If an event must be flown in combined competition divisions because of insufficient entries, only adjacently entered divisions may have their flight records combined. For this purpose, a Team shall compete in the division of its oldest member.

9.7 Substitution of Models

Substitution of models between official flights of an event is allowed, unless disallowed by the rules for a specific event. When the rules for a specific event disallow substitution between official flights, only recovery devices and minor lost or damaged parts necessary to make the model flight worthy may be changed for subsequent flights. In these circumstances, a replacement for a minor lost or damaged part shall be identical to the part that it replaces.

9.8 Simultaneous Events

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

9.9 Construction

The RSO or his/her deputy shall make every reasonable effort to ensure that each contestant has completely constructed the model rocket(s) he/she uses in competition. Model rockets not requiring construction shall be excluded from competition. Materials and design may be obtained from any source, including kits.

9.10 Impound

The Contest Director or any of his/her appointed officials has the authority to require that any model having made an official flight be returned and impounded for a reasonable length of time for inspection if there is serious question regarding the adherence of the model to the Sporting Code. This must be stated during or immediately after the flight in question. When the model or part cannot be returned to the officials within a reasonable time, the officials may disqualify that flight.

9.11 Gross Launching Mass

All entries in model rocket competition shall not exceed a maximum GLM of 1,500 grams. Booster stage, single stage, and upper stage motors may be used in locations other than their primary intended stage.

9.12 Radio Control

Frequency control regulations must be obeyed if implemented on the flying site. Any contestant failing to do so will be considered in violation of safety rules under Rule 11.4 and may be disqualified from the event or meet. Radio Control safety is part of the Range Safety Officer's responsibility. Radio Control of a model 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 model may be radio controlled. The contest director can prohibit the use of Radio Control in any event or for the entire meet, by so stating on the sanction form for the meet, and in all appropriate meet literature. Models that are to be radio controlled must be controlled or guided by the builder or a builder of the model.

9.13 FAI Events

Models flown in the FAI class of an event, except for Boost Glider (*), must comply with the following construction requirements of the FAI Sporting Code, Section 4, Volume SM Space Models for that event. First, the minimum length of the enclosed airframe of the model 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. Second, in events where multi-staging is allowed the booster stage must deploy a recovery device, the upper stage must be at least 18 millimeters diameter over at least 75 percent of the upper stage length, and any boat tails on that stage must be at least 18 millimeters in diameter.

(*) "except for Boost Glider" was unintentionally omitted from the original RCP, and was added as a Rules Interpretation, by Rule F.8.B.

10 OFFICIAL FLIGHTS

10.1 Number of Flights

Time and weather permitting, each contestant shall be given an opportunity to make no more than two official flights in each competition event unless otherwise specified in the rules for a specific event. This limitation shall not apply at Record Trials. Unless otherwise specified in the rules for a specific event, a contestant in a duration event shall receive as his/her official score, the sum of the durations achieved by the contestant on all official flights.

It is suggested that the Contest Director carefully consider constraints imposed by the time and weather when deciding on the number of flights that is to be allowed each contestant in an event, since in many events a contestant who cannot make both flights will be at a severe disadvantage. In such cases, it is preferable to limit contestants to one flight in one or more events than to impose a hardship on contestants who could not make both flights due to lack of time or inclement weather. If such a limitation is necessary, it should be announced prior to any official flight by any contestant in the event being so limited. In circumstances where it is necessary to enact such a limitation after official flights have been made in an event, i.e., a sudden weather change, all contestants, regardless of how many official flights they have already made shall be bound by the new limits. In these circumstances, the Contest Director shall select for consideration only those flights of a contestant that would be qualified under the new limitation, and shall then choose the best of the selected flights as the official flight of that contestant in that event.

For example, if the Parachute Duration event must unexpectedly be limited to one flight per contestant, and a contestant has already made two flights, the Contest Director must first select only the flights that were returned, (since in single-flight Parachute Duration, the flight must be returned). If both flights were returned, the Contest Director shall select the better of the two flights as the official flight of the contestant.

10.2 Record Attempts

At the discretion of the Contest Director, any NAR member or Team may be allowed to attempt to set or surpass a United States Model Rocket Performance Record in any class of any event allowed in Rule 17.2, whether or not the event is listed on the sanction application for the meet. (See Rule 6.3.6.)

10.3 Official Flight Requirements

A flight is official if any part of the model 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, in which case the flight is not considered to be official. All models that do not leave the launcher subsequent to motor ignition shall 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 model disengages and proceeds into the air under power without the glider portion, the attempt shall be considered a disqualified official flight. A model that does not ignite enough motors to be in the proper total impulse class as per Rule 4.6 shall not be considered as having made an official flight unless its flight is disqualified for other reasons.

10.4 Return of Inaccessible Models

When the return of a model is required, and the contestant cannot return his/her model, but can point out (to a qualified official) the model, visible in an inaccessible place such as a tree, power line, lake, or rooftop where recovery would pose a personal hazard to the contestant, the Contest Jury has the option of scoring the model as having been returned. The Range Safety Officer, the Contest Director, members of the Contest Jury, or Timers or Trackers assigned to follow the contestant's model are qualified officials for the purposes of this rule. The Contest Director shall state prior to the start of competition what distance limits such officials may travel to act as observers under this rule. This rule may be superseded by the rules of a specific event.

10.5 Recording of Returns

It is the responsibility of the contestant to ensure that the officials have noted on the entry card that the model has been returned, where it is so required.

11 DISQUALIFICATIONS

11.1 Officials

The Contest Jury and/or the Range Safety Officer or his/her deputies may disqualify any entry that in their opinion did not comply with the competition rules or which in their opinion was not reasonably safe in operation.

11.2 Scope

An entry may by reason of flight characteristics be disqualified for that flight, but it is not necessarily disqualified for the entire event.

11.3 Scoring

For the purposes of events in which a total score is computed from the sum of the performances of two or more flights, a disqualification shall result in a score of zero for that flight. 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 at least one return is required. If a contestant flying in an event requiring at least one returned flight has one disqualified flight and another not returned, the contestant shall receive only flight points for the event.

11.4 Expulsion

The Contest Director may disqualify any contestant 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 his/her deputies; whose ability to safely fly model rockets is, in the opinion of the Contest Director or Range Safety Officer, impaired by alcohol, drugs, or condition; or for misconduct in general.

11.5 Catastrophic Failure

A model rocket experiencing a catastrophic failure shall not be given a disqualification. The flight may or may not be considered as an official flight, only if in the opinion of the Range Safety Officer the model performed a safe and stable flight, and at least nominally complied with the competition rules (e.g., a glider glided). The contestant shall in this situation have the option of having such a flight ruled as either official or unofficial. If the model did not meet these requirements, then it shall be ruled an unofficial flight.

When he has the option, the contestant shall inform the applicable Contest Official of his/her decision to accept or reject the flight as an official flight as soon as possible; but in any case, prior to any subsequent flight by the contestant in that event. The contestant shall be permitted to substitute another model; in the case of craftsmanship events, or other events as specified, an identical model must be substituted, although it does not have to exhibit the craftsmanship and detail of the original.

11.6 Recording Data

Performance data on an entry that has been disqualified during or after its flight shall be recorded, even though the flight may not at that time be considered official, in case of later reversal of the disqualification ruling.

11.7 Shock Cord

A broken shock cord shall not cause a disqualification of the entry's flight unless a part of the entry falls to the ground and lands in a manner that the Range Safety Officer considers hazardous. This rule may be superseded by the rules for a specific event.

11.8 Correctable Conditions

Disqualifications for static conditions of an entry are not permitted. In this case the modeler shall be instructed to 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. *Ex post facto* disqualifications are prohibited.

11.9 Self-Penalizing Flights

Models whose flights are safe, but do not recover in the manner they were designed to (refer to Rule 15.3), are not necessarily disqualified. If the recovery problem was of a safe nature and did not tend to give the model a performance advantage contrary to the event and the model still performs the basic requirement of the event, then the flight is qualified. For example, parachute duration models whose chute does not deploy, a glider with a streamer hung onto it (while still gliding stably), or a helicopter model which flips multiple times (while primarily autorotating about the vertical axis) are penalizing their flight performances.

12 PROTESTS AND APPEALS

12.1 Protests

Protests will be considered only when presented in writing to the Contest Jury no later than one hour after the end of the competition, and when accompanied by \$5.00 in cash.

12.2 Details

The protesting competitor must report in full the action or decision under protest, the names of the contestants and officials involved, and other substantiating details. All sides of a protest shall have the right to be heard by the Contest Jury and/or NAR Contest Board.

12.3 Decision

The Contest Jury shall give to the Contest Director, and all parties involved in the protest, a brief written statement of the situation and their decision. This statement shall be included with the contest results. If the protest is upheld, the protest fee shall be returned to the contestant. If the protest is denied, the protest fee shall also be included with the contest results forwarded to the NAR Contest Board. A decision is required within 24 hours of filing of the protest.

12.4 Appeal

A contestant may appeal a decision of the Contest Jury to the entire NAR Contest Board. Such appeals, written legibly or typed, must be postmarked within three days following the receipt by the contestant of the decision from the Contest Director on the original protest. If the Contest Board upholds the appeal, the protest fee paid at the meet shall be returned to the competitor. The decision of the Contest Board on a protest is final.

The Contest Board must rule on the appeal, in writing, within 21 days from receipt of the appeal and all necessary documents required to make the ruling.

13 COMPETITION POINTS AND CHAMPIONSHIPS

13.1 Competition Points

Competition points shall be awarded to each contestant on the basis of the following schedule:

10 points per event for placing first

6 points per event for placing second

4 points per event for placing third

2 points per event for placing fourth

1 point per event for making at least one qualified, official flight (flight points)

Note that "Track Lost", "Track Not Closed", and "No Return", if not disqualified for other reasons, may not place in an event, but still receive flight points.

13.2 Ties

In case of a tie in any of the four places, duplicate points shall be awarded. This rule may be superseded by the rules for a specific event.

13.3 Weighting Factor

Each event is assigned a Weighting Factor that is based on the difficulty of the event. These Weighting Factors are listed under the rules for each event and summarized in the Weighting Factor Chart in Appendix B.

13.4 Contest Factor

Each competition classification as listed in Rule 6.3 has a Contest Factor as reiterated below:

Event Type	Contest Factor
Section Meet	1
Local Meet	1
Open Meet	2
Regional Meet	3
National Meet	8
Record Trial	None

13.5 Scores

Scores are calculated in the following way: Competition Points are multiplied by the Weighting Factor for each event. The result is then multiplied by the Contest Factor to produce the contestant's total score for the event. For example, a contestant places first in Scale Competition at an Open Meet. First place gives the contestant 10 points; Scale has a Weighting Factor of 32; and an Open Meet has a Contest Factor of 2. Multiply $10 \times 32 \times 2$ to obtain the number of competition points to be awarded to the contestant for the event: 640 points.

13.6 Acceptance

Points scored in competition shall be official only when the NAR Contest Board accepts the contest results.

13.7 Competition Division

An event flown in competition divisions shall be scored and points shall be awarded as if separate events had been flown.

13.8 Contest Year

Competition points shall be cumulative for each NAR member, team, or section that enters and flies in sanctioned competition during each Contest Year.

13.9 National Championships

National Championship Awards for a Contest Year shall be given in the following categories to the contestant, team, and section that has compiled the largest number of contest points in that category during the Contest Year. At least the top four places in each category shall be recognized with these awards. Each place across all categories shall receive equivalent awards. To be eligible for any of these awards, individuals, teams, or sections must enter and fly in the National Meet at the close of the Contest Year.

- A Division;
 - B Division;
 - C Division;
 - T Division; Team awards shall be given in pairs.
- Sections; The National Championship Section shall also receive the rotating pennant.

Proxy-flown entries shall not be permitted to earn National Championship Awards in individual or team categories or be the sole entries in the Section category.

NARAM and pre-NARAM awards may be given to the top places in each of the above 5 categories at the option of the National Meet Contest Director.

14 ALTITUDE DATA

14.1 Theodolites

All entries in any event for which an achieved altitude figure is scored shall be tracked in flight by theodolites of a design approved by the NAR Contest Board. Any tracking theodolite that:

- Is equipped with both azimuth and elevation axes at right angles to each other
- Can be leveled or adjusted to an otherwise proper plane before use
- Has an accuracy of 0.5 degrees in both azimuth and elevation
- Uses a rifle-sight or equivalent optical sight with or without lenses, or uses a pair of open sight mounted at least twenty centimeters apart
- Uses crosshairs in the optical or open sight
- Is mounted on a sturdy tripod or other solid base in a manner that does not permit the tracking head to wobble or otherwise lose its zero-reference under normal use
- Has a provision for securely holding the sights firmly in any desired position, so that the operator may accurately record the tracking data associated with a flight
- Is capable of tracking to an azimuth of ± 180 degrees and an elevation from 0 degrees to 90 degrees shall be acceptable for NAR contest use.

The Contest Board must approve theodolites that do not meet all of the above requirements before they may be used in a sanctioned activity.

14.2 Baseline

Two or more tracking theodolites shall be used on appropriate baselines. The baseline should be between 50% and 400% of the expected altitudes to be tracked. Thus a 300-meter baseline would be appropriate for 75-600 meter flights. While very low power events may require a baseline under 300 meters, proper care and judgment should be used before this is done. Longer baselines are strongly encouraged for high-powered or high-performance models. Proper baselines must be used to track any record setting flight.

14.3 Tracking

Models shall be tracked to apogee if practical. When apogee tracking is used, one person shall be designated to give a mark to the theodolite operators at precisely the instant the entry appears to reach apogee, and the theodolites shall be locked at the mark. At the discretion of the Contest Director, models may be tracked to ejection instead of apogee. When ejection tracking is used, it is recommended that the models to be tracked contain colored tracking powder to create a visible cloud at ejection, and that the theodolite operators lock their theodolites at the appearance of the tracking powder cloud. It is further recommended that all entries that are to be tracked be painted in colors or patterns that will aid tracking. All entries in an event shall be tracked using the same tracking method (either apogee or ejection).

14.4 Communication System

A reliable voice communication system shall be used to link both trackers and the launch control area, for the purpose of calling marks and for the transmission of tracking data.

14.5 Data Reduction

Angular data obtained from theodolite tracking shall be reduced to an achieved altitude figure by means of a standard system of equations approved by the NAR Contest Board. Samples are included in Appendix E. All data shall be recorded for all altitude events and flights, including those flights that may be disqualified; this permits the altitude data to be available in case the disqualification ruling is later reversed.

14.6 Error Check

The error figure as computed by the approved equations must be less than or equal to 10% to be considered valid and acceptable for competition and record flights. Flights whose reduced altitudes do not satisfy this constraint shall be scored as Track Not Closed. Flights whose data is incomplete, preventing calculation of their altitude, shall be scored as Track Lost. All altitudes shall be rounded off to the nearest meter. Fractions of a meter less than 0.5 must be rounded to the next lower meter; fractions 0.5 or above must be rounded to the next higher meter. The rounded altitude shall be the official scored altitude. Any altimeter reading reporting by an entry that was optically tracked using theodolites will NOT be officially considered and Rule 14.9 will NOT apply.

14.7 Multiple Stations

When multiple-station or parallel systems are used, it is only necessary that one pair of trackers (one at each station) close. In the case that more than one pair of trackers close, the official altitude shall be computed by averaging all closed tracks, and then rounding them as above. The averaged rounded altitude shall be the official scored altitude.

14.8 Novel Methods

The NAR Contest Board must approve novel altitude determination methods before the results are accepted for competition.

14.9 Untracked Flights

Track Lost or Track Not Closed, if it is not disqualified for any other reason, is considered an unofficial flight. In this case the contestant is entitled to an additional flight, to be made during the period allocated for tracked flights. At the option of the contestant, Track Lost or Track Not Closed may be considered an official flight if it is not disqualified for any other reason. In this case the flight cannot place but shall receive flight points; except in an event where the score is the sum of several factors, in which case the flight shall be scored as having an altitude of zero.

14.10 Electronic Altimeters

The use of theodolites will remain the preferred method for altitude tracking, (as described in Rule 14.1). Approved electronic altimeters may also be used. All entries in a given event, other than non-competition record attempts, are to be tracked using the same method. The sanction request form submitted by the contest director shall, for each altitude event, designate under "Special Provisions" whether "Theodolites (14.1)" or "Altimeters (14.10)" will be used for altitude tracking. In the case of record trials, the contest director may designate either or both types of tracking. The contest director shall ensure that all announcements and publications for the sanctioned meet inform prospective entrants of the tracking method for each altitude event.

Only commercially available altimeters approved by the NAR Contest Board and publicly announced as approved at least 60 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 which are outside the voltage range published by the altimeter manufacturer. An altimeter must meet the following requirements to be approved by the Contest Board: Uses barometric measurement techniques to record relative flight apogee altitude above launch pad altitude. Resolution of 2 meters or better in readout. Accuracy 2 percent of recorded altitude or 2 meters, whichever is greater. Sampling rate of 10 per second or greater. Audio or visual readout directly from the altimeter. Capable of being automatically or manually placed in a state of readiness to record new flight data. This state must be audibly or visibly verifiable.

The altimeter must be fully enclosed within the rocket body. The part of the rocket containing the altimeter must be vented to the outside air by at least 3 vent holes evenly spaced around the circumference of the body. There must not be any protrusions or depressions on the body within 1 body diameter of the holes. Any attempt to deliberately produce excessively high altitude readings, such as venturis are specifically prohibited. The ports must be on a section of the model that is an unobstructed cylinder or cone for 1 caliber either side of the ports, and the cone must be no steeper than 1 in 4 taper (.25"

change in diameter per inch of length). In this case, a fin counts as an obstruction, as does a launch lug and would not be allowed within 1 caliber of the ports.

NAR Contest Board approved altimeters are listed in Appendix G.

14.10.1 Safety Check-In Procedure

The flight ready entry with the altimeter removed must be presented to the safety check official for inspection to verify the altimeter is unaltered and has been properly powered. The safety check officer may request the “owner’s manual” for the altimeter if any questions arise concerning its operation or post flight readout. The make and model of the altimeter will be noted on the contestant’s flight card under the “remarks” section. The altimeter’s power source will be turned on in the presence of the safety check official, and readiness to record new flight data will be verified after boot-up. The altimeter will now be placed in the model and secured in the presence of the safety check official. The entry is now ready for pad assignment.

14.10.2 Returns Procedure

The model and altimeter must be returned as recovered, unopened. If necessary (as in the case of visual readout), the contestant shall open the altimeter compartment in the presence of the returns official to read the altimeter. The returns official and contestant both will concur on the reported altitude. Any other specific event rules may also apply.

If the altimeter can NOT be returned, and the model is not DQ’d for any other safety or event rule violations, then that flight can be considered “Track Lost” and Rule 14.9 can be applied. If the altimeter fails to report an altitude, and the flight has not been DQ’d for any safety or event rule reason, then that flight can be considered “Track Lost” and Rule 14.9 can be applied.

14.10.4 Performance Records with Altimeters

The altitude reported for performance records with altimeters is subject to additional requirements and review. An altitude record may be set only using a recording altimeter. Altitude records may not be set using a reporting-only altimeter. After the flight, the altimeter data will be downloaded by the contestant and reviewed by a contest official (RSO, CD, or member of the contest jury). If it is shown that a sudden peak in altitude is attributable to the ejection event or a flight anomaly, that peak 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 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.

15 TIMING DATA

15.1 Timers

In all events for which a time-of-flight figure is scored, one or more Timers shall be stationed in the launching area with stopwatches and may not leave the launching area in order to keep the model in sight. Meet officials will provide the same number of timers to all contestants; any additional official timers must be provided by the contestant. Optical aids, other than sunglasses or eyeglasses to correct to normal vision, may not be used by the Timers, except in FAI class events, where optionally, Timers may be equipped with binoculars.

15.2 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.

15.3 Deployment

The recovery system of any duration model need not deploy fully and correctly, as long as the model descends in a safe manner and the recovery system action remains within the requirements of the particular event.

15.4 Conflict of Interest

A Timer shall not time his/her own entry.

15.5 Stopwatches

Stopwatches used for timing shall have a resolution no coarser than 1/10 second; shall have (at the minimum) standard start, stop, and reset capabilities, and shall be capable of being restarted from a stopped state without being reset. 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, on demand, the total elapsed time since the watch was started) may be used for competition, provided that if it is used to time any entry, it shall be available for use to time any other entry in competition with it.

15.6 Timed Interval

All entries shall be timed from the instant of **first motion** on the launcher until the part to be scored for time of flight touches the ground, is caught in a tree, power line, or otherwise stopped, or drifts out of sight of the timer. As specified in Rule 1.1, motors, recovery system protectors, and wadding are not to be timed as portions of an entry.

15.7 Averaging

The official time of flight shall be computed by averaging the elapsed times of flight recorded by each Timer, then rounding to the nearest whole number of seconds. The individual elapsed times recorded by the Timers shall not be rounded before summing. After averaging the times, fractions of a second less than 0.5 shall be rounded to the next lower second; fractions of 0.5 or above shall be rounded to the next higher second.

15.8 Disappearance

If the model disappears behind an obstacle to vision in such a manner as to lead the Timers to believe that it touched the ground very shortly thereafter, stopwatches shall be stopped when the model disappears; however, they may be started again if the model reappears. If the model drifts out of sight in the sky, the Timers shall stop their watches individually when they lose sight of it.

15.9 Recording Data

All data shall be recorded for all timing events and flights, including those flights that may be disqualified. This permits the timing data to be available in case the disqualification ruling is later reversed.

15.10 Return

Unless otherwise specified by the rules of the event, the contestant must return his entry to the officials after at least one of his/her qualified flights, except as specified by Rule 10.4. Contestants failing to satisfy this requirement cannot place in an event, but shall receive flight points, except in an event where the score is the sum of several factors, in which case the flight shall be scored as having a duration of zero.

15.11 Malfunction

When a malfunction of a stopwatch or Timer occurs such that any elapsed time measurement is not available, the elapsed time(s) recorded by the remaining Timer(s) shall be used as the official time. When all stopwatches or Timers malfunction, the flight shall not be considered an official flight unless the flight is disqualified on other grounds. Alternately, at the option of the contestant, 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; except in an event where the score is the sum of several factors, in which case the flight shall be scored as having a time of zero.

15.12 Multi-Round Events

Any duration event listing a multi-round maximum may be flown as a multi-round event. This must be indicated on the contest sanction. The weighting factor for the event shall be increased by 4 (four) in this case.

15.12.1 Number of Flights

Each contestant is initially allowed three official flights in a multi-round event. The Contest Director may designate that each flight must be flown in the time interval (round) designated by the Contest Director. Any model not flown in its designated round shall receive a zero score.

15.12.2 Number of Models

A contestant may enter no more than two models in a multi-round event for the purpose of making the first three rounds of flights, except as stated in Rule 11.5. One (1) additional model may be entered and flown in the event if a modeler is tied for first place at the end of the third round.

15.12.3 Maximum Time

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

15.12.4 Scoring

Multi-round events shall be scored as follows: the official durations achieved by the contestant on the initial three official flights in the event shall be summed. If there is no tie for first place, then the contestant achieving the highest score is the winner. If there is a tie, contenders for first place shall be given the opportunity to make additional official flights (flyoffs) to determine the winner. The maximum time limit for a contestant's first additional flight shall be computed by adding a one minute increment (or, at the discretion of the Contest Director, a greater increment) to the maximum time limit for the event. For each subsequent additional flight made by a contestant, one additional increment shall be added to the previous maximum time limit. Additional flights shall be held in this manner until a winner is determined. Second through fourth places shall be distributed first among the other contenders in the flyoffs, and then among any other contestants having made qualified flights, on the basis of total computed score.

15.12.5 Return

The models in multi-round duration events need not be returned to the officials except as required by Rules 9.10 and 15.12.2.

15.12.6 Reduced Maximum Time

If unusual weather or field conditions are encountered, the Contest Director, with the concurrence of a majority of the contestants entered in the event, may lower the maximum time to a more reasonable value. The Contest Director must advise the Regional Contest Board that this has been done and the reasons for doing so.

16 STATIC JUDGING

16.1 Judging

In events that require static judging (e.g., Research and Development, Scale, Plastic Model Conversion) all entries in an event that are in competition with one another must be judged by the same team of one or more Judges. Several teams of Judges may be used for events conducted in age divisions, provided all entries in each event in each division are judged by the same Judges.

16.2 Conflict of Interest

No Judge entered in an event shall judge his/her own entry, nor any entry in competition with it.

16.3 Viewing Period

At any meet holding events requiring static judging, it is recommended that the Contest Director officially set aside a period of time between judging and launching during which the models can be viewed by the competitors and guests. The intent of this practice is to stimulate interest in craftsmanship events in modelers who may not otherwise enter such events, and improve the craftsmanship of those modelers who regularly do.

16.4 NAR Number

The name or NAR number required to be on the model by Rule 9.4 shall be judged for craftsmanship along with the model.

16.5 Judging Condition

Models shall be judged for points 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 model during judging. Pop lugs are considered part of the launcher, not of the model. Nothing may be added to the model, or taken off the exterior of the model, 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.

16.6 Accidental Damage

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

16.7 Human Intervention

For any model being judged for damage, no human intervention (e.g., catching the model or cushioning its landing) shall be allowed between launch and touchdown. However, with the exception of the egg lofting events, contestants may choose to catch their models. In this case, models that are caught shall be judged as if they had sustained maximum damage on landing, but shall not be disqualified. Any egg lofted that is caught or cushioned shall 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 contestant for all events except egg lofting which shall be an unofficial flight. The contestant shall inform the applicable Contest Official of his/her decision to accept or reject the flight as an official flight as soon as possible; but in any case, prior to any subsequent flight by the contestant in the event.

16.8 Lost Models

Any model being judged for damage that cannot be returned to the Judges shall be judged as if it had sustained maximum damage on landing, but shall not be disqualified, except as per Rule 9.10. Rule 10.4 shall not apply.

17 UNITED STATES MODEL ROCKET PERFORMANCE RECORDS

17.1 Sanctioned Competition

All United States Model Rocket Performance Records must be attempted, established, or surpassed during competition sanctioned by the National Association of Rocketry in accordance with this United States Model Rocket Sporting Code. No proxy-flown entries shall be permitted to earn a United States Model Rocket Performance Record.

17.2 Categories

United States Model Rocket Performance Records may be set in any event and class unless judging is required, or a minimum score is the goal. For example, records may be set in any class of Altitude or Parachute Duration, but not in Scale Altitude or Spot Landing.

17.3 Competition Divisions

All United States Model Rocket Performance Records will be awarded in competition divisions.

17.4 Return

Regardless of the rules of the individual event, the model must be returned to the officials for a detailed examination after the flight to verify compliance with all rules for that event. Rule 10.4 does not apply.

17.5 Surpassing

Attempts to surpass an established United States Model Rocket Performance Record must exceed the value of the established record performance by at least 1%.

17.6 Radio Control

A separate class of records will be kept for radio-controlled entries. Such models flown in slope soaring conditions are not eligible for records. The flight conditions for a radio-controlled entry must be documented as part of the record documentation.

17.7 Altimeters

A separate class of records will be kept for altitude entries where the altitude was measured using an altimeter. The record will use the altitude as defined in Rule 14.10.4.

17.8 Setting New Records

Contest Directors and Regional Contest Board Chairmen will examine the results of all flights flown in NAR Competition to determine if they meet the requirements for a new performance record under the provisions of Section 17. If the performance is a new performance record, the pertinent data shall be forwarded to the NAR Records Subcommittee for automatic inclusion as a new United States Model Rocket Performance Record. Individual modelers may, at their discretion, apply for recognition of a record-setting flight directly to the NAR Records Subcommittee by sending a copy of their flight card for the flight and their entry form for the sanctioned competition or record trials, both signed by the Contest Director.

17.9 Certification

It is the purpose of these homologation and requirements to ascertain that a given model did indeed attain the flight performance claimed, and that a flight was made completely within the requirements of this United States Model Rocket Sporting Code. The NAR Records Subcommittee has the right to request any additional record substantiating data it feels may be necessary in the circumstances to achieve this purpose, and has the right to disallow any record claim, regardless of the homologation data submitted, if the opinion of the NAR Records Subcommittee the record attempt was unfairly made or untruthfully reported.

17.10 Record Data

In addition to the event, class, age division, record, date and name of the record holder, records will also retain motor(s) used and altimeter used if the record was set under Rule 14.10.4.

18 PROVISIONAL COMPETITION

18.1 Publishing

In order to foster the development of new events for national competition, the NAR Contest Board may publish twice a year provisional rules for those events that appear to have sufficient merit for inclusion into regular competition.

18.2 Submission

New events may be proposed by any NAR member or section for the consideration of the NAR Contest Board. They should be submitted to the chairman of the Provisional Events Subcommittee.

18.3 Form

Rules for provisional competition shall be presented as for any established event. The NAR Contest Board shall choose an appropriate Weighting Factor, to be used during the period of Provisional Competition.

18.4 Adoption

An event shall retain its provisional status for at least two full contest years. It may then be either dropped or adopted for inclusion into the next Sporting Code Revision by a vote of the NAR Contest Board. The Weighting Factor or other parts of the event rules may be changed at this time as necessary for the purpose of regular competition. Provisional events that engender little national interest or appear to offer no challenge after being tested in competition may be dropped after two years.

18.5 Improvement

During the provisional stage of an event, NAR members and sections are encouraged to suggest rule changes in the event for the purposes of improving the event, eliminating loopholes, or making the event more interesting. Contest Directors are encouraged to include Provisional events in meets, so that the rules can be tested for suitability before they are officially adopted.

18.6 National Meet

A Provisional event may not be included in a National Meet until it has qualified under Rule 18.4; except by a special resolution of the NAR Contest Board.

18.7 Standards

Provisional events submitted for the consideration of the NAR Contest Board must meet safety standards. In addition, they should be designed so that they can be flown in all sanctioned NAR meets, and from launching sites of limited size as well as large size. If applicable, a history of the event, including the number of times flown and the apparent degree of difficulty, should be included in the proposal.

19 Reserved for future events

ALTITUDE EVENTS

20 ALTITUDE COMPETITION

20.1 Scope

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

20.2 Classes

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

Motor Class	Weighting Factor
1/8A	9
1/4A	9
1/2A	9
A	10
FAI A	10
B	11
FAI B	11
C	12
D	13
E	14
F	15
G	16

21 SUPER-ROC ALTITUDE COMPETITION

21.1 Scope

Super-Roc Altitude Competition comprises ten events open to single-staged model rockets whose body length is no less than the minimum allowed for the classes of the event. The purpose of this competition is to achieve the greatest altitude possible with the longest rocket possible without impairing the structural integrity of the rocket.

21.2 Structural Failure

An entry that comes apart, bends so as to crimp the body, or has a similar structural failure prior to ejection shall be disqualified.

21.3 Separation

The model is allowed to separate into two or more unattached parts after ejection, provided that each part conforms to the provisions of Rule 3.5.

21.4 Construction

Entries with bodies or significant structural parts made from hard or potentially unsafe material (e.g., hardwood doweling or fiberglass shafts) shall not be allowed, under the provisions of Rule 1.1.

21.5 Scoring

Super-Roc Altitude Competition shall be scored as follows: the length in centimeters of the model, as measured from the tip of the nose cone to the aftmost end of the motor nozzle, up to the maximum length for that category, shall be awarded as static points. If the model has more than one motor, the length shall 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 in meters, as tracked and reduced, shall be awarded as flight points. The static points and flight points thus obtained shall be multiplied to determine the score. The contestant achieving the highest score shall be declared the winner. When posting, printing, or maintaining contest results or performance records, the model's altitude in meters must be shown with its composite score.

21.6 Classes

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

Motor Class	Minimum Length (centimeters)	Maximum Length (centimeters)	Weighting Factor
1/8A	12.5	25	13
1/4A	25	50	14
1/2A	50	100	14
A	75	150	14
B	100	200	15
C	125	250	16
D	150	300	17
E	175	350	18
F	200	400	19
G	225	450	20

22 PRECISION ALTITUDE COMPETITION

22.1 Scope

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

22.2 Classes

The three classes of Precision Altitude shall be:

22.2.1 Predicted Altitude

The contestant must predict the altitude in meters to which the model will be flown. This Predicted Altitude shall be recorded on the flight card and given to the Contest Director or his/her deputy prior to any official flight by the contestant at the meet. The minimum altitude prediction allowable is 100 meters.

Weighting Factor	8
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22.2.2 Set Altitude

The Contest Director shall set the target altitude when the meet is sanctioned. This value shall appear in the sanction form and all appropriate contest information. The target altitude shall be a multiple of 5 meters between 100 and 300 meters. All contestants shall attempt to achieve this same Set Altitude.

Weighting Factor	8
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22.2.3 Random Altitude

The Contest Director shall randomly select the target altitude just prior to when the event is flown, by draw, dice, or other random device. The target altitude shall be a multiple of 5 meters between 100 and 300 meters. All contestants shall attempt to achieve this same Random Altitude.

Weighting Factor	10
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22.3 Order

A contestant entered in Precision Altitude Competition shall make all official flights in Precision Altitude before flying any other event requiring tracking.

22.4 Number of Flights

Entries shall be allowed only one official flight in Precision Altitude Competition. In the case of a track not closed or a track lost, any flight allowed under Rule 14.9 shall be made by the same model, and no changes in configuration, motor type, or prediction shall be allowed.

22.5 Control

The entry shall not be radio-controlled or contain any device whose purpose is to limit the altitude of the model (e.g., a wire or string).

22.6 Scoring

Precision Altitude Competition shall be scored as follows: the achieved altitude of the model shall be divided by the target altitude, and the result multiplied by 100. This figure shall 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 contestant whose score comes closest to zero shall be declared the winner.

22.7 Weighting Factor

The Weighting Factor for Predicted Altitude and Set Altitude is 8. The Weighting Factor for Random Altitude is 10.

23 CLUSTER ALTITUDE COMPETITION

23.1 Scope

Cluster Altitude (CA) is comprised of six events open to single staged model rockets.

23.2 Purpose

The purpose of this event is to foster the understanding and execution of a fundamental model rocket skill: clustering. The purpose of the competition is to achieve the highest altitude.

23.3 Retained Motors

All motor cases are to be retained in the model. Following an official flight, a contestant must present his/her model as recovered to a contest official for verification of motor casing retention or the flight will be disqualified.

23.4 Winner

The person achieving the highest altitude is the winner.

23.5 Classes

The following five classes of Cluster Altitude are established:

Class Name	Weighting Factor
1/8A x 2 Motor CA	12
1/4A x 2 Motor CA	12
1/2A x 3 Motor CA	14
A x 4 Motor CA	16
B x 5 Motor CA	18
C x 6 Motor CA	20

23.6 Simultaneous Ignition

All motors of Cluster Altitude event models shall be ignited on or instantaneously after the model's first motion (i.e., "Simultaneous Ignition").

Partial cluster ignition shall be deemed a qualified flight unless disqualified for other safety reasons by the RSO. Unignited motors carried aloft shall be retained within the model.

23.7 Partial Ignition

Models that do not ignite all motors in flight will be considered official flights. An entry which fails to ignite all of its motors is considered a qualified flight unless it is unsafe (Rule 11.1), experiences a catastrophic failure (Rule 11.5), or the track is lost (Rule 14.9).

24 Reserved for future events

PAYLOAD EVENTS

25 PAYLOAD COMPETITION

25.1 Scope

Payload Competition comprises seven events open to model rockets that carry one or more standard NAR model rocket payloads. If the model is staged, the payload(s) must be enclosed in the uppermost stage of the model. The purpose of this competition is to carry a payload 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.

25.2 Payload Specifications

The standard NAR model rocket payload is a non-metallic cylinder containing fine sand, with a mass of no less than 28.0 grams. This cylinder shall be 19.1 ± 0.5 millimeters in diameter, and 70.0 ± 10.0 millimeters in length. The payload may be permanently sealed to prevent the loss of the sand. No holes may be drilled into it, no changes made in its shape, and no other material may be affixed to it.

25.3 Enclosed Payloads

The standard NAR model rocket payload or payloads carried in a model shall be completely enclosed and contained within the model, shall not separate from the model in flight, and shall be removable from the model.

25.4 Recovery

Models in the competition must contain must be equipped with a recovery device to allow a safe landing under the provisions of Rule 3.5. All entries must comply with the provisions of Rule 16.7.

25.5 Separation

The payload(s) shall not become separated from the portion of the entry intend to contain it during flight or upon landing, and the flight shall be disqualified if this occurs.

25.6 Return

Following the flight, the contestant shall present his/her entry as recovered and, in the presence of an official, shall remove the payload(s). If the official cannot examine the payload(s), the entry shall be disqualified. If the contestant removes the payload(s) in the absence of officials, the entry shall be disqualified. The official may require that the payload(s) be rechecked if there is any question as to whether or not mass may have been lost from any payload, and shall disqualify the entry if it no longer complies with Rule 25.2.

25.7 Classes

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

Motor Class	Payloads Carried	Weighting Factor
A	1	16
B	1	15
C	1	16
D	1	17
E	2	18
F	3	20
G	4	22

25.8 Non-Return

If the portion of the model containing the payload cannot be returned to the officials, the entry shall be disqualified. Rule 10.4 does not apply.

26 EGG LOFTING ALTITUDE COMPETITION

26.1 Scope

Egg Lofting Altitude Competition comprises six events open to model rockets that carry, as a totally enclosed payload, one raw USDA Large hen's egg, with a mass of no less than 57 grams and no more than 63 grams, and measuring no more than 45 millimeters in diameter. If the model is staged, the egg must be enclosed in the uppermost stage of the model. The purpose of this competition is to carry an exceedingly fragile payload to as high an altitude as possible and to recover the payload without damage. The egg is intended to simulate (in miniature) an astronaut, who must be properly cushioned and restrained to withstand the forces of acceleration and the shock of landing. No material may be affixed to the egg (e.g., glue or tape).

26.2 Eggs

The Safety Check Officer or other official shall provide the egg to each contestant presenting his/her entry for pre-launch safety check. Each egg shall be numbered, and that number shall be recorded on the contestant's flight card. A contestant shall not be required to use an egg that has been previously lofted by another contestant.

26.3 Return

Following the flight, the contestant shall present his/her entry as recovered and, in the presence of an official, shall remove the egg. The official shall determine the extent of damage to the egg. If the official cannot examine the egg, the entry shall be disqualified. If the contestant removes the egg in the absence of officials, or breaks the egg in the process of removing it from the model, the entry shall be disqualified. If the shell of the egg is broken or cracked, the entry shall be disqualified. All entries must comply with the provisions of Rule 16.7.

26.4 Classes

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

Motor Class	Weighting Factor
B	19
C	18
D	19
E	20
F	22
G	24

26.5 Non-Return

If the portion of the model containing the egg cannot be returned to the officials, the entry shall be disqualified. Rule 10.4 does not apply.

27 DUAL EGG LOFTING ALTITUDE COMPETITION

27.1 Scope

Dual Egg Lofting Altitude Competition comprises five events open to model rockets that carry, as a totally enclosed payload, two raw USDA Large hen's eggs, each with a mass of no less than 57 grams and no more than 63 grams, and measuring no more than 45 millimeters in diameter. If the model is staged, the eggs must be enclosed in the uppermost stage of the model. The purpose of this competition is to carry an exceedingly fragile payload to as high an altitude as possible and to recover the payload without damage. The eggs are intended to simulate (in miniature) astronauts, who must be properly cushioned and restrained to withstand the forces of acceleration and the shock of landing. No material may be affixed to the eggs (e.g., glue or tape).

27.2 Eggs

The Safety Check Officer or other official shall provide the eggs to each contestant presenting his/her entry for pre-launch safety check. Each egg shall be numbered, and the numbers shall be recorded on the contestant's flight card. A contestant shall not be required to use an egg that has been previously lofted by another contestant. The Safety Check Officer shall also perform an inspection of the recovery system to insure that it is sufficient to safely recover the model, and will perform properly.

27.3 Return

Following the flight, the contestant shall present his/her entry as recovered and, in the presence of an official, shall remove the eggs. The official shall determine the extent of damage to the eggs. If the official cannot examine the eggs, the entry shall be disqualified. If the contestant removes the eggs in the absence of officials, or breaks either egg in the process of removing them from the model, the entry shall be disqualified. If the shell of any egg is broken or cracked upon removal of the egg, the entry shall be disqualified. All entries must comply with the provisions of Rule 16.7.

27.4 Classes

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

Motor Class	Weighting Factor
C	30
D	29
E	29
F	30
G	31

27.5 Non-Return

If the portion of the model containing the eggs cannot be returned to the officials, the entry shall be disqualified. Rule 10.4 does not apply.

28 – 29 Reserved for future events

DURATION EVENTS

30 PARACHUTE DURATION COMPETITION

30.1 Scope

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

30.2 Classes

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

Motor Class	Weighting Factor	Multi-Round Maximum
1/8A	7	40 sec
1/4A	7	60 sec
1/2A	7	120 sec
A	7	180 sec
FAI A	7	300 sec
B	8	240 sec
C	9	300 sec

31 STREAMER DURATION COMPETITION

31.1 Scope

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

31.2 Streamer Specifications

A streamer is defined for this event as a piece of cloth, plastic film, or paper, whose shape is approximately rectangular. The streamer must have a length- to-width ratio of five to one (5:1) or greater and have a minimum area of 100 square centimeters. The streamer and model must be connected by only a single line or cord, attached at the narrow end of the streamer. The cord may not be connected to either the streamer or the model at more than one point (e.g., no yokes are permitted). The streamer may not be cut, slit, or otherwise altered in such a manner as to affect its nature as a simple connected plane.

31.2.1 FAI Streamers

For FAI class streamer duration, the streamer must have a length-to-width ratio of ten to one (10:1) or greater. The cord attaching the streamer to the model may be attached to a loop of thread which is attached to each edge of the narrow end of the streamer.

31.3 Assembly

Several pieces of material may be assembled into a single streamer to overcome length restrictions imposed by the length of commercially available material. All pieces of the streamer shall consist of identical material (e.g., the same type of crepe, plastic, or so on). Lengths of streamer material assembled in this manner must be joined in a manner so as to keep the aerodynamic effects of the joint as small as possible. All such joints shall be parallel to the narrow axis of the streamer.

31.4 Classes

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

Motor Class	Weighting Factor	Multi-Round Maximum
1/8A	8	20 sec
1/4A	8	30 sec
1/2A	8	60 sec
A	8	120 sec
FAI A	8	180 sec
B	9	180 sec
C	10	240 sec
D	11	300 sec
E	12	300 sec
F	13	300 sec
G	14	300 sec

32 HELICOPTER DURATION COMPETITION

32.1 Scope

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

32.2 Autorotation

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

32.3 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.

32.4 Classes

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

Motor Class	Weighting Factor	Multi-Round Maximum
1/8A	21	20 sec
1/4A	20	30 sec
1/2A	19	60 sec
A	20	120 sec
FAI A	20	180 sec
B	21	180 sec
C	22	240 sec
D	23	300 sec
E	24	300 sec
F	26	300 sec
G	27	300 sec

33 SUPER-ROC DURATION COMPETITION

33.1 Scope

Super-Roc Duration Competition comprises ten events open to single-staged model rockets whose body length is no less than the minimum allowed for the classes of the event. The purpose of this competition is to achieve the greatest duration possible with the longest rocket possible without impairing the structural integrity of the rocket.

33.2 Structural Failure

An entry that comes apart, bends so as to crimp the body, or has a similar structural failure prior to ejection shall be disqualified.

33.3 Construction

Entries with bodies or significant structural parts made from hard or potentially unsafe material (e.g., hardwood doweling or fiberglass shaft) shall not be allowed, under the provisions of Rule 1.1.

33.4 Scoring

Super-Roc Duration Competition shall be scored as follows: the length in centimeters of the model, as measured from the tip of the nose cone to the end of the motor nozzle, up to the maximum length for that category, shall be awarded as static points. If the model has more than one motor, the length shall 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 model in seconds shall be awarded as flight points. The static points and flight points thus obtained shall be multiplied to determine the total points for each flight. The contestant achieving the highest score is the winner. When posting, printing, or maintaining contest results or performance records, the model's time in seconds must be shown with its composite score.

33.5 Classes

This competition is divided into classes based on the permissible total impulse of the motor(s). The following classes of Super-Roc Duration Competition are established:

Motor Class	Minimum Length (centimeters)	Maximum Length (centimeters)	Weighting Factor
1/8A	12.5	25	12
1/4A	25	50	13
1/2A	50	100	13
A	75	150	13
B	100	200	14
C	125	250	15
D	150	300	16
E	175	359	18
F	200	400	19
G	225	450	20

34 EGG LOFTING DURATION COMPETITION

34.1 Scope

Egg Lofting Duration Competition comprises six events open to single-staged model rockets that carry, as a totally enclosed payload, one raw USDA Large hen's egg, with a mass of no less than 57 grams and no more than 63 grams; and measuring no more than 45 millimeters in diameter. The purpose of this competition is to carry an exceedingly fragile payload for as long a time as possible and to recover the payload without damage. The egg is intended to simulate (in miniature) an astronaut, who must be properly cushioned and restrained to withstand the forces of acceleration and the shock of landing. No material may be affixed to the egg (e.g., glue or tape).

34.2 Eggs

The Safety Check Officer or other official shall provide the egg to each contestant presenting his/her entry for pre-launch safety check. Each egg shall be numbered, and that number shall be recorded on the contestant's flight card. A contestant shall not be required to use an egg that has been previously flown by another contestant.

34.3 Return

Following the flight, the contestant shall present his/her entry as recovered and, in the presence of an official, shall remove the egg. The official shall determine the extent of damage to the egg. If the official cannot examine the egg, the entry will be disqualified. If the contestant removes the egg in the absence of officials, or breaks the egg in the process of removing it from the model, the entry shall be disqualified. If the shell of the egg is broken or cracked, the entry shall be disqualified. Any model that cannot be returned to the officials shall be disqualified. Rule 10.4 does not apply. All entries must comply with Rule 16.7 (no catching of models is allowed for official flights).

34.4 Classes

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

Motor Class	Weighting Factor
B	17
C	16
D	17
E	18
F	29
G	22

34.5 Scoring

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

35 DUAL EGG LOFTING DURATION COMPETITION

35.1 Scope

Dual Egg Lofting Duration Competition comprises five events open to single stage model rockets that carry as a totally enclosed payload, two raw USDA Large hen's eggs each with a mass of no less than 57 grams and no more than 63 grams; and measuring no more than 45 millimeters in diameter.

35.2 Eggs

The Safety Check Officer or other official shall provide two eggs to each contestant presenting his/her entry for pre-launch safety check. Both eggs shall be numbered, and those numbers shall be recorded on the contestant's flight card.

35.3 Return

Following the flight, the contestant shall present his/her entry as recovered and, in the presence of an official, shall remove both eggs. The official shall determine the extent of damage to the eggs. If the official cannot examine the eggs, the entry will be disqualified. If the contestant removes the eggs in the absence of officials, or breaks the eggs in the process of removing them from the model, the entry will be disqualified. If the shell of either egg is broken or cracked, the entry shall be disqualified. Rule 10.4 does not apply. All entries must comply with Rule 16.7 (no catching of models is allowed for official flights).

35.4 Classes

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

Motor Class	Weighting Factor
C	28
D	27
E	27
F	28
G	29

35.5 Scoring

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

36 BOOST GLIDER DURATION COMPETITION

36.1 Scope

Boost Glider Duration Competition comprises of eleven events open to any model rocket, one portion of which returns to the ground in stable, gliding flight supported by aerodynamic lifting surfaces which sustain that portion against gravity. If the entry is staged, the gliding portion must be part of the uppermost stage, and must not be deployed until that stage has burned out. The entry may separate into multiple pieces; only the gliding portion is timed and only the timed gliding portion needs to be returned to satisfy Rule 15.10. Models 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.

36.2 Disqualifications

An entry that descends with parachute and/or streamer recovery device(s) permanently attached to the gliding portion of the model shall be disqualified. However, other portions of an entry may deploy parachutes and/or streamers for recovery purposes.

If the glider entry accidentally rips the motor pod's recovery streamer and the streamer attaches itself to the glider, the entry may be qualified depending on the RSO ruling that the entry still glided and was not disqualified for other reasons.

36.3 Classes

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

Motor Class	Weighting Factor	Multi-Round Maximum
1/8A	19	30 sec
1/4A	18	45 sec
1/2A	17	90 sec
A	18	120 sec
FAI A	18	180 sec
B	19	240 sec
C	20	270 sec
D	22	270 sec
E	23	300 sec
F	25	300 sec
G	26	300 sec

37 ROCKET GLIDER DURATION COMPETITION

37.1 Scope

Rocket Glider Duration Competition comprises ten 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. Models 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.

37.2 Disqualification

Any entry that descends with parachute and/or streamer recovery device(s) attached shall be disqualified.

37.3 Classes

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

Motor Class	Weighting Factor	Multi-Round Maximum
1/8A	21	30 sec
1/4A	20	45 sec
1/2A	19	90 sec
A	20	120 sec
B	21	180 sec
C	22	240 sec
D	24	270 sec
E	25	300 sec
F	27	300 sec
G	28	300 sec

38 FLEX-WING BOOST GLIDER DURATION COMPETITION

38.1 Scope

Flex-Wing Boost Glider Duration Competition 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, and must not be deployed until that stage has burned out. The entry may separate into multiple pieces; only the gliding portion is timed and only the timed gliding portion needs to be returned to satisfy Rule 15.10. The purpose of this competition is to achieve the longest flight duration time.

38.2 Disqualification

Any entry that descends with parachute and/or streamer recovery device(s) attached to the gliding portion of the model shall be disqualified. However, other portions of an entry may deploy parachutes and/or streamers for recovery purposes.

38.3 Classes

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

Motor Class	Weighting Factor	Multi-Round Maximum
1/8A	19	30 sec
1/4A	18	45 sec
1/2A	17	90 sec
A	18	120 sec
B	19	180 sec
C	20	240 sec
D	22	270 sec
E	23	300 sec
F	25	300 sec
G	26	300 sec

39 PRECISION DURATION COMPETITION

39.1 Scope

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

39.2 Classes

The three classes of Precision Duration are:

39.2.1 Predicted Duration

The contestant must predict the duration in seconds that the model will achieve. This Predicted Duration shall be recorded on the flight card and given to the Contest Director or his/her deputy prior to any official flight by the contestant at the meet. The minimum duration prediction allowable is 30 seconds.

Weighting Factor	8
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39.2.2 Set Duration

The Contest Director shall set the target duration when the meet is sanctioned. This value shall appear on the sanction form and all appropriate contest information. The target duration shall be a multiple of 5 seconds between 30 and 120 seconds. All contestants shall attempt to achieve this same Set Duration.

Weighting Factor	8
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39.2.3 Random Duration

The Contest Director shall randomly select the target duration just prior to when the event is flown, by draw, dice, or other random device. The target duration shall be a multiple of 5 seconds between 30 and 120 seconds. All contestants shall attempt to achieve this same Random Duration.

Weighting Factor	10
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39.3 Order

A contestant entered in Precision Duration Competition shall make his/her official flight in Precision Duration before flying any other event requiring timing.

39.4 Number of Flights

Entries shall be allowed only one official flight in Precision Duration Competition. In the case of a timer malfunction, any flight allowed under Rule 15.11 shall be made by the same model, and no changes in configuration, motor type, or prediction shall be allowed.

39.5 Control

The entry may not be radio controlled. The entry shall not contain a dethermalizer or other device whose purpose is to cause the model to land after a predetermined amount of elapsed time. No human intervention (e.g., catching the model) shall be allowed between launch and touchdown. If the model is not allowed to land naturally, the entry shall be disqualified. Any model that drifts out of sight of the timers while still in the sky shall earn only flight points.

39.6 Scoring

Precision Duration Competition shall be scored as follows: the achieved duration of the model shall be divided by the target duration, and the result multiplied by 100. This figure shall 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 contestant whose score comes closest to zero shall be declared the winner.

39.7 Weighting Factor

The Weighting Factor for Precision Duration and Set Duration Competition is 8. The Weighting Factor for Random Duration is 10.

39.8 Return

The model is not required to be returned to the officials, except as stated in Rule 9.10.

40 – 49 Reserved for future events

CRAFTSMANSHIP EVENTS

50 SCALE COMPETITION

50.1 Scope

Scale Competition 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 vehicle that exhibits maximum craftsmanship in construction, finish, and flight performance.

50.2 Exclusions

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

50.3 Non-Flying Prototypes

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

50.4 Plastic Models

Entries that qualify for Plastic Model Conversion Competition under Rule 55 are specifically excluded from this event. Parts from commercial plastic kits may be used on scale models provided this is pointed out in the data presented with the model for judging.

50.5 Kits

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

50.6 Serial-Numbered Prototype

The contestant 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 scaling. However, the contestant shall make every reasonable attempt to model a specific prototype, since any generalization may detract from his/her score.

50.7 Data

The contestant must supply data to substantiate their model's adherence to scale in dimension, shape, color, and paint pattern.

50.8 Stages

If the prototype is a multi-staged vehicle, the scale model may be designed so that some or all of the upper stages are inoperable dummies. However, a scale model of only the upper stages of a multi-staged 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 configuration has flown separately, alone, and as a vehicle itself.

50.9 Transparent Fins

If the prototype is not stabilized by means of fins, or if the scaled fins are not of sufficient size to ensure the stable flight of the model, the scale model may be fitted with transparent plastic fins to make it stable in flight. However, the transparent fins and their attachment shall be judged for craftsmanship along with the model.

50.10 Flight

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

50.11 Judging

Each entrant shall be judged using the standard form Scale Model Judging Sheet that is available from the NAR Contest Board.

50.12 Static Points

Static points shall be awarded according to the following schedule:

50.12.1 Scale Data: 50 points

Points shall 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 modeler 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 only if the reproduction is equal in clarity to the original. Any entry not accompanied by the minimum allowable data as listed above shall be disqualified. In addition, the modeler should make an effort to include in the table (or drawing) any additional dimensions (both prototype and scaled) that he/she has tried to accurately scale. Points may be deducted if the scale packet contains data not pertinent to the prototype model, or is presented in such a manner as to complicate judging. The entry shall be judged by the data presented in the scale packet.

50.12.2 Accuracy of Major Dimensions: 200 points

Major dimensions include dimensions required under Rule 50.12.1, as well as dimensions of subassemblies, location of details, location of paint pattern, and so on. At least 5 dimensions shall be checked for accuracy. It is recommended that calipers be used to check small scale dimensions and that Judges attempt to measure the main model dimensions to at least 0.5 millimeters. Points shall be deducted according to the percentage of deviation from the scale dimensions. Model dimensions so small that they cannot be measured to better than a 1% tolerance should not be measured by the judges, but should appear scale-like.

50.12.3 Accuracy of Color and Markings: 100 points

The color and texture (e.g., flat, glossy) of the paint should conform to the data and photographs. Lettering and insignia, if applicable, should be scaled and properly reproduced. Paint patterns should be properly proportioned.

50.12.4 Accuracy 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 properly scaled.

50.12.5 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, the proper curving of curved lines, and edges made properly sharp or rounded as shown in the substantiating data. The finish should be free of fingerprints, brush strokes, runs, or other unintentional blemishes, and the paint pattern should be well defined. The details should be precise, and neither more nor less obvious than on the prototype.

50.12.6 Degree of Difficulty: 200 points

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

50.13 Flight Characteristics: 300 points

Points for Flight Characteristics shall be awarded as follows:

50.13.1 Mission: 200 points

Mission points are awarded for appropriate and scale-like operation of the model during flight. Examples of such operations are staging, simulated cloud seeding, operation of electronic payload, and smoke ejection. Any such operation must comply fully with the safety standards set forth in this NAR Sporting Code. If it does not, the entry shall be disqualified. The RSO is the only official who may judge the safety qualities of the operation.

50.13.2 General Flight: 100 points

General flight points are awarded for proper operation of the model 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 these are covered under Mission points. However, if the general flight performance of the model is adversely affected by the failure of one or more of these aspects, points may be deducted from General Flight.

50.14 Scoring

Scale Competition shall be scored as follows: the points awarded to the entry in static judging shall be added to the points awarded to the entry in flight. The contestant receiving the highest score is the winner.

50.15 Damage

Damage shall be judged cumulatively with each flight, assessed from the judged condition of the model to the condition presented to the judge post-flight. The only exception to this is damage caused in the course of a catastrophic failure under Rule 11.5, in which case such damage shall not be counted against the flight points.

Weighting Factor	32
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51 SCALE ALTITUDE COMPETITION

51.1 Scope

Scale Altitude Competition comprises ten 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 vehicle, that exhibits maximum craftsmanship in construction, finish, and flight performance; and to achieve the greatest possible altitude with the model.

51.2 Judging

The model rocket and its flight must comply with the rules of the Scale Competition (Rule 50) and shall be judged for scale qualities and awarded scale points according to the rules for Scale Competition.

51.3 Disqualification

The Judges may disqualify any model that, in their opinion, does not show sufficient scale substantiation or evidence of the normal level of workmanship required for a scale model under the provisions of the Scale Competition. The intent of this rule is to eliminate from competition any entry for which scale qualities have been grossly subordinated in favor of altitude performance characteristics.

51.4 Scoring

Scale Altitude Competition shall be scored as follows: the total number of scale points awarded to the entry shall be added to the altitude in meters achieved by the entry. The contestant achieving the highest score shall be declared the winner.

51.5 Damage

Damage shall be judged cumulatively with each flight, assessed from the judged condition of the model to the condition presented to the judge post-flight. The only exception to this is damage caused in the course of a catastrophic failure under Rule 11.5, in which case such damage shall not be counted against the flight points.

51.6 Classes

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

Motor Class	Weighting Factor
1/8A	25
1/4A	26
1/2A	27
A	28
B	29
C	30
D	31
E	32
F	33
G	34

52 SUPER SCALE COMPETITION

52.1 Scope

Super Scale Competition comprises a single event open to any entry consisting of:

- A model rocket that is a true scale model of an existing or historical guided missile, rocket vehicle, or space vehicle; and
- A launching complex that is a true scale model of the launching complex used by the prototype of the scale model rocket. Launching complex elements that do not directly support or guide the rocket (e.g., umbilical towers or buildings) do not have to be modeled. Their inclusion would, however, contribute to the score.

52.2 Purpose

The purpose of this competition is to produce an accurate flying replica of a real rocket vehicle that has flown under rocket power, and an accurate working replica of its actual launching complex; both of which exhibit maximum craftsmanship in construction, finish, and performance.

52.3 Judging

The model rocket and its flight must comply with the rules of the Scale Competition (Rule 50) and shall be judged for scale qualities and awarded scale points according to the rules for Scale Competition.

52.4 Launching Complex Judging

The launching complex and the model rocket shall be judged for scale qualities at the same time.

52.5 Launching Complex Modeling

The launching complex shall be of the same prototype (or round) as that used to launch the particular serial-numbered prototype rocket entered by the modeler.

52.6 Launching Complex Safety

A model rocket launching device satisfying the requirements of Rules 5.4, 5.5, and 5.6, shall be built as an integral part of the scale launching complex.

52.7 Points

Scale points shall be awarded to the launching complex according to the following schedule:

52.7.1 Scale Data: 50 points

Points will 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
- Color pattern (documented either in writing or by photographs)
- One clear photograph, halftone, or photo-reproduction
- Substantiation that the particular launcher modeled was indeed used to launch the prototype rocket chosen
- For all dimensions that the modeler has attempted to accurately scale, both the actual (prototype) dimensions and the scaled (model) dimensions, presented in a table or on a drawing

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.

Any entry not accompanied by the minimum allowable data as listed above shall receive zero scale points for the launching complex. In addition, the data presented should show the details of the launch complex in order to receive maximum points. Points may be deducted if the scale packet contains data not pertinent to the prototype launcher, if the data is presented in such a manner as to complicate judging, if the scale indicated on the data does not match the scale of the model launching complex, or if the launching complex is not to the same scale as the model rocket.

52.7.2 Accuracy of Major Dimensions: 200 points

Major dimensions include dimensions of subassemblies, location of details, location of paint pattern, and so on. At least 5 dimensions shall be checked for accuracy. It is recommended that calipers be used to check small scale dimensions and the judges attempt to measure the main launcher dimensions to at least 0.5 millimeters. Points shall be deducted according to the percentage of deviation from the scale dimensions. Launcher dimensions so small that they cannot be measured to better than a 1% tolerance should not be measured by the judges, but should appear scale-like.

52.7.3 Accuracy of Color and Markings: 50 points

The color and texture (e.g., flat, glossy) of the paint should conform to the data and photographs. Lettering and insignia, if applicable, should be scaled and properly reproduced. Paint patterns should be properly proportioned.

52.7.4 Accuracy of Details: 50 points

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

52.7.5 General Appearance: 100 points

The launch complex should look like the photo(s) of the prototype launcher. No points shall be deducted for neatly constructed modifications to the launching complex that are necessary to effect the safe and proper launching of a model rocket.

52.7.6 Craftsmanship: 250 points

Points will be awarded for neatness, care in construction, craftsmanship of details, quality of finish, and construction of movable parts (if applicable). Consideration should be given to the invisibility of wood grain and the proper curving of curved parts. The finish should be free of fingerprints, brush strokes, runs, or other unintentional blemishes; and the paint pattern should be well defined. The details should be precise, and neither more nor less obvious than on the prototype. In addition, consideration should be given for the ingenuity and care with which the launching device is built into the launching complex.

52.7.7 Degree of Difficulty: 200 points

Points shall be awarded according to the difficulty experienced by the modeler in building the launching complex and adapting it for the launching of the scale model rocket. Points to be considered by the Judges include the use of prefabricated parts and details, intricacy of the complex, number of detailed components, difficulty of detailing, difficulty of finishing, parts and details that were individually constructed by the modeler, and difficulty in adapting the complex to launch model rockets. (To facilitate judging, the contestant should point out difficult assemblies or construction problems in his/her scale packet.)

52.7.8 Operation: 100 points

Points shall be awarded for success of operation under launch conditions, lack of damage under launch, and realism. In addition, points shall be awarded for working parts operated manually or by automatic or remote control under launch conditions.

52.8 Scoring

Super Scale Competition shall be scored as follows: the points awarded the model rocket in static judging, the points awarded the model rocket in flight, and the points awarded to the launching complex shall be summed. The contestant receiving the highest score is the winner.

52.9 Damage

Damage shall be judged cumulatively with each flight, assessed from the judged condition of the model to the condition presented to the judge post-flight. The only exception to this is damage caused in the course of a catastrophic failure under Rule 11.5, in which case such damage shall not be counted against the flight points.

Weighting Factor	40
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53 SPORT SCALE COMPETITION

53.1 Scope

Sport Scale Competition comprises three events open to any model rocket 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 a flying replica of a real rocket vehicle that exhibits maximum craftsmanship in construction, finish, and flight performance. Sport Scale Competition differs from Scale Competition (Rule 50) in that the dimensions of the model are not directly measured.

53.2 Classes

The following classes of Sport Scale shall exist:

53.2.1 Sport Scale

Any size model may be entered.

53.2.2 Giant Sport Scale

The model must be at least 100 centimeters in overall length or at least 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 once 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.

53.2.3 Peanut Sport Scale

The model must be no more than 30 centimeters in overall length or no more than 2 centimeters in body diameter. When judging this class, the increased difficulty of building a very small model should be considered.

53.3 Exclusions

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

53.4 Non-Flying Prototypes

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

53.5 Plastic Models and Kits

Entries that qualify for Plastic Model Conversion Competition under Rule 55 are specifically excluded from this event. Parts from commercial plastic kits may be used on Sport Scale models, provided this is pointed out in the data presented with the model for judging.

53.6 Data

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

53.7 Stages

If the prototype is a multi-staged vehicle, the scale model may be designed so that some or all of the upper stages are inoperable dummies. However, a scale model of only the upper stages of a multi-staged 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 configuration has flown separately, alone, and as a vehicle itself.

53.8 Transparent Fins

If the prototype is not stabilized by means of fins, or if the scaled fins are not of sufficient size to ensure the stable flight of the model, the scale model may be fitted with transparent plastic fins to make it stable in flight. However, the transparent fins and their attachment shall be judged for craftsmanship along with the model.

53.9 Judging

Models shall 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.

53.10 Details

Details that are not visible during judging (e.g., dummy engines, hidden interior assemblies) shall not be considered in scoring the entry.

53.11 Flight

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

53.12 Static Points

Static points shall be awarded according to the following schedule:

53.12.1 Similarity of Outline: 200 points

The contestant is required to submit data to substantiate his/her model'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

Any entry not accompanied by the minimum allowable data as listed above shall be disqualified. The Judges may disqualify any entry that, in their opinion, is accompanied by substantiation data of such poor quality as to fail to convey a satisfactory impression of the outline and general configuration of the prototype.

53.12.2 Finish, Color, and Markings: 200 points

The contestant should submit data to substantiate his/her model's fidelity to the prototype. Suggested options include:

- 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, from a reliable 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. This drawing may be neatly made by the modeler.

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

53.12.3 Degree of Difficulty: 100 points

Points shall be awarded according to the difficulty experienced by the modeler in building the model and adapting it for flight. Minor consideration should be given to whether the model was built from scratch or a kit. Points should be awarded for parts and details that were individually constructed by the modeler. (To facilitate judging, the contestant should point out difficult assemblies or construction problems in his/her substantiation data packet.)

53.12.4 Craftsmanship: 300 points

Points will be awarded for neatness, care in construction, craftsmanship of visible details, and quality of finish. Consideration should be given to the invisibility of body seams and wood grain, the proper curving of curved lines, and edges made properly sharp or rounded as visible from the substantiating data. The finish should be free of fingerprints, brush strokes, runs, or other unintentional blemishes; and the paint pattern should be well defined. The details should be precise, and neither more nor less obvious than on the prototype.

53.13 Flight Characteristics: 300 points

Flight points shall be awarded according to the following schedule:

53.13.1 Mission: 200 points

Mission points are awarded for appropriate and scale-like operation of the model during flight. Examples of such operations are staging, simulated cloud seeding, operation of electronic payload, and smoke ejection. Any such operation must comply fully with the safety standards set forth in this NAR Sporting Code. If it does not, the entry shall be disqualified. The RSO is the only official who may judge the safety qualities of the operation.

53.13.2 General Flight: 100 points

General Flight points are awarded for proper operation of the model 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 these are covered under Mission points; however, if the general flight performance of the model is adversely affected by the failure of one or more of these aspects, points may be deducted from General Flight.

53.14 Scoring

Sport Scale Competition shall be scored as follows: the points awarded to the entry in static judging shall be added to the points awarded to the entry in flight. The contestant receiving the highest score is the winner.

53.15 Damage

Damage shall be judged cumulatively with each flight, assessed from the judged condition of the model to the condition presented to the judge post-flight. The only exception to this is damage caused in the course of a catastrophic failure under Rule 11.5, in which case such damage shall not be counted against the flight points.

Weighting Factor	20
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54 SPACE SYSTEMS COMPETITION

54.1 Scope

Space Systems Competition comprises a single event open to any entry that closely resembles an existing or historical guided missile, rocket vehicle, or space vehicle, that has flown under rocket power, simulates in-flight performance of the prototype vehicle, and optionally includes a launcher. The purpose of this competition is to duplicate in miniature the full-scale operation of a sounding rocket or space vehicle and its launch complex.

Operation simulations may include, but are not limited to: Egg Loft Competition simulating astronauts or cosmonauts, Precision Predicted Altitude achieving the scale altitude of the prototype, Precision Predicted Duration achieving the flight duration of the prototype, Spot Landing Competition simulating planned recovery, clustering, staging, and deployments.

54.2 Judging

The model rocket and its flight must comply with the rules of Sport Scale Competition (Rule 53) and shall be judged for static scale qualities according to the rules for Sport Scale Competition (Rule 53.12).

54.3 Launcher

Each entry may be accompanied by its own launcher which shall closely resemble the launcher of the prototype. If such a launcher is entered, it shall be judged for scale qualities at the same time and in the same manner as the model.

54.4 Points

All entries (including launchers if entered) shall be judged before flight for static points. Each model shall be judged for static scale qualities according to the rules for Sport Scale Competition (Rule 53.12). The model's static score shall be one tenth (1/10) the Sport Scale static score.

54.5 Flight

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

54.6 Additional Points

54.6.1 Flight Simulation: 200 points

Each model can be made to simulate the prototype vehicle's operation in any safe manner. The modeler must provide documentation that the feature being simulated is representative of the prototype's operation. Before flight, the modeler must provide a written flight plan listing those simulations to be attempted. Flight points may be awarded from a minimum of 0 to a maximum of 100 points from any single simulation according to the following schedule.

- Egg Loft: 25 points per egg. Up to one egg per astronaut/cosmonaut. If any egg is cracked, the flight shall be disqualified.
- Predicted Altitude: 50 points minus the score accumulated by Precision Predicted Altitude (Rule 22.6). Prediction must be the actual or scale prototype altitude.
- Predicted Duration: 50 points minus the score accumulated by Precision Predicted Duration (Rule 39.6). Prediction must be the actual or scale prototype duration.
- Spot Landing: 50 points minus the score accumulated by Spot Landing (Rule 60.6).
- Multi-stage: 50 points per stage after first stage.
- Cluster: 20 points per motor, -20 points per misfire.
- Deployment: 50 points per simulated action.
- Data transmission/photo/instrumentation: 50 points.
- Launch from scale launch complex: 50 points. The launch complex shall be awarded points for accuracy, complexity, and craftsmanship.
- Other simulations of rocket or launcher operations approved by the flight judges or the Contest Director: 50 points each.

54.7 Scoring

Space Systems Competition shall be scored as follows: the points awarded to the entry in Static judging shall be added to the points awarded to the entry in Flight Simulation. The contestant receiving the highest score is the winner.

54.8 Damage

Damage shall be judged cumulatively with each flight, assessed from the judged condition of the model to the condition presented to the judge post-flight. The only exception to this is damage caused in the course of a catastrophic failure under Rule 11.5, in which case such damage shall not be counted against the flight points.

Weighting Factor	28
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55 PLASTIC MODEL CONVERSION COMPETITION

55.1 Scope

Plastic Model Conversion Competition comprises a single event open to model rockets that have been assembled from commercially available plastic 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 model must be one that the manufacturer did not produce as a model to be flown; and it must be modified for safe and stable flight by the contestant. The purpose of this competition is to produce a flying model from a kit originally intended as a static model; that shows maximum craftsmanship in construction, finish, and flight performance. The entry must be representative of the kit chosen, as designed by the manufacturer. It is not the purpose of this competition to allow entries which represent original and/or imaginative designs on the part of the contestant that incidentally are executed using parts from plastic kits as a basis.

55.2 Construction

With the exception of modifications necessary to convert the model for flight, the basic structure and configuration of the model must be as designed by the manufacturer of the kit. Details may be constructed from parts obtained from other commercially available plastic kits, from plastic sheet, tubing, or shapes, and other materials as desired. Parts and assemblies necessary to convert the model for flight may be made of any safe material, and may be obtained from any source.

55.3 Transparent Fins

For stability purposes, the model may be fitted with transparent plastic fins to make it stable in flight. However, the transparent fins and their attachment shall be judged for craftsmanship along with the model.

55.4 Flight

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

55.5 Static Points

Static points shall be awarded according to the following schedule:

55.5.1 Craftsmanship: 500 points

Points will be 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

55.5.2 Degree of Difficulty: 300 points

Points shall be awarded according to the difficulty experienced by the modeler 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 contestant.
- Difficulty of stabilizing model: 50 points
- Difficulty of adapting the model for flight: 50 points

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

55.6 Flight Characteristics: 300 points

Flight points shall be awarded according to the following schedule:

55.6.1 Mission: 200 points

Mission points are awarded for appropriate and scale-like operation of the model during flight. Examples of such operations are staging, simulated cloud seeding, operation of electronic payload, and smoke ejection. Any such operation must comply fully with the safety standards set forth in this NAR Sporting Code. If it does not, the entry shall be disqualified. The RSO is the only official who may judge the safety qualities of the operation.

55.6.2 General Flight: 100 points

General Flight points are awarded for proper operation of the model 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 these are covered under Mission points; however, if the general flight performance of the model is adversely affected by the failure of one or more of these aspects, points may be deducted from General Flight.

55.7 Scoring

Plastic Model Conversion Competition shall be scored as follows: the points awarded to the entry in static judging shall be added to the points awarded to the entry in flight. The contestant receiving the highest score is the winner.

55.8 Damage

Damage shall be judged cumulatively with each flight, assessed from the judged condition of the model to the condition presented to the judge post-flight. The only exception to this is damage caused in the course of a catastrophic failure under Rule 11.5, in which case such damage shall not be counted against the flight points.

Weighting Factor	26
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56 CONCEPT SPORT SCALE COMPETITION

56.1 Purpose

Concept Sport Scale Competition is a variation of Sport Scale. The purpose of this competition is to produce a flying replica of either a fictional or a seriously proposed, but unflown rocket vehicle that differs from Sport Scale Competition (Rule 53) only in the nature of the prototype and substantiation data.

56.2 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

56.3 Plastic Models

Entries that qualify for Plastic Model Conversion Competition under Rule 55 are specifically excluded from this event.

56.4 Substantiation Data

As with Sport Scale, the contestant must supply data to substantiate the model's adherence to scale in shape, color, and paint pattern. Data must derive from the work of science fiction or from a published serious proposal. A serious proposal is one by an established aerospace professional, institution or company.

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 proposal prototypes, photos and drawings of models produced by the proposing companies or institutions are acceptable. If color or markings data is not available, the modeler may document markings for a similar design proposed or flown in the same era. Drawings or photographs depicting flying model kits are not adequate.

56.5 Scoring

Scoring is the same as in the Sport Scale (Rule 53) event.

56.5.1 Similarity of Outline: 200 points

56.5.2 Finish, Color, and Markings: 200 points

56.5.3 Degree of Difficulty: 100 points

56.5.4 Craftsmanship: 300 points

56.5.5 Flights Characteristics: Mission: 200 points

56.5.6 Flight Characteristics: General Flight: 100 points

56.6 Flight

Each entry shall make a safe, stable flight. If the entry does not make a safe, stable flight, the entry shall be disqualified.

56.7 Weighting Factor

Weighting factor is the same as in the Sport Scale event.

56.8 Damage

Damage shall be judged cumulatively with each flight, assessed from the judged condition of the model to the condition presented to the judge post-flight. The only exception to this is damage caused in the course of a catastrophic failure under Rule 11.5, in which case such damage shall not be counted against the flight points.

Weighting Factor	20
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MISCELLANEOUS EVENTS

60 SPOT LANDING COMPETITION

60.1 Scope

Spot Landing Competition 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 Control

The entry may not be remotely controlled or remotely guided.

60.3 Recovery

Each entry must comply fully with the provisions of Rule 3.5.

60.4 Separation

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

60.5 Number of Flights

Each entry shall be allowed only one official flight. No practice flights may be made.

60.6 Scoring

Spot Landing Competition shall be scored as follows: the distance between the tip of the nose cone (or motor nozzle if the model has no nose cone) of the model and the target spot shall be measured by the officials. If the tip of the nose cone lands more than 50 meters from the spot, the model shall not place, but shall receive flight points; otherwise, the model shall be given a score equal to its distance in meters. The contestant achieving the smallest score shall be the winner.

60.7 Classes

Spot Landing Competition shall be divided into three classes:

60.7.1 Parachute Spot Landing

Each entry must fully and completely deploy a parachute, with dimensions no less than 15 centimeters square or 15 centimeters in diameter for recovery purposes. Rule 11.9 does not apply to Parachute Spot Landing.

60.7.2 Streamer Spot Landing

Each entry must fully and completely deploy a streamer with dimensions not less than 25 millimeters by 300 millimeters. Rule 11.9 does not apply to Streamer Spot Landing.

60.7.3 Open Spot Landing

Any type of recovery device allowed.

60.8 Non-Return

Any model that cannot be returned to the officials shall be scored as if it had landed over 50 meters from the spot.

Weighting Factor	4
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61 DRAG RACE COMPETITION

61.1 Scope

Drag Race Competition comprises a single event open to single-staged entries. The purpose of this competition is to determine which entry is most successful at meeting the triple criteria of quick ignition and lift-off, low altitude, and long duration.

61.2 Flyoffs

The event is a series of flyoffs (heats) between pairs of entries. The winner of each heat flies against the winner of another heat until the overall winner is determined. An additional flyoff between the losers of the semifinal rounds is to be made to determine third and fourth places.

61.3 Substitution

No substitution of models is permitted during the course of this event, except as specified under the provisions of Rule 11.5.

61.4 Choosing Competitors

The officials shall choose competitors for each flyoff by lot.

61.5 Launching

The model may be launched by either of the following methods:

- Through a common ignition switch operated by the Launch Control Officer; or
- By the contestants themselves, using separate ignition systems.

61.6 Ignition System

Any type of electrically initiated ignition system may be used, provided that it meets the requirements of Rule 9.5.

61.7 Disqualification

An entry that does not fly successfully shall be disqualified.

61.8 Early Start

When a model is launched with a separate ignition system under the control of the contestant, the model must achieve first motion on or after T-0. A model achieving first motion before T-0 shall be disqualified.

61.9 Late Start

A model that does not achieve first motion before T+2 shall be disqualified.

61.10 Scoring

Drag Race Competition shall be scored as follows: the winner of each heat shall be that entry which receives the higher number of points according to the following schedule:

- One point for the first entry to achieve first motion;
- One point for the entry achieving the lower altitude; and
- One point for the entry that touches the ground last. If the entry separates into two or more pieces, the first piece to touch the ground is counted.

The winner of the last heat shall be declared the winner. The loser of the last heat shall receive second place. There shall be a flyoff for third and fourth places between the losers of the semifinal heats.

61.11 Return

The model is not required to be returned to the officials, except as stated in Rule 9.10, and Rule 61.3.

Weighting Factor	2
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62 RADIO CONTROLLED GLIDER COMPETITION

62.1 Scope

Radio Controlled Glider Competition comprises a single event open to any single-staged model rocket, one portion of which is radio controlled during flight, and returns to the ground in stable, gliding flight supported by aerodynamic lifting surfaces which sustain it against gravity. The entry may separate into multiple pieces, only the gliding portion is scored.

The purpose of this competition is to repeatedly achieve specified flight times, and land as close as possible to a designated spot consistently over a series of three flights.

62.2 Recovery

Any entry that descends with parachute and/or streamer recovery device(s) attached to the model shall be disqualified. However, other portions of an entry may deploy parachutes and/or streamers for recovery purposes. Any entry not under full control of its pilot at all times shall be disqualified.

62.3 Target

The contestant must choose their target time, in any 30-second interval from 30 seconds minimum to 8 minutes maximum, prior to any official flight by the contestant at the meet. If unusual weather or field conditions are encountered, the Contest Director may lower the maximum target time. However, if this is known prior to the competition it should be announced in all notices.

Prior to the first flight in the event, the Contest Director shall announce the location of the landing spot. The landing area must be kept clear of persons or other obstacles to a safe landing.

62.4 Timing

It is not the responsibility of the timer to inform the contestant of the time remaining to the target landing time. The contestant may designate another individual to be his/her helper for this event. Either the contestant him/herself or the helper is responsible for keeping the contestant informed of the running official flight time as indicated by the official timer's watch. It is recommended that there be only one official timer for this event.

62.5 Scoring

Radio Controlled Glider Competition shall be scored as follows: officials shall measure the distance between the nose of the model and the target spot. If the tip of the nose lands more than 50 meters from the target, or if the contestant catches or interferes with the landing of the model, the model shall be given a score of 100, otherwise, the model shall be given a score equal to its distance in meters.

The achieved duration of the model shall be divided by the target duration, and the result multiplied by 100. This figure shall 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 distance score shall be added to the time score and the contestant with the lowest total error summed over three flights shall be the winner.

Weighting Factor	32
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63 RESEARCH & DEVELOPMENT COMPETITION

63.1 Scope

Research and Development Competition is open to any NAR member who is performing research, or engineering new developments, in which model rocketry plays a primary part. The purpose of this competition is to stimulate new concepts, approaches, and ideas in:

- Advancing the state-of-the-art of model rocketry; or
- Using model rocketry as a research tool.

Projects previously entered in a meet with a contest factor greater than or equal to the current meet may not be accepted as an entry unless the contestant has demonstrated that significant new work has been done.

63.2 Weighting Factor

This event may be conducted at Conventions as well as at Competition Meets. A Convention director desiring to hold Research and Development Competition shall apply for a contest sanction as described in Rule 6.8. The Convention shall be sanctioned as a Local Meet, with a Contest Factor of 1 and a Weighting Factor equal to the maximum Weighting Factors available at a Local Meet as described in Rule 6.6.

63.3 Proxy

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

63.4 Judging

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

63.5 Entries

Each entry must be accompanied by three copies of a written report, stating in detail

- The objectives of the work
- The approach taken
- List of any related R & D Reports previously entered by the author, if any, with brief summaries
- References to previous work done on the subject, found in research preparatory to this report
- The equipment used
- The facilities used
- The money spent on the project (budget)
- The data collected
- The results obtained
- The conclusions drawn
- Further work that would clarify or extend the results obtained

Note that every report must have these elements in some form to be considered a qualified entry. If the report concerns a book, data compilation, product design, etc., the above elements regarding its development are required.

63.5.5 Copies

Portions of the report which are difficult or expensive to copy, such as color photographs or samples, may be either copied in black and white, or may be replaced in the copies with a note explaining the omission and referring to the primary copy. The primary copy should be clearly marked "original", and copies marked "copy 1" and "copy 2".

63.6 Summary

Each entry shall include, in addition to the detailed report, a separate 250-300 word written summary of the report. The summaries from all the entries shall be sent to the NAR Contest Board by the Contest Director with the meet results. The NAR reserves the right to publish the summary in order to disseminate information on current R&D activities. This in no way is intended to interfere with the contestant's right to publish his/her report or summary.

63.6.5 Right To Publish

By entering his/her R & D report, the author attests that it is his/her own work, and conveys to the NAR the non-exclusive right to publish the summary and/or the report in Sport Rocketry Magazine and/or in other NAR publications. 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.

63.7 Oral Presentation

The contestant 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 contestant shall not be interrupted. No oral comments shall be made by anyone until the presentation is complete and the contestant asks for questions. At this time, the Judges and members of the audience may question the contestant concerning his/her project for a time not to exceed ten minutes.

63.8 Required Presentation

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

63.9 Demonstration

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

63.10 Safety

If any entry does not fully comply with the safety standards set forth in this NAR Sporting Code, the contestant must present to the RSO evidence that the entry is really safe in operation. The RSO is the only official who may judge the safety qualities of a project.

63.11 Budget and Facilities

Contestant must state in his/her written report or oral presentation how much money was spent on the project, and what facilities were available to him/her to carry out experimental work.

63.12 Scoring

Research and Development competition shall be scored as follows: the top four places will be awarded sequentially descending from first place (1-2-3-4) on the basis of the quality of the projects submitted, and their new contributions to the hobby or its applications. All places must be awarded; entered and qualified entries must occupy first (through second, third, fourth, etc. until entries have been exhausted) place without skipping places. In the event of a tie, both entries will be awarded their place as if the other did not exist, i.e., 1st, 2nd, 2nd, 3rd awarded for the top four places in case of a tie for second. Entries that, in the opinion of the judges, were entered solely to qualify in the event and which offer little or no quality value may be disqualified at the discretion of the judges, and if disqualified shall not be awarded flight points for the event.

Weighting Factor	36
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PROVISIONAL EVENTS

P24 SUPER-ROC XL ALTITUDE COMPETITION

P24.1 Scope

Super-Roc XL Altitude Competition comprises nine events open to single staged model rockets whose length and circumference are no less than the minimum values allowed for the classes of the event. The purpose of this competition is to achieve the greatest altitude possible with the largest rocket possible without impairing the structural integrity of the rocket.

P24.2 Structural Failure

An entry that comes apart, bends so as to crimp the body, or has a similar structural failure prior to ejection shall be disqualified.

P24.3 Separation

The model is allowed to separate into two or more unattached parts after ejection, provided that each part conforms to the provisions of Rule 3.5.

P24.4 Construction

Entries with bodies or significant structural parts made from hard or potentially unsafe material (e.g., hardwood doweling or fiberglass shafts) shall not be allowed, under the provisions of Rule 1.1.

P24.5 Static Points

Static points shall be calculated as length (in centimeters) multiplied by circumference (in millimeters). Length and circumference will be measured for the longest constant diameter section of cylindrical tubing used in the vehicle. Multiple adjacent tubes of the same diameter joined with coupler(s) shall count as a single section. Length and circumference must meet or exceed the minimum values for the event categories. No additional length or circumference points are awarded for values exceeding the maximum values.

P24.6 Scoring

Super-Roc XL Altitude Competition shall be scored as follows: the static points shall be multiplied by the altitude (in meters) to determine the score. The contestant achieving the highest score shall be declared the winner.

P24.7 Classes

This competition is divided into classes based on the permissible total impulse of the motor(s). The following classes of Super-Roc XL Altitude Competition are established:

Motor Class	Length Minimum (cm)	Length Maximum (cm)	Circumference Minimum (mm)	Circumference Maximum (mm)	Weighting Factor
1/8A	12.5	25	20	60	13
1/4A	25	50	40	80	14
1/2A	50	100	40	80	14
A	75	150	40	120	14
B	100	200	50	140	15
C	125	250	75	180	16
D	150	300	100	220	17
E	175	350	120	250	18
F	200	400	140	350	19
G	225	450	175	500	20

P25 PEE-WEE PAYLOAD COMPETITION

P25.1 Scope

Pee-Wee Payload Competition comprises three events open to model rockets that carry one or more Pee-Wee NAR model rocket payloads. If the model is staged, the payload(s) must be enclosed in the uppermost stage of the model. The purpose of this competition is to carry a payload of given mass and dimensions to as high an altitude as possible and to recover the payload. The Pee-Wee NAR payload is intended to represent an instrument package whose dimensions and mass cannot be modified, but must be accepted as a design constraint.

P25.2 Pee-Wee Payload Specifications

The Pee-Wee NAR model rocket payload is a non-metallic cylinder containing fine sand, with a mass of no less than 3.5 grams. This cylinder shall be 6.2 ± 0.5 millimeters in diameter, and 70.0 ± 10.0 millimeters in length. The payload may be permanently sealed to prevent the loss of the sand. No holes may be drilled into it, no changes made in its shape, and no other material may be affixed to it.

P25.3 Enclosed Payloads

The standard NAR model rocket payload or payloads carried in a model shall be completely enclosed and contained within the model, shall not separate from the model in flight, and shall be removable from the model.

P25.4 Recovery

Models in the competition must contain must be equipped with a recovery device to allow a safe landing under the provisions of Rule 3.5. All entries must comply with the provisions of Rule 16.7.

P25.5 Separation

The payload(s) shall not become separated from the portion of the entry intend to contain it during flight or upon landing, and the flight shall be disqualified if this occurs.

P25.6 Return

Following the flight, the contestant shall present his/her entry as recovered and, in the presence of an official, shall remove the payload(s). If the official cannot examine the payload(s), the entry shall be disqualified. If the contestant removes the payload(s) in the absence of officials, the entry shall be disqualified. The official may require that the payload(s) be rechecked if there is any question as to whether or not mass may have been lost from any payload, and shall disqualify the entry if it no longer complies with Rule P25.2.

P25.7 Classes

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

Motor Class	Payloads Carried	Weighting Factor
1/8A	1	17
1/4A	2	16
1/2A	3	15

P25.8 Non-Return

If the portion of the model containing the payload cannot be returned to the officials, the entry shall be disqualified. Rule 10.4 does not apply.

P40 PAYLOAD DURATION COMPETITION

P40.1 Scope

Payload Duration Competition comprises ten events open to single-stage or multi-stage model rockets that carry, as a totally enclosed payload, one standard Duration Payload. The purpose of this competition is to boost a standard Duration Payload, eject the payload from the carrier vehicle, and achieve the longest duration for the payload.

P40.2 Payload Specifications

Duration Payloads are defined in the following table:

Type	Description	Approximate Size	Definition
1	Table Tennis (ping pong) ball	40 mm diameter	ITTF [1] or similar
2	Badminton birdie	54 mm diameter at aft end	BWF [2] or similar
3	Wiffle baseball	75 mm diameter	Wiffle [3] or similar
4	Wiffle softball	96 mm diameter	Wiffle [3] or similar

[1] International Table Tennis Federation (www.ittf.com)

[2] Badminton World Federation (www.internationalbadminton.org)

[3] The Wiffle Ball, Inc. (www.wiffle.com)

P40.3 Requirements and Disqualifications

The Duration Payload must be completely enclosed within the carrier vehicle during ascent.

The Duration Payload must be released or ejected from the carrier vehicle prior to touchdown of the carrier vehicle. The Duration Payload must fall freely after separation from the carrier vehicle. Nothing may be attached to or entangled with the payload during descent. The carrier vehicle shall be recovered in a safe manner per Rule 3.5. A flight shall be disqualified if any of the above flight requirements are not satisfied.

P40.4 Duration

Duration is measured from first motion of the carrier vehicle to touchdown of the payload. If the payload cannot be observed by the timer(s) after separation from the carrier vehicle, the flight is considered a “track lost” and is not counted as an official flight.

P40.5 Classes

This competition is divided into classes based on the payload type and the permissible total impulse of the motor(s). The following classes of Payload Duration Competition are established with their respective weighting factors:

Motor Class	Payload Type	Weighting Factor
1/8	1	9
1/4A	1	9
1/2A	1 or 2	9
A	1, 2 or 3	9
B	1, 2, 3 or 4	10
C	2, 3 or 4	11
D	2, 3 or 4	12
E	3 or 4	13
F	4	14
G	4	15

P41 SUPER-ROC XL DURATION COMPETITION

P41.1 Scope

Super-Roc XL Duration Competition comprises nine events open to single staged model rockets whose length and circumference are no less than the minimum allowed for the classes of the event. The purpose of this competition is to achieve the greatest duration possible with the largest rocket possible without impairing the structural integrity of the rocket.

P41.2 Structural Failure

An entry that comes apart, bends so as to crimp the body, or has a similar structural failure prior to ejection shall be disqualified.

P41.3 Construction

Entries with bodies or significant structural parts made from hard or potentially unsafe material (e.g., hardwood doweling or fiberglass shaft) shall not be allowed, under the provisions of Rule 1.1.

P41.4 Static Points

Static points shall be calculated as length (in centimeters) multiplied by circumference (in millimeters). Length and circumference will be measured for the longest constant diameter section of cylindrical tubing used in the vehicle. Multiple adjacent tubes of the same diameter joined with coupler(s) shall count as a single section. Length and circumference must meet or exceed the minimum values for the event categories. No additional length or circumference points are awarded for values exceeding the maximum values.

P41.5 Scoring

Super-Roc XL Duration Competition shall be scored as follows: the static points shall be multiplied by the duration (in seconds) to determine the score. The contestant achieving the highest score shall be declared the winner.

P41.6 Classes

This competition is divided into classes based on the permissible total impulse of the motor(s). The following classes of Super-Roc XL Duration competition are established:

Motor Class	Length Minimum (cm)	Length Maximum (cm)	Circumference Minimum (mm)	Circumference Maximum (mm)	Weighting Factor
1/8A	12.5	25	20	60	13
1/4A	25	50	40	80	14
1/2A	50	100	40	80	14
A	75	150	40	120	14
B	100	200	50	140	15
C	125	250	75	180	16
D	150	300	100	220	17
E	175	350	120	250	18
F	200	400	140	350	19
G	225	450	175	500	20

P57 CLASSIC MODEL COMPETITION

P57.1 Scope

Classic Model Competition is a unique 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. The model must have been available for sale in kit form 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 can be an upscaled or downsized version of the original model.

P57.2 Exclusions

Subjects excluded from this event:

Models that are reproductions of scale model rocket kits that would be eligible for competition in Scale (Rule 50), Sport Scale (Rule 53), Concept Scale (Rule 56) are specifically excluded from this event.

Entries that qualify for Plastic Model Conversion Competition (Rule 55) are specifically excluded from this event.

P57.3 Substantiation Data

As with craftsmanship events, the contestant must supply data to substantiate the model's adherence to scale in shape, color, and paint pattern. Data must derive from a catalog, package insert and/or original kit instruction.

P57.4 Judging

Models shall be judged for static points for scale-like qualities from a distance of one meter. Judges may then closely examine the model to judge it for craftsmanship.

P57.5 Flight

Each entry shall make a safe, stable flight. If the entry does not make a safe, stable flight, the entry shall be disqualified.

P57.6 Static Points

Static scoring shall be the same as in Sport Scale (Rule 53).

P57.7 Flight Characteristics: 300 points

Points are awarded for proper operation of the model during flight, including launch, lack of misfires, stability, recovery, and lack of damage on landing. Consideration should be given to clustering, staging, glide recovery, or flight characteristics that mimic the operation of the classic rocket kit prototype; however, if the general flight performance of the model is adversely affected by the failure of one or more of these aspects, points may be deducted from Flight Characteristics.

P57.8 Scoring

Classic Scale Competition shall be scored as follows: the points awarded in static judging shall be added to the points awarded to the entry in flight. The contestant receiving the highest score is the winner.

P57.9 Damage

Damage shall be judged cumulatively with each flight, assessed from the judged condition of the model to the condition presented to the judge post-flight. The only exception to this is damage caused in the course of a catastrophic failure under Rule 11.5, in which case such damage shall not be counted against the flight points.

Weighting Factor	20
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APPENDIX A: GLOSSARY

catastrophic failure: A failure that, in the opinion of the judges, 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 a similar occurrence beyond the control of a contestant. This does not include improper assembly of a reloadable motor. A flight experiencing a catastrophic failure can be declared not to be an official flight. See Rule 11.5.

construction: The action required to complete a model starting with no more prefabrication than the amount used in the average kit. Model rockets that are completely prefabricated and require only a few minutes of unskilled effort for their completion, or in which many normally separate pieces are pre-assembled are not considered to require construction. One-piece plastic fin units are not prohibited per se, but as such depend on the degree of prefabrication of the rest of the model.

contestant: A NAR member or a team composed of NAR members entered in a sanctioned competition.

entry: Includes the model rocket and any required scale data information and for Space Systems Competition may also include the launcher. Flight cards or any other item to record the pre or post flight data are not to be considered part of an 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 in a meet-provided launch system shall not be considered a misfire.

NAR Contest Board: Refers to the National Contest Board of the National Association of Rocketry. If a rule applies to action with respect to a Regional Contest Board, this is specifically stated.

pop 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.

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.

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 the RSO, a deputy RSO, or (in limited cases according to Rule 11.1) the Contest Jury, denying an entry the opportunity to fly due to considered judgment that the model would be unsafe in flight; also a ruling that disqualifies a model which flies in an unsafe manner. If an RSO or deputy RSO, acting in the capacity of a flight judge, disqualifies a model for a reason other than unsafe or hazardous operation or flight, this is not considered a safety ruling.

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 which 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.

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: WEIGHTING FACTOR AND POINTS CHARTS

Event	1/8 A	1/4 A	1/2 A	A	B	C	D	E	F	G
Altitude	9	9	9	10	11	12	13	14	15	16
Boost Glider Duration	19	18	17	18	19	20	22	23	25	26
Cluster Altitude	12	12	14	16	18	20	-	-	-	-
Dual Egg Lofting Altitude	-	-	-	-	-	30	29	29	30	31
Dual Egg Lofting Duration	-	-	-	-	-	28	27	27	28	29
Egg Lofting Altitude	-	-	-	-	19	18	19	20	22	24
Egg Lofting Duration	-	-	-	-	17	16	17	18	20	22
Flex-Wing Glider Duration	19	18	17	18	19	20	22	23	25	26
Helicopter Duration	21	20	19	20	21	22	23	24	26	27
Parachute Duration	7	7	7	7	8	9	-	-	-	-
Payload	-	-	-	16	15	16	17	18	20	22
Rocket Glider Duration	21	20	19	20	21	22	24	25	27	28
Scale Altitude	25	26	27	28	29	30	31	32	33	34
Streamer Duration	8	8	8	8	9	10	11	12	13	14
Super-Roc Altitude	13	14	14	14	15	16	17	18	19	20
Super-Roc Duration	12	13	13	13	14	15	16	18	19	20

NOTE: Add 4 to Duration Weighting Factors for Multi-Round events.

Event	WF
Concept Sport Scale	20
Drag Race	2
Plastic Model Conversion	26
Predicted Altitude	8
Predicted Duration	8
Radio-Controlled Glider	32
Random Altitude	10
Random Duration	10
Research and Development	36
Scale	32
Set Altitude	8
Set Duration	8
Space Systems	28
Sport Scale	20
Spot Landing	4
Super Scale	40

	Section or Local Meet Points					Open Meet Points					Regional Meet Points				
WF	1 st	2 nd	3 rd	4 th	FP	1 st	2 nd	3 rd	4 th	FP	1 st	2 nd	3 rd	4 th	FP
1	10	6	4	2	1	20	12	8	4	2	30	18	12	6	3
2	20	12	8	4	2	40	24	16	8	4	60	36	24	12	6
3	30	18	12	6	3	60	36	24	12	6	90	54	36	18	9
4	40	24	16	8	4	80	48	32	16	8	120	72	48	24	12
5	50	30	20	10	5	100	60	40	20	10	150	90	60	30	15
6	60	36	24	12	6	120	72	48	24	12	180	108	72	36	18
7	70	42	28	14	7	140	84	56	28	14	210	126	84	42	21
8	80	48	32	16	8	160	96	64	32	16	240	144	96	48	24
9	90	54	36	18	9	180	108	72	36	18	270	162	108	54	27
10	100	60	40	20	10	200	120	80	40	20	300	180	120	60	30
11	110	66	44	22	11	220	132	88	44	22	330	198	132	66	33
12	120	72	48	24	12	240	144	96	48	24	360	216	144	72	36
13	130	78	52	26	13	260	156	104	52	26	390	234	156	78	39
14	140	84	56	28	14	280	168	112	56	28	420	252	168	84	42
15	150	90	60	30	15	300	180	120	60	30	450	270	180	90	45
16	160	96	64	32	16	320	192	128	64	32	480	288	192	96	48
17	170	102	68	34	17	340	204	136	68	34	510	306	204	102	51
18	180	108	72	36	18	360	216	144	72	36	540	324	216	108	54
19	190	114	76	38	19	380	228	152	76	38	570	342	228	114	57
20	200	120	80	40	20	400	240	160	80	40	600	360	240	120	60
21	210	126	84	42	21	420	252	168	84	42	630	378	252	126	63
22	220	132	88	44	22	440	264	176	88	44	660	396	264	132	66
23	230	138	92	46	23	460	276	184	92	46	690	414	276	138	69
24	240	144	96	48	24	480	288	192	96	48	720	432	288	144	72
25	250	150	100	50	25	500	300	200	100	50	750	450	300	150	75
26	260	156	104	52	26	520	312	208	104	52	780	468	312	156	78
27	270	162	108	54	27	540	324	216	108	54	810	486	324	162	81
28	280	168	112	56	28	560	336	224	112	56	840	504	336	168	84
29	290	174	116	58	29	580	348	232	116	58	870	522	348	174	87
30	300	180	120	60	30	600	360	240	120	60	900	540	360	180	90
31	310	186	124	62	31	620	372	248	124	62	930	558	372	186	93
32	320	192	128	64	32	640	384	256	128	64	960	576	384	192	96
33	330	198	132	66	33	660	396	264	132	66	990	594	396	198	99
34	340	204	136	68	34	680	408	272	136	68	1020	612	408	204	102
35	350	210	140	70	35	700	420	280	140	70	1050	630	420	210	105
36	360	216	144	72	36	720	432	288	144	72	1080	648	432	216	108
37	370	222	148	74	37	740	444	296	148	74	1110	666	444	222	111
38	380	228	152	76	38	760	456	304	152	76	1140	684	456	228	114
39	390	234	156	78	39	780	468	312	156	78	1170	702	468	234	117
40	400	240	160	80	40	800	480	320	160	80	1200	720	480	240	120

APPENDIX C: ABBREVIATIONS

C.1 OFFICIALS and ORGANIZATIONS

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

C.2 EVENTS

ALT	Altitude	R&D	Research and Development
BG	Boost Glider Duration	PSL	Parachute Spot Landing
CA	Cluster Altitude	RDA	Random Altitude
CSC	Concept Sport Scale	RDD	Random Duration
DED	Dual Egg Loft Duration	RCG	Radio Controlled Glider
DEL	Dual Egg Lofting Altitude	RG	Rocket Glider Duration
DR	Drag Race	STA	Set Altitude
ELA	Egg Lofting Altitude	STD	Set Duration
ELD	Egg Lofting Duration	SCA	Scale Altitude
FW	Flex-Wing Boost Glider Duration	SC	Scale
HD	Helicopter Duration	SPSC	Sport Scale
OSL	Open Spot Landing	SD	Streamer Duration
PRA	Predicted Altitude	SPSY	Space Systems
PRD	Predicted Duration	SRA	Super-Roc Altitude
PAY	Payload	SRD	Super-Roc Duration
PD	Parachute Duration	SSL	Streamer Spot Landing
PMC	Plastic Model Conversion	SUSC	Super Scale

C.3 SCORING and DISQUALIFICATIONS

BRK	Broken Egg	NG	No Glide
CAT	Catastrophic Failure (CATO)	NR	No Return
CHU	No Chute	NVB*	Non-Vertical Boost
CR	Crimped Body	PRG*	Prang (crash) under Power
DNF	Did Not Fly	PS*	Pod Separation (under power)
DQ	Disqualified	RB	Red Baron (pod hung on gliding portion)
EGG	Egg Broken	ROD	Hung on Rod
EJ	Ejected Motor	ROT	No Rotation
FP	Flight Points	SAF*	Safety
HNG	Hung on Pad	SD	Spiral Dive
ID	Insufficient Data	SEP	Separation
LOP*	Loop under Boost	SHR	Shred
LST	Lost by Timers	SP	Spit Motor
MAX	Maximum Time	STR	Stripped Chute or Streamer
MIS	Misfire	TL	Track Lost
NC	Track Not Closed	UNS*	Unsafe
NDP	No Deployment	US*	Unsafe
NEJ	No Ejection	WF	Weighting Factor
NF	Not Flown		

* Indicates that this is considered a disqualification for safety reasons

APPENDIX D: RETURN/SCORING GUIDE

Event	Applicable Section #	Return Required*	Rule 10.4 Applies?	Scoring Method
Altitude	20	No	N/A	Best single qualified flight
Boost Glider Duration	36	Yes	Yes	Sum of qualified flights**
Cluster Altitude	23	Yes	No (23.3)	Best single qualified flight
Concept Sport Scale	56	No	N/A	See 56.5
Drag Race	61	See 61.3	No	See 61.10
Dual Egg Lofting Altitude	27	Yes	No (27.5)	Best single qualified flight
Dual Egg Lofting Duration	35	Yes	No (35.3)	Best single qualified flight
Egg Lofting Altitude	26	Yes	No (26.5)	Best single qualified flight
Egg Lofting Duration	34	Yes	No (34.3)	Best single qualified flight
Flex-Wing Glider Duration	38	Yes	Yes	Sum of qualified flights**
Helicopter Duration	32	Yes	Yes	Sum of qualified flights**
Parachute Duration	30	Yes	Yes	Sum of qualified flights**
Payload	25	Yes	No (25.8)	Best single qualified flight
Plastic Model Conversion	55	No	N/A	See 55.7
Precision Altitude	22	No	N/A	Only one official flight permitted
Precision Duration	39	No	N/A	Only one official flight permitted
Radio Controlled Glider	62	See 62.5	N/A	See 62.5
Random Altitude	22	No	N/A	Only one official flight permitted
Random Duration	39	No	N/A	Only one official flight permitted
Research & Development	63	N/A	N/A	N/A
Scale	50	No	N/A	See 50.14
Scale Altitude	51	No	N/A	See 51.4
Space Systems	54	Rule 54.6.1	Rule 54.6.1	Best single qualified flight
Sport Scale	53	No	N/A	See 53.14
Spot Landing	60	No	N/A	Only one official flight permitted
Streamer Duration	31	Yes	Yes	Sum of qualified flights**
Super-Roc Altitude	21	No	N/A	Best single qualified flight
Super-Roc Duration	33	Yes	Yes	Sum of qualified flights**
Super Scale	52	No	No (16.8)	See 52.8
Multi-Round Duration	30-33, 36-38	Per 15.12.2	N/A	Sum of 3 (or more) flights, 15.12.4

* Any model may require return if a safety or rule conformance question exists (9.10)

** Refer to Rule 10.1

N/A Not Applicable

APPENDIX E: ALTITUDE DATA REDUCTION

E.1 Sample Program

```
0010 REM TRACK.BAS by Geoff Landis
0020 REM from the 9 / 83 "Model Rocketeer" page 11
0030 REM NAR Tracking Data Reduction by various methods
0040 REM Refer to that issue for full details
0050 REM
0060 REM Tracking Data Reduction Program
0070 REM Program Copyright (C) 1983
0080 REM by Geoffrey A. Landis
0090 REM may be freely used but not sold
0100 REM
0110 REM Minor Edits and Renumbering Copyright (C) 1985 Robert G. Kaplow
0150 REM
0200 REM data input
0210 REM Change the next line as appropriate for your baseline
0220 B = 300.
0240 R1 = .0174532925199433
0500 PRINT
0510 PRINT "Tracker One Azimuth, Elevation: "
0520 INPUT A1, E1
0530 PRINT "Tracker Two Azimuth, Elevation: "
0540 INPUT A2, E2
0550 IF E1 < 0. THEN 9998
0560 IF E2 < 0. THEN 9998
0570 A1 = A1 * R1
0580 E1 = E1 * R1
0590 A2 = A2 * R1
0600 E2 = E2 * R1
1000 REM
1010 REM Geodesic Data Reduction
1020 REM
1030 F = SIN(E1) * SIN(E2) - COS(E1) * COS(E2) * (COS(A1) * COS(A2) - SIN(A1) * SIN(A2))
1040 D = 1. - F ^ 2
1050 T = (COS(E2) * SIN(E1) * SIN(A2) - COS(E1) * SIN(E2) * SIN(A1)) / SQR(D)
1060 D1 = (COS(E1) * COS(A1) + F * COS(E2) * COS(A2)) / D
1070 D2 = (COS(E2) * COS(A2) + F * COS(E1) * COS(A1)) / D
1080 A = B * (SIN(E1) + SIN(E2)) * (D1 * D2) / (D1 + D2)
1090 C = ABS(T * B / A) * 100.
1100 PRINT
1110 PRINT "Geodesic"
1120 GOSUB 9000
2000 REM
2010 REM Vertical Midpoint Data Reduction
2020 REM
2030 S = SIN(A1 + A2)
2040 H1 = SIN(A2) * SIN(E1) / (S * COS(E1))
2050 H2 = SIN(A1) * SIN(E2) / (S * COS(E2))
2060 A = B * (H1 + H2) / 2.
2070 C = ABS((H1 - H2) / (H1 + H2)) * 100.
2080 PRINT
2090 PRINT "Vertical Midpoint"
2100 GOSUB 9000
2110 REM
8999 GO TO 500
9000 REM
9010 REM Display Altitude and Closure
9020 REM
9030 PRINT "Altitude: "; A
9040 IF C > 10. THEN GO TO 9080
9050 IF A < 1. THEN GO TO 9080
9060 PRINT "Track Closed: "; C; "%"
9070 RETURN
9080 PRINT "Track Not Closed: "; C; "%"
9090 RETURN
9998 STOP
9999 END
```

E.2 Sample Test Data

East		West		Geodesic		Vertical Midpoint	
Azimuth	Elevation	Azimuth	Elevation	Altitude	Closure	Altitude	Closure
90	45	50	40	380.0	6.3%	374.6	4.6%
30	45	60	45	203.3	31.2%	204.9	26.8%
120	75	25	55	596.3	6.2%	735.9	12.1%
30	80	40	85	1337.8	3.2%	1494.2	22.1%

All altitudes in meters. Test cases assume 300-meter baseline.

E.3 Symbols used in Equations

- B is the length of the tracking baseline
- A_1 and E_1 are the azimuth and elevation angles reported by tracking east.
- A_2 and E_2 are the azimuth and elevation angles reported by tracking west.
- A is the final, reduced altitude.
- C is the closure, expressed as a fraction of the altitude. $Closure \leq 0.1$ denotes a closed track.
- Other symbols denote common subexpressions, and are used solely for purposes of clarity.

E.4 Vertical Midpoint Method

$$h_1 = B \frac{\sin A_2 \tan E_1}{\sin(A_1 + A_2)}$$

$$h_2 = B \frac{\sin A_1 \tan E_2}{\sin(A_1 + A_2)}$$

$$A = \frac{h_1 + h_2}{2}$$

$$C = \left| \frac{h_1 - h_2}{2A} \right|$$

E.5 Geodesic Method

$$f = \sin E_1 \sin E_2 - \cos E_1 \cos E_2 (\cos A_1 \cos A_2 - \sin A_1 \sin A_2)$$

$$d_1 = B \frac{\cos E_1 \cos A_1 + f \cos E_2 \cos A_2}{1 - f^2}$$

$$d_2 = B \frac{\cos E_2 \cos A_2 + f \cos E_1 \cos A_1}{1 - f^2}$$

$$A = \frac{d_1 d_2}{(d_1 + d_2)} (\sin E_1 + \sin E_2)$$

$$C = B \left| \frac{\cos E_2 \sin E_1 \sin A_2 - \cos E_1 \sin E_2 \sin A_1}{A \sqrt{1 - f^2}} \right|$$

APPENDIX F: Notice of Rulemaking Procedures

Model rocketry contests in the United States are governed by the U.S. Model Rocket Sporting Code, a booklet known as The Pink Book. The rules in the Pink Book are revised every year. The procedures published here explain how the rules are rewritten, and how you can have a voice in the process. The NAR Contest Board oversees the project. If you have questions about the Pink Book revision process, contact the NAR Rules Revision Chairman.

F.1 Purpose

The purpose of the Rules Proposal (RP) Procedures is to assist the NAR Contest Board in monitoring and accomplishing rules revisions through an open process that encourages member participation and feedback. The responsibility of the Contest Board is to provide the U.S. Model Rocket Sporting Code standards and policy that will promote the healthy development of the competitive hobby of model rocketry.

F.2 General Considerations for Rules Proposals

Proposals submitted in the RP process should be reviewed by all interested members for ambiguities in scoring, judging, and interpretation. Contest Board members should openly discuss rule change proposals with as many members as possible to obtain input on the merits or faults in the proposed new rules. Care should be taken by members proposing and reviewing rule change proposals to avoid generating rules that overlap or conflict with general rules covering all contest events.

F.3 Analysis of Proposals

The following are example criteria the Contest Board may use in analyzing each new rules proposal:

- Manufacturing - Will current models or equipment tend to become obsolete or no longer useful?
- Protests - Will the change tend to eliminate a source of protests or are protests more likely?
- Model Processing Time - Will the change tend to increase or decrease time required to process models at a meet?
- Designs - Will the builder be given more or less freedom in design?
- Contests - Will the time and effort required to conduct a contest be increased or decreased?
- Present models - Will a modeler be able to effectively compete with current models, or will the modeler have to build new ones?
- Effect on Competition - Will the net effect of the proposed change be to encourage or discourage contest participation?
- Effect on Skill Level - Will the modeler be encouraged to develop new skills and construction techniques?

F.4 Schedule

These procedures provide for a one-year schedule, which begins on September 1 of each year, for the review and adoption of Rules Proposals.

F.5 Advisory Committees to the Contest Board

The National Contest Board Chairman may appoint advisory committee(s) and a chair to assist the Contest Board in the development of a RP. These committees will operate in accordance with the Contest Board Procedures.

The Contest Board Chair will strive to achieve maximum utilization of existing special interest groups or individuals when selecting advisory committee members. The Contest Board Chair will determine the tenure of advisory committees. The National Contest Board Chair will appoint a Rules Revision Chair to oversee the RP process.

F.6 Proposal Preparation and Submittal

Any NAR member may submit an RP by filing a completed Rules Change Proposal Form with the Rules Revision Chairman (RRC). Upon receipt of the proposal it will be reviewed by the RRC to assure that it has been properly submitted (clearly stated proposal; name, address, and signature of proposer). If the proposal, as submitted, does not pass the review, then it will be returned to the author along with a checklist explaining deficiencies and proper filing procedures. The RRC will process the submittal in a timely manner and will send the author an acknowledgment of receipt within 30 days.

F.7 Types of Proposals

There are two basic types of proposals:

- REGULAR RULES REVISION PROPOSAL - May be filed by any NAR member. If adopted, the new rules go into effect with the next edition of the Pink Book.
- SAFETY, EMERGENCY, URGENT OR INTERPRETATION PROPOSALS - May be filed by any NAR member, but because of the relatively longer time required to get a rule change through the normal process, there are alternate paths for revision, which may be enacted quickly if the situation dictates.

The RRC will determine which of these two categories a proposal should fall into, based on the content of the proposal and the perceived dangers of delaying action on the proposal. Proposals addressing problems that might result in the loss of life, injury, or property damage will be given SAFETY status. The intent of SAFETY proposals is to quickly modify a rule to create a safer flying environment.

Proposals addressing problems that might affect the integrity of the national competition structure will be given EMERGENCY status. The intent of an EMERGENCY proposal is to quickly modify an existing or proposed rule to prevent a significant disruption to the Contest Year, National Championships, or to otherwise ensure all competitors can compete in

a fair manner. EMERGENCY proposals may only be used when the time-sensitive nature of the issue does not allow the proposal to be processed under URGENT or REGULAR rules change proposals.

An URGENT proposal is one that is neither an interpretation nor is it necessarily related to safety. It will constitute an actual change in the rules and therefore the justification behind this type of proposal must be scrutinized, as always, to prevent abuse.

An INTERPRETATION proposal will not alter an existing rule but would provide information designed to clarify it. It deals with interpretations of the rules, or ways in which the rules are applied in the field. URGENT and INTERPRETATION proposals will be dealt with as described in F.8.B below.

F.8 General Procedure or Safety, Emergency, Urgent and Interpretation Proposals

A. SAFETY or EMERGENCY PROPOSALS

Proposals may be put in force immediately if the National Contest Board Chairman, Rules Revision Chairman and the President concur that the action is necessary. Notice of the action and its rationale behind will be communicated to NAR members. Any SAFETY or EMERGENCY proposal enacted as set forth above will remain in effect under temporary status until acted upon by the Board of Trustees.

B. URGENT or INTERPRETATION PROPOSALS

Proposals may be put in force immediately if the National Contest Board Chairman, Regional Contest Board Chairman, and the Rules Revision Chairman concur that the action is necessary. Notice of the action and its rationale behind will be communicated to NAR members.

Situations judged by the RRC as cases where rules do not seem to cover areas they should, may be applied to more than would be intended, or seem to lack the logic and/or intent, and do not qualify under part (A), and require immediate action may be enacted immediately based upon a 2/3 vote in favor of the Contest Board listed above. When an RP illustrates an issue that requires immediate action and is not sufficient as written (e.g., it does not cover the areas it should, may be applied to more than one section of the Pink Book, or lack complete logic to fully implement as written), the RRC can submit it to the Contest Board for review, changes and ratification by a 2/3 vote of the group consisting of the Contest Board Chair, the RRC, and the NAR President.

If the proposal does not receive a majority approval for immediate action, it will be retained and is eligible for consideration as a Regular Rules revision in the normal one-year cycle. All requests for SAFETY, EMERGENCY, INTERPRETATION or URGENT rules shall be submitted on the standard proposal form or a facsimile that contains all of the required information. All SAFETY, EMERGENCY, INTERPRETATION or URGENT rules adopted by the National Contest Board will be included in the next printing of the Pink Book.

F.9 General Procedure or Regular Rules Revision Proposals

Upon receipt of a completed Rules Change Proposal Form, the RRC shall review the proposal for acceptability. The RRC will ensure that the intent is clearly stated and that the language and format is suitable for inclusion in the Pink Book. The proposed rule revision must not result in a rules revision that violates the Safety Code or general safety guidelines. If the new proposal affects more than one rule or event, then the author must clearly address each of the changes necessary to implement the proposal. If the proposal is deficient in any of these areas, then the RRC may return it to the author with comments or suggestions for presenting it properly. The RRC will process the submittal in a timely manner and will send the author an acknowledgment of receipt within 30 days.

F.10 Voting and Vote Tabulation for Regular Rules Revisions

The reviewed proposals will be communicated to NAR members and will be placed in the normal cycle for Regular Rules revisions. The Final Vote will be conducted by the RRC through an electronic survey (E-Survey) ballot sent to the membership. The E-Survey will contain a listing of the proposals having passed the Initial Vote. It shall contain web links to the full original RCP submission and to any public comments about the RCP. It shall state the deadline for voting. The deadline shall be set so that it is no less than 30 days after the E-Survey has been sent to the membership.

The communication of a regular rules revision for comment will occur no less than three (3) months prior to the Final E-Survey so that there is ample time for the membership to discuss the merits of each proposal.

Every NAR member is entitled to one vote. Only votes cast on the official E-Survey will be tabulated. Each survey vote may be submitted only by voting members and the member will have to enter his/her NAR license number. E-Survey votes can not be submitted after the deadline. The RRC will review the votes cast for and against each individual proposal. Each proposal that receives two-thirds (66.7%) or greater "Yes" votes will be deemed to have been approved and will be included in the upcoming Pink Book revision.

F.11 Proposal Editing

To encourage member participation and discussion, the RRC or designee shall present the proposals received prior to the June 30th deadline in a Contest Forum Meeting at NARAM following the close of that proposal cycle. Rule change proposals will be communicated to NAR members prior to NARAM. Members will be encouraged to participate in the NARAM Contest Forum Meeting or, if unable to attend, to submit comments to the RRC. The purpose of all of the member participation efforts is to allow for maximum input and suggestions for changes that increase the quality of the proposed revision.

The RRC may, at any time prior to a vote, edit proposal wording for purposes of clarity or to minimize misunderstandings and ambiguities, where the RRC deems it necessary. Whenever possible, editing should be done early in the rulemaking process. The RRC shall not edit the proposal in such a manner that its intent is altered. The RRC will inform the author in writing of the revised wording in a timely manner so that any potential conflicts will be resolved prior to publication deadlines. Should the member who submitted the proposed rule change deem that the intent has of the proposed rule has changed, and editing revisions cannot be resolved with the RRC, then the proposed rule change as written by the submitting member will be offered to the members for a vote.

F.12 Proposal Withdrawal

The author of a proposal may request for withdrawal of the proposal with the RRC.

F.13 Revisions to Rules Proposal Procedure

Revisions to the Rules Proposal procedures shall require approval by the NAR Board of Trustees.

The suggested text of any proposed revision(s) shall be submitted to the RRC for communication to NAR members at least two (2) months prior to a NAR Board Meeting so that the Board might consider relevant input from the NAR membership.

APPENDIX G: Altimeters Approved for Contest Use

The following list of altimeters is approved for contest use, per Rule 14.10:

Adept	Verifying "Zeroed"	Verifying Altitude	Records?
A1 (includes A1, A1-M, A1-E, A1-ME)	steady beep	altitude beep	
ALTS1, ALTS1-50K	steady beep	altitude beep	
ALT05, ALT05-50K	steady beep	altitude beep	
ALTR1	steady beep	altitude beep	yes
A1-TA	steady beep	altitude beep	
ALTS2, ALTS2-50K	steady beep	altitude beep	
ALTIM1	steady beep	altitude beep	
Adrel			
ALT-LED	steady blink	altitude blink	
Altus Metrum			
Micro Peak	steady blink	altitude blink	yes
Featherweight Altimeters LLC			
Raven 2	steady blink	altitude blink	yes
G-Wiz			
LCX	configuration beep	altitude beep	yes
MC2 (using audible barometric readout)	configuration beep	altitude beep	yes
HXC (using audible barometric readout)	configuration beep	altitude beep	yes
Jolly Logic			
Altimeter One	read zero	read altitude	
Altimeter Two	read zero	read altitude	
Missile Works			
RRC2 rev D	steady beep/blink	altitude beep/blink	
RRC2 mini	steady beep/blink	altitude beep/blink	
PerfectFlite			
ALT15K/WD	steady beep	altitude beep	yes
ALT15K/WD rev 2	steady beep	altitude beep	yes
MAWD/minialt WD	steady beep	altitude beep	yes
ARPA	steady beep	altitude beep	
pNut	steady beep	altitude beep	yes
Stratologger	steady beep	altitude beep	yes
Quest Aerospace			
How High	steady blink	altitude blink	
Winged Shadow Systems			
How High SP	steady blink	altitude blink	
How High (with "battery board")	steady blink	altitude blink	
How High RT	steady blink	altitude blink	

Notes

Verifying "zeroed":

Steady beep: hear a uniformly repeated single beep

Steady blink: see a uniformly repeated single blink

Read zero: 0000 displayed

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

Updated: January 30, 2014

Effective: April 1, 2014

NAR Team Registration Form

To register a team for competition meets sponsored by the National Association of Rocketry, please complete the following information for each team member. You may request a team name and number (between 1 and 999); but the Contest Board reserves the right to reassign your name and/or number if a conflict arises. There is no team registration fee.

Team Information

Team Name _____

Team Number _____ New ____ Renewal ____

Competition Division _____ (age division of the oldest team member)

Team Members:

Name	NAR Number	Birth Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Point of Contact:

Name _____

Address _____

City _____ State _____ Zip _____

Phone _____

Email _____

Send your registration form to:

NAR Contest Board Chairman at the USPO or email address listed in the NAR Contest Board Directory.

A confirmation letter/email establishing your team name and number will be sent within 45 days of receipt.

NAR Contest Board Form CB-09pb-TM
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