AMERICAN ROCKETRY CHALLENGE

2026 Team Handbook

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www.rocketrychallenge.org

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Section 1. INTRODUCTION

American Rocketry Challenge (ARC) provides 6th through 12th grade students in U.S. schools and other eligible organizational programs a realistic experience in designing a flying aerospace vehicle that meets a specified set of mission and performance requirements. Students work together in teams, replicating the work of aerospace engineers. Throughout the year, they engage in the full engineering process as they design, build, and test their rockets. They compete through qualifying flights of their rockets with thousands of peers across the country for the opportunity to participate in the culminating National Finals event held in Northern Virginia on May 16, 2026. The program inspires and excites students about learning and careers in STEM (science, technology, engineering and mathematics). The challenge is not intended to be easy, but it is well within the capabilities of students of these ages who have a determination to learn the science, engineering, math, and craftsmanship skills necessary to succeed.

The American Rocketry Challenge is run jointly by the Aerospace Industries Association and the National Association of Rocketry. Since 1919, the Aerospace Industries Association (AIA) has advocated for policies and investments that keep our country strong, bolster our capacity to innovate, and spur economic growth in the aerospace sector. The National Association of Rocketry is the oldest and largest sport rocketry organization in the world. Since 1957, over 100,000 sport rocket modelers have joined the NAR to take advantage of the fun and excitement of rocketry in a safe manner.

Challenge Objective

The objective of the 2026 challenge, and requirement for qualification flights, is to design, build, and fly a safe and stable model rocket to an altitude of exactly 750 feet while also achieving a total flight duration of between 36 and 39 seconds and returning a payload of one raw hen's egg undamaged. The rocket must keep all parts tethered together for recovery and must recover by parachute. The rocket's external structure must be a body tube whose diameter is the same from the rocket's nose cone to its tail, and which must be no less than 47 millimeters in diameter so it can hold an egg. The total length of the rocket must be no less than 650 millimeters. Teams must make at least two and may make up to three official qualification flight attempts by the qualification deadline and the scores from the best two of these will be added to determine national rankings, with 100 teams receiving the invitation to National Finals.

Teams at the National Finals on May 16, 2026 will face an additional challenge; the altitude goals will be slightly different while the duration goal will remain the same. This tests the teams' understanding of the rocket science and how to fine-tune their rocket's performance. All 100 teams will attempt a first flight with an exact altitude goal between 725 feet and 775 feet (the exact number will be announced at the Finals). The top 24 teams (or 42 if weather permits) will attempt a second flight to a different altitude goal (also between 725 and 775 ft). The flight duration goal of 36-39 seconds will be the same for all flights regardless of the altitude goal. Scores from the two flights will be summed and the national winner will be the team whose flight vehicle receives the lowest score overall. See Appendix 1 for additional information about National Finals.

Awards at National Finals

The U.S. National Champion will represent the United States and compete at the International Rocketry Challenge at the Farnborough Air Show in the UK in July 2026. This unique and fully sponsored opportunity provides a global perspective on rocketry designs and competitions.

The first to tenth place teams at National Finals, receive monetary awards (including $20,000 for first place) and their schools/sponsoring organizations receive a monetary award to further their rocketry programs, with a combined award pool of $100,000.

The top 25 teams qualify for the NASA Student Launch Initiative. In addition, two Special Awards of $500 will be given for other aspects of performance at National Finals - Most Innovative Technical Approach to Mission and Best ARC Rocket Craftsmanship.

The National Finals also includes additional optional competitions and events throughout the day, each with monetary awards. They include:

Competition / Award	**Description**
Rocket-Building Competition - $500 Best Craftsmanship - $500 Most Creative Design	The most popular additional competition at the National Finals is the Rocket Building Competition, where up to 40 teams are challenged to construct a rocket in 70 minutes from a bag of mystery parts. Teams may sign up for these spots at the Friday night Orientation.
Out of this World Outfits - Free Registration for the following year	On the lighter side, each year we are impressed by the spirit of teams during the Finals. The "Out of this World Outfits" Competition highlights teams who have donned their most creative and entertaining team costumes or attire.
Aerospace Games - Free Registration for the following year	Aerospace Games is an optional puzzle-based scavenger hunt at National Finals where teams can explore the grounds, meet partner organizations, and collaborate with other teams.

Mission Extension Challenges (Open to All Registered Teams)

Mission Extension Challenges are open to all registered teams and are not dependent upon rocket launch performance. They take place throughout the year and are virtual.

Mission Extension Challenge	Challenge Description
Rocket Reels Challenge (Formerly Marketing Competition) - First Place - $3,000 - Second Place - $1500 - Deadline: March 6	In the Rocket Reels Challenge, teams develop a two-minute video marketing the American Rocketry Challenge program and their team. This competition offers a $3000 award to the first place winner and $1500 for second place. It is open to all teams regardless of their success in flying and additional information can be found on the ARC website. See Appendix 4 for additional information.
Mission Debriefing Challenge (Formerly Presentation Competition) - First Place - $3,000 - Second Place - $1,500 - Deadline: April 6	The most important of these challenges in preparation for international competition is the Mission Debriefing Challenge (formerly Presentation Competition), where teams are given a set amount of time to present and explain their rocket design and flight-testing process to a panel of judges drawn from the National Association of Rocketry. This type of presentation is included in the judging criteria for the International Rocketry Challenge, so teams with ambitions to win the American Rocketry Challenge and move on to Farnborough or Paris should consider practicing for the international event by entering. This is a virtual competition conducted just before the Finals, and participation is open to all teams that have made at least three flights of their rocket, regardless of whether their qualification scores earned an invitation to the Finals. See Appendix 5 for additional Information.
Launchpad League - First Place - $3,000 - Variety of awards for earning Miles and reaching certain orbital levels - Deadline: May 6	All teams who have opened an application can join the Launchpad League, which provides additional opportunities, resources, engagement, and giveaways! Teams earn Miles by engaging with the program through live webinars, mission extension challenges, social media, and more. See Appendix 6 for additional Information.

About This Handbook

This Team Handbook provides the current American Rocketry Challenge rules plus some guidelines on how to approach the process of rocket design and flight. It also provides additional sources of information on general model rocket design, construction, and flying. Competing is not scripted; no design is provided as an example. The challenge and the learning for each team come from developing and testing your own original design.

Teams should begin prepping for the Challenge by becoming familiar with the basics of model rocketry. Those who have no experience with how these models are built and flown should start by reading G. Harry Stine's *Handbook of Model Rocketry* and by purchasing, building, and flying a basic model rocket kit, such as the one offered by Aerospace Specialty Products for ARC. A Recommended Schedule of Team Activities can be found in Appendix 2. At all times, teams must follow the Model Rocket Safety Code of the National Association of Rocketry (NAR) which can be found in Appendix 3.

If you live near one of the more than 240 National Association of Rocketry sections (chartered clubs) or the 400 experienced adult members of the National Association of Rocketry who have volunteered to be mentors, you are encouraged to consult with them. The sections are listed at the NAR web site, www.nar.org. The list of mentors is on the ARC website: NAR Mentor List - American Rocketry Challenge (ARC) and teams can access contact information via the application system. . These rocketeers can help teach you the basics of how to build and fly a payload-carrying rocket. Typically, they can also help you in locating a test-flying launch site and will work with local officials if this is required. Many will allow you to do your practice or qualification flight at one of their already-organized launches (launch dates and locations also listed at the NAR web site). **Remember: Neither these experts nor any other adult is permitted to help you design, build or fly your actual entry or any part of that entry**. All of this work must be done by the student members on your team.

If model rocketry interests you and you want to be connected to others in the U.S. who are part of the hobby's "expert team," you should join the National Association of Rocketry. You can do this online at www.nar.org. Membership brings you insurance coverage, the hobby's best magazine, the bi-monthly *Sport Rocketry*, and a whole range of other benefits and resources.

Good luck! Design carefully, fly early, fly safely, and fly often. We hope to see you at the National Finals in May 2026.

Section 2. AMERICAN ROCKETRY CHALLENGE 2026 RULES

June 16, 2025

1. SAFETY

All rockets must be built and flown in accordance with the Model Rocket Safety Code of the National Association of Rocketry (NAR), any applicable local fire regulations, and Federal Aviation Regulations (FAR). Rockets flown at the Finals must have previously flown safely and successfully. Rockets will be inspected before launch and observed during flight by a NAR official, whose judgment on their compliance with the Safety Code and with these rules will be final. Teams are encouraged to consult with designated NAR officials who are running this event well before the fly-off to resolve any questions about design, the Safety Code, or these rules.

2. TEAMS

The application for a team must come from a single school or a single U.S. incorporated non-profit youth or educational organization (excluding NAR, the Tripoli Rocketry Association, or any of their local chapters or any other incorporated rocket organization). There is no limit to the number of teams that may be entered from any single school or organization, but no more than two teams containing students who attend the same school or who are members of the same organization, regardless of whether the teams are sponsored by that school or organization, can be invited to attend the Finals. Team members must be students who are currently enrolled in grades 6 through 12 in a U.S. school or homeschool. Teams may have members from other schools or other organizations and may obtain financing from any source, not limited to their sponsoring organization. Teams must be supervised by an adult approved by the principal of the sponsoring school, or by an officially appointed adult leader of their sponsoring organization. Minimum team size is three students and maximum is ten students. Each student member must make a significant contribution to the designing, building, and/or launching of the team's entry. No part of any of these activities for a rocket used in a qualification flight or at the Finals may be done by any adult, by a company (except by the sale of standard off-the-shelf components available to the general public, but not kits or designs for the event), or by any person not a student on that team. If custom 3-D printed parts are used in a rocket, these must be designed and fabricated by student team members only. Custom circuit boards must be designed by students but can be fabricated commercially. No student may be on more than one team. The supervising teacher/adult may supervise more than one team. The Challenge is open to teams that submit a completed application, including payment of $175, between July 15 and December 6, 2025.

3. ROCKET REQUIREMENTS

Rockets must not exceed 650 grams gross weight at liftoff. The overall length of the rocket must be no less than 650 millimeters (25.6 inches) as measured from the lowest to the highest points of the airframe structure (including fins) in launch configuration. It must use a body tube that has the same diameter the entire distance between the nose cone and the fins. This body tube may have an outside diameter greater than or equal to 47 millimeters and be capable of holding an egg internally that could be up to 45 millimeters in diameter. All parts of the rocket (other than disposable recovery wadding) must descend tethered together and must use parachute recovery. Rockets must have the team's official ARC entry number written on them. Rockets flown at the Finals will be required to have a paint or other decorative coating applied to any wood, paper, or fiber exterior surface of the rocket and will be assessed a 5-point flight score penalty on their first flight at the Finals if they do not. Rockets may not be commercially-made kits designed for this event or kits designed to carry egg payloads with the only modification being the addition of an altimeter compartment. They must have only one stage. They must be powered only by commercially-made model rocket motors of "F" or lower power class that are listed on the ARC Certified Motor List posted on the ARC website and provided in the ARC Handbook. Any number of motors may be used, but the motors used must not contain a combined total of more than 80 Newton-seconds of total impulse based on the total impulse ratings in the ARC list, and all must be ignited on the ground. They must be used only for flight upward propulsion and must be the only powered source for vertical propulsion. Motors must be retained in the rocket during flight and at ejection by a positive mechanical means (clip, hook, screw-on cap, etc.) and not retained simply by friction fit in the motor mounting tube, but they must be removable post-flight. Rockets must not contain any pyrotechnic charges except those provided as part of the basic commercially-made rocket motor used for the flight, and these must be used only in the manner prescribed in the instructions for that motor.

4. PAYLOAD

Rockets must contain and completely enclose one raw hen's egg of 55 to 63 grams mass and a diameter of up to 45 millimeters. The egg must return from the flight without any cracks or other external damage. The egg will be issued to the teams by event officials during the Finals, but teams must provide their own egg for their qualifying flights. The egg and altimeter must be removed from the rocket at the end of a qualification or Finals flight in the presence of a designated NAR official and presented to that official, who will inspect the egg for damage after their removal and will read the altimeter score. All coatings, padding, or other materials used to protect the egg must be removed by the team prior to this inspection. Any external damage to the egg noted after its flight and removal from the rocket by the team is disqualifying.

5. DURATION SCORING

The duration score for each flight shall be measured from first motion at liftoff from the launch pad until the moment that the first piece of the rocket touches the ground (or a tree) or until it can no longer be seen due to distance or to an obstacle. Times must be measured independently by two people not on the team, one of whom is the official NAR-member adult observer, using separate electronic stopwatches that are accurate to 0.01 seconds. The official duration will be the average of the two times, rounded to the nearest 0.01 second, with .005 seconds being rounded up to the next highest 0.01 seconds. If one stopwatch malfunctions, the remaining single time will be used. The flight duration goal is a range of 36 to 39 seconds. Flights with duration in the range of 36 to 39 seconds get a perfect duration score of zero. Duration scores for flights with duration below 36 seconds will be computed by taking the absolute difference between 36 seconds and the measured average flight duration to the nearest 1/100 second and multiplying this by 4. Duration scores for flights with durations above 39 seconds will be computed by taking the absolute difference between 39 seconds and the measured average flight duration to the nearest 1/100 second and multiplying this by 4. These duration scores are always a positive number or zero. The target duration range for flights at the Finals will be the same regardless of the altitude target.

6. ALTITUDE SCORING

Rockets must contain one electronic altimeter of the specific commercial types approved for use in the ARC that will be the sole basis for the altitude score. These approved types are the Perfectflite Pnut or Firefly or the Jolly Logic Altimeter One or Altimeter Two. The altimeter must be inspected by an NAR official both before and after the flight, and may not be modified in any manner. The altimeter must be confirmed by this official before flight to not have been triggered and to be ready for flight. The Jolly Logic altimeters must have all previous flights erased before a scored flight. The peak altitude of the rocket as recorded by this altimeter and sounded or flashed out on its audible or visible light transmission or displayed on its screen post-flight will be the sole basis for judging the altitude score and this altimeter may be used for no other purpose. Other altimeters of other types may be used for flight control or other purposes. The altitude performance goal for qualification flights is 750 feet (229 meters). The altitude score will be the absolute difference in feet between the altitude performance goal in feet and the altimeter-reported actual flight altitude in feet (always a positive number or zero). The altitude performance goal for flights at the Finals will not be 750 feet; it will be a different altitude that will be between 725 feet and 775 feet, with first and second flights having different altitude targets in this range. These two altitude target numbers will be determined at the student team pre-flight briefing at the Finals.

7. FLIGHTS

Team members cannot be changed after the first qualification flight, with one exception as noted below for the Finals. Only team members on record at AIA with valid parent consent forms are eligible to receive prizes. To be eligible for the national final fly-off event, a registered team is required to fly and submit the results from at least two qualifying flights observed in person by an adult member of the NAR (unrelated to any team members or to the team's adult supervisor and not a paid employee of or student at their school or member of their youth group) between July 1, 2025 and Monday, March 30, 2026. Each team may conduct a maximum of three qualification flights and will be ranked based on the sum of the best two qualified flights. More than two qualification flights are not required if the team is satisfied with the results of their first two flights. A qualification flight attempt must be declared to the NAR observer before the rocket's motor(s) are ignited. Once an attempt is declared, the results of that flight must be recorded and submitted to the AIA, even if the flight is unsuccessful. A rocket that departs the launch rail or rod under rocket power is considered to have made a flight, even if all motors do not ignite. If a rocket experiences a rare "catastrophic" malfunction of a rocket motor (as determined by the NAR official observer), a replacement flight may be made, with a replacement vehicle if necessary. Catastrophic malfunctions for this event are defined as ejection of propellant grain, loss or rupture of an end closure, rupture of casing, or failure of ejection charge to fire at all. Flights which are otherwise fully safe and qualified, but which result in no altimeter reading despite correct usage of the altimeter by the team will be counted as "no flight" and may be re-flown without penalty. The results from qualification flight attempts must be entered into an online score reporting form by 11:59 PM Eastern time on Monday, March 30, 2026. NAR Observers who observe a disqualification flight should submit forms via email to qualificationflights@aia-aerospace.org. Based on these qualification scores 100 teams (with a limit of no more than the best two made up of students from any single school or organization) will be selected on the basis of lowest combined scores for their best two flights.

If a school has three or more teams **whose flight score is better than the cutoff score for Finals selection**, they may adjust the membership of the two best teams invited to attend the Finals to include students from other teams with scores that met the Finals cutoff, up to a limit of ten students on any single team. Schools/organizations who do not have 3 or more teams who met the cutoff score may not change the composition of their teams. Teams will be notified no later than 5 PM ET on Monday, April 6, 2026, and will be invited to participate in the final fly-off to be held on May 16, 2026 (alternate date in case of inclement weather will be May 17, 2026). Teams must confirm their attendance at National Finals by April 24, 2026, including a $365 registration payment.

8. SAFE RECOVERY

The rocket must return to earth safely and at a velocity that presents no hazard. An entry which has any heavy structural part or an expended motor casing separate from the rest and fall to earth without any form of recovery device will be disqualified. An entry whose parachute does not come out of the rocket body at all will be disqualified. The rocket must be allowed to land at the end of flight without human intervention (catching) and the flight will be disqualified if there is such intervention.

9. RETURNS

Return of the entire rocket is required by the deadline time on that same day that was established at the beginning of the day's flying. If the rocket cannot be returned after an otherwise safe and stable flight because it cannot be located or because it landed in a spot from which recovery would be hazardous (as determined by an NAR official), a replacement vehicle may be substituted for a replacement flight. Once the NAR official has declared that a rocket has landed in a place from which recovery would be hazardous, the results from that rocket's flight may not subsequently be used even if it is recovered.

10. LAUNCH SYSTEMS

Teams may use the electrical launch system and the launch pads (with six-foot long, 1-inch rails) provided by the event officials at the Finals or may provide their own rail or tower system as long as it provides at least six feet of rigid guidance; launch rods will not be permitted to be used at the Finals. Launch systems used locally for qualification flights prior to the Finals must provide the rocket with at least six feet of rigid guidance, with a rail or with use of a rod diameter of at least 1/4 inch, if a rod is used. All launches will be controlled by the event Range Safety Officer and must occur from the ground.

11. FLIGHT CONTROL

Rockets may not use an externally generated signal such as radio or computer control (except GPS navigation satellite signals) for any purpose after liftoff. They may use autonomous onboard control systems or altimeters separate from the official scoring altimeter to control any aspect of flight as long as these do not involve the use of pyrotechnic charges or rocket motors.

12. PLACES

Places in the final fly-off of the competition will be determined on the basis of the sum of the altitude and duration scores. At the fly-offs, at least 24 teams will be invited to make a second flight based on the results of their first flights. In these second flights, rockets which have issues which would otherwise rate a replacement flight under ARC rules #7 or #9 will not receive a replacement flight. Prizes awarded to the top places will be awarded only to those teams that make a second flight. The top final places (1st to 42nd) will be ranked on the basis of the sum of the scores from the two qualified flights made at the fly-offs. Remaining places will be awarded based on the scores from the first flight. Ties will result in pooling and equal splitting of the prizes for the affected place(s) -- for example, a two-way tie for 4th place would result in a merger and even division of the prizes for 4th and 5th places. If there is a tie for one of the top three places, the teams involved in the tie will be required to make a third flight to determine final places. AIA reserves the right to make all last and final competition determinations.

Section 3. KEY POINTS

After you read and understand the rules, please consider these ten key pointers about how to succeed in ARC 2026:

1. Do not launch your official competition rocket as the first rocket you build and fly; if you have never done model rocketry before, build and fly a simple rocket first. There is a good chance of failure (and learning!) on your first try, so this will reduce the chance that your official competition rocket will be damaged on the first flight.

2. Reach out to a NAR mentor early for advice on how to build a rocket, where to get your rocketry supplies, and where to fly.

3. Develop a budget and a division of labor and schedule for your team's efforts, and raise the money needed to buy the parts and rocket motors it will take to be successful; plan on at least 10 practice flights plus your 3 official qualification flights. A typical budget is between $800 and $1000, including entry fee and one altimeter, plus the parts for two rockets and the rocket motors for a dozen flights, but not launch equipment, the National Finals registration fee, or travel to National Finals.

4. Get your initial design done before winter break; use one of the computer programs to see if it will be stable in flight, and how high it is likely to go with which rocket motor, before you build it.

5. Do your first flight test by sometime in January, so that if major changes are needed in your design or your rocket crashes you have time to recover and do many flight tests before the qualification flight deadline.

6. Conduct many flight tests of your design (try to do at least ten and highly successful teams typically do at least twice that many) and take data on each test (rocket weight, motor type, altitude and duration; wind and temperature conditions; launch angle) so that you can make the right adjustments to exactly hit the target flight performance.

7. Figure out who your official NAR flight observer will be for your qualification flights, and check their availability well in advance. Keep in mind that they are volunteers and may not be able to help on short notice to support you.

8. Remember that two qualification flights are required and up to three qualification flight attempts are permitted. The best two scores count (they are added) for computing the score for determining Finals eligibility. These flights must be declared to an NAR observer before launch, and there are no "do-overs" for flights that do not have good scores; every official flight must be reported. Teams that submit only one qualification flight fail to qualify for theFinals.

9. Complete your qualification flights and submit the scores by the deadline; do not wait until the last weekend to fly, as weather may prevent flying and your NAR observer may not be available.

10. If you have a very good combined two-flight score from your qualification flights, develop your plan for how you will fund your travel to the National Finals, in case you are one of the 100 top teams.

Section 4. ROCKET DESIGN

How do you approach the process of designing a flight vehicle? Engineers start with what is a fixed, given quantity—such as the size and shape of the egg payload and its cushioning and the altimeter—and with the mission performance requirements. In this case the 2026 requirement is to reach an altitude of 750 feet and stay up for 36-39 seconds, and then have the rocket make a safe return to earth at the end with a parachute, with all sections remaining tethered together throughout recovery. No matter what your design is, it must incorporate this payload and achieve the performance requirement.

The challenge is finding the exact combination of airframe design, rocket engines, and duration-control technique with one or more parachutes that will achieve exactly 750 feet and 36-39 seconds. Doing this will require either lots of trial-and-error, or smart use of a rocket-design and flight-simulation computer program to get the design "roughly right" first. Modern aerospace engineers do lots of "flight tests" on a computer before they start building and flying hardware--it's quicker and cheaper!

What, then, are the variables in your aerospace system's design? Well, the size and shape of the rocket certainly has a wide range of possibilities, subject to the overall limitations that the rocket must be safe and stable, must be at least 650 millimeters in overall length, must not exceed 650 grams (23 ounces) in weight, and must comply with the specific requirements in the 2026 rules. And the selection of the vehicle's rocket motors is another major variable. Since certified commercially-made model rocket motors or a combination of motors with an aggregate total of 80 Newton-seconds or less of total impulse may be used, you must pick which ones you plan to use from the "American Rocketry Challenge Approved Motor List." This list is posted (and updated) at the National Association of Rocketry website at www.nar.org and in Appendix 7 of this Handbook. The minimum liftoff weight is probably at least 10 ounces and the rocket will probably need at least a 30 to 40 N-sec E motor (or a pair of D motors clustered in parallel) to achieve the altitude goal.

There are other design variables to be considered including:

- how to predict or control flight duration in various weather conditions
- how to cushion and protect the fragile egg
- what kind of electrical launching device to use.

What all of this means is that, like all engineers, you must engage in an iterative design process. You start with a very rough design, evaluate its performance against the requirements, and change the design progressively until your analysis shows that you have a design that is likely to meet them. Then you build, test, evaluate the success or failure of the test, and adjust the design as required until your analysis and tests show that the performance requirement is approximately met. Initial tests are best done as virtual flights on a computer, with the construction and flight testing of an actual rocket saved for the second step.

Remember that this program is also about teamwork; engineers design in teams because complex projects that are due in short periods of time demand some kind of division of labor. There are many ways to divide the labor—perhaps one person could become expert in computer flight-simulation programs, another in the craftsmanship techniques of model rocket building, a third in launch system design, and a fourth in charge of fundraising. All the members need to meet and communicate regularly, because what each one does affects how all the others approach their part of the job. You will need to elect or appoint a Program Manager/Team Captain to make sure everything fits together at the end so that your complex system will work in flight test. And you need to start early!

Here is a path that you may wish to follow to take you through the design process.

1. **Accommodate the payload.** Determine what size compartment is required to contain the altimeter and the Grade A large egg (which can be up to 45 millimeters in diameter) inside the rocket and to cushion the egg against the shocks of rocket launch, recovery system deployment in flight, and impact with the ground at the end of flight. Make sure that the lines connecting the sections of the rocket are strong cord (six to eight feet of 500-pound-test Kevlar or stronger, and not cotton or nylon cord), or 5 or more feet of strong elastic (at least ¼-inch wide); and that they are anchored strongly at the point where they attach to the rocket. Tying this line around the motor mount tube is recommended, just gluing it to the inside wall of the body will not work.

   Hint: Make sure you cushion the egg from impact with the walls of the payload compartment or with each other, or with metal hardware including the altimeter in every direction including the sides.

2. **Accommodate the instrumentation**. One of the electronic altimeters specified for the event must be used in your rocket, and will be the sole basis for measuring the rocket's achieved maximum altitude. You may install other additional altimeter-based systems if you wish to control duration or other features, but only an official altimeter type can be used for the official record of achieved altitude and this altimeter cannot be used for anything else. It is very important that the compartment in which the altimeter is placed be properly positioned on the rocket and vented with holes as described in Appendix 8, so that the air pressure inside it is always at equilibrium with the outside air pressure. The instrument measures altitude on the basis of the air pressure changes it senses during flight.

   Hint: Place the altimeter in a compartment that is totally sealed on the bottom against intrusion by high-pressure gases from the rocket motor's ejection charge.

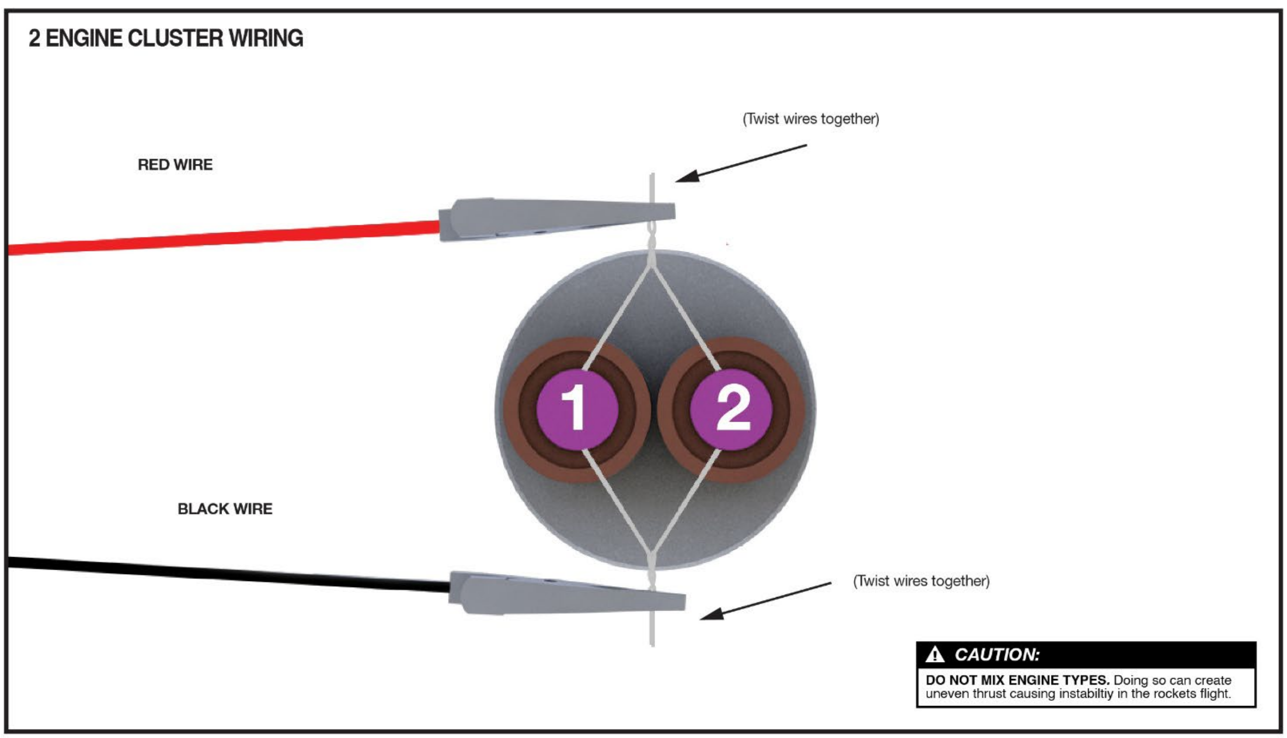
   Hint: Secure the altimeter in place mechanically in its compartment, don't let it "rattle" around or rely on foam padding to hold it in place (such padding might interfere with proper pressure equalization). But make it easy to remove, because you will have to remove the altimeter both before and after flight for inspection by event officials. Secure the shorting plug that powers up the altimeter (if you are using a Perfectflite Pnut) so that it does not shake loose in flight.

3. **Decide on a recovery system design approach.** You must determine how to trade off among parachute-design features (number of parachutes, parachute canopy diameter and shape, number and length of shroud lines, size of center spill hole, etc.) in order to achieve the specified duration of 36 to 39 seconds with the rocket. Additional information about parachutes can be found in Appendix 9.

4. **Learn to use a rocket-design computer program.** There are two good rocket-design programs currently available: the commercial RockSim program and the "freeware" Open Rocket program. Such a program is the best way to work through the remaining steps of flight vehicle design on a basis other than trial-and-error. There is no single correct design for this challenge; there are many different combinations of motor types, rocket length and diameter, rocket weight, and recovery system configuration that could lead to a flight altitude of 750 feet and flight duration of 36-39 seconds. A computer program will let you work through the rough possibilities fairly quickly and discard approaches that simply will not work or designs that are not aerodynamically stable. No simulation, however, is exactly accurate. Its estimate of the aerodynamic drag forces on your rocket may be off due to your construction techniques and it may therefore overestimate how high your real rocket will go; the rocket motors you use may perform slightly differently from the notional data for them in the program due to normal manufacturing variations, etc. That's why you still need to (and are required to) test-fly at the end of the design process.

5. **Decide on a propulsion (rocket motor) approach**. The list of rocket motors approved for use in the ARC program is very long–in theory you have lots of choices. But when you run flight simulations of your design using a good estimate of what your rocket design is going to weigh, you will find that only a few of these will really have the right overall power (total impulse) to give you the altitude that you want. Fewer still will have a sufficiently high average thrust to give you the flight velocity you want in order to get off the pad safely (see #7 below) and go straight up even in windy weather. And finally you need to check market availability—look at the ARC supporting vendor websites to make sure that the motor you have in mind is actually currently available from a vendor. Availability can be intermittent or limited for some motor types. And make sure that you pick the right delay time – the time from motor burnout to ejection – that will (according to the computer simulation) give your rocket time to coast to its natural apogee before parachute deployment.

   There are two overall approaches for rocket motors: single-use, which are very simple to use; or user-reloadable (with loadable casings and reload kits sold separately), which are more complex to use but average out to be cheaper per flight if you do a lot of flights. For ARC, all the approved motors that you are likely to use will be either 24 millimeters or 29 millimeters in casing diameter, so your motor choice will affect airframe construction. If you choose to use 24mm motors with black powder propellant (the ones made by Estes Industries) you also have the option to "cluster" them, or use a pair of motors in parallel, which also affects airframe construction. Clustering is described well in this Apogee Rocketry video: https://www.apogeerockets.com/Advanced_Construction_Videos/Rocketry_Video_282 and is illustrated in the diagram below.



6. **Simplicity**. The more complex you make your rocket design, the more things it has that can go wrong and the more it will cost both to develop and test. In the real world of engineering, low cost, rapid

delivery, and high reliability are what the customer wants. In this Challenge, since your eligibility for the top awards is based on the results of your flight attempts at the Finals, whatever you fly has to work perfectly the first time. Add complexity only where you need to in order to meet performance requirements.

7. **Basic design safety**. First and foremost, your rocket must be "stable." Read the *Handbook of Model Rocketry* chapter on stability if you do not know what this means, and use a computer program to calculate stability if in doubt. Because your rocket will be nose-heavy as a result of the egg and altimeter and its overall length (minimum of 650 millimeters), you should not need extremely large fins—be conservative and design for a stability margin of about two "calibers" (Center of Gravity ahead of Center of Pressure by two body tube diameters) with the egg and with loaded rocket motors. Second, make sure that the motor(s) you pick provide enough thrust to give your rocket a speed of 40 ft/sec by the time it reaches the end of its launcher, so that it does not "stagger" slowly into the air and tip over and fly non-vertically if there is any wind. Generally, you need a motor or combination of motors whose combined average thrust no less than five times the rocket liftoff weight, or at least 20 Newtons.

   Finally, plan on using a launch rod of at least 6 feet in length and 1/4 inch in diameter or (much better) a rail for flying these heavy rockets -- they will need the length to achieve safe speed and the rigidity to avoid "rod whip" when the heavy rocket is at the end of the launch rod on its way up. While launch rods can be used for local test and qualification flights, all teams must fly from 1-inch rails at National Finals; use of launch rods will not be permitted there.

   Electronic recovery system deployment systems, if you choose to use them, must be SAFE. If they are designed to sense acceleration or deceleration of the rocket as the basis for starting an ejection sequence, then there is a great risk that they can trigger on the ground or in your hands if you drop or jog the rocket while carrying it. Such systems must have a power switch, plug, or other electrical disconnect mechanism that permits you to maintain them in a completely "safe" configuration until placed on the launching pad, and will not be allowed to fly if they do not. These systems may not use pyrotechnic charges of any type (no Pyrodex or black powder or little rocket motors) to trigger deployment, but may use standard igniters to burn through or deploy something.

8. **Commercial vs Custom Parts.** The flight vehicle must be made by the student team members. You may use commercially-available "off the shelf" component parts (body tubes, nose cones, egg capsules, parachutes, etc.) and may adapt some kinds of rocket kits for the event, or you can scratch-build components if you prefer. Commercial kits or published designs that are made specifically for ARC are not allowed. Having a custom flight vehicle part fabricated by a composite or plastics company or custom wood machining company (even if it is to your design) does not constitute sale of a "standard off the-shelf product" and is not allowed. The rules do permit an electronic circuit board that is designed by the team to be fabricated by a commercial service. Using a 3-dimensional printer to make parts is OK as long as the student team does all the programming and runs the printer. Having a mandrel fabricated to your specifications that is used to wrap fiberglass on to make your rocket body is OK. In this case, the company is making a tool; you are making the part that flies.

Section 5. ROCKET CONSTRUCTION

Designing a rocket on a computer is important, but in the end you must build it and fly it. There are four key resources available to you for learning the craftsmanship techniques for building a model rocket for the American Rocketry Challenge. Review the online material and read the applicable chapters of the book before you start trying to put together your rocket. Then build and fly a simple rocket kit (such as the American Rocketry Challenge practice kit from Aerospace Specialty Products) before you build your entry.

1. Web pages of basic tutorial material on how to build a model rocket on the NAR website at http://www.nar.org/educational-resources/
2. Free online how-to resources from Apogee Components (an ARC partner vendor) on building model rockets at https://www.apogeerockets.com/New-to-Model-Rocketry#WhatIsARocket
3. A 45-minute instructional video for rocketeers of all ages on all the steps and techniques involved in building and flying a basic model rocket. This instructional video has been divided into six short segments of 4 to 9 minutes duration and posted online by the Aerospace Industries Association on their YouTube site. The six segments are:
    - Part 1: How Model Rockets Work www.youtube.com/watch?v=gYh1pWHoQXE
    - Part 2: Components of a Rocket www.youtube.com/watch?v=7kAkitKKKlA
    - Part 3: Construction www.youtube.com/watch?v=sxQ7vGgXx5Y
    - Part 4: Finishing the Rocket's Fins www.youtube.com/watch?v=xS021hCT3LU
    - Part 5: Assembling the Rocket www.youtube.com/watch?v=E4GLuSSyBWo
    - Part 6: Painting the Completed Rocket www.youtube.com/watch?v=NQFx1qe6zww
4. The NAR's official handbook, the *Handbook of Model Rocketry* by G. Harry and Bill Stine.

Below are some common mistakes we have observed:

1. Don't over-spend on parts. The basic components of a rocket, such as paper body tubes, balsa fins, and balsa or plastic nose cones are not going to cost you a lot if you design your rocket to use the inexpensive parts that are available from the "official" component vendors: Aerospace Specialty Products, Apogee, Balsa Machining Service, eRockets, or Estes. See their addresses in the "Resources" chapter of this Handbook. Get advice from an experienced NAR mentor concerning where to get parts and what kinds to get, to avoid overspending on materials that are overpriced, too heavy, or will not be needed.

2. Use the right materials in the right places. Body tubes should be commercially-made, smooth, and strong. Don't try using gift-wrap rolls or other "economy" parts for the main structural member of your rocket. Use balsa wood (or aircraft plywood or basswood) from a hobby store for your fins, probably at least 1/8 inch thickness (for balsa), and make sure that the wood grain lines start on the fin-body glue joint and go outward from it.

3. Use the right glues. Body parts should be held together with yellow carpenter's wood glue or epoxy, not white glue or hot-melt glue. You can use cyanoacrylate "super" glues for short-term on-field repairs, but do not use them for structural initial construction. You can reinforce fin-body joints with a "fillet" of hobby epoxy, or glue the fins into slots cut into the body tube to keep your fins from breaking off.

Section 6. ROCKET FLYING

Once your flight vehicle (rocket) is designed and built, it's time for flight test. This section provides some suggestions for organizing and conducting these tests, and for preparing for your flight at the National Finals. First and foremost, of course, is safety: **read and follow the NAR Model Rocket Safety Code**.

There is a detailed PowerPoint briefing on how to do flight testing and how to understand and control for all the variables that may affect flight results on the ARC website in the "Resources" section https://rocketrychallenge.org/resources/ (it is called "Flight Testing in the American Rocketry Challenge") but here is a summary of its key points:

- Flight testing needs to be systematic – take data, understand what it tells you, and use it to make purposeful adjustments
- Record everything about each flight in a consistent format – rocket weight, flight characteristics, launch device angle, weather; not just altitude and duration
- Use a data-logging altimeter and evaluate the trace after each flight
- Use computer simulations adjusted with the rocket's actual weight and drag coefficient to determine how much weight change will be required to change the altitude the number of feet needed to hit the altitude target
- Adjust your rocket to hit the altitude target, then adjust the recovery device to hit the duration target – then do your qualification flights early in the day to avoid "thermals"
- Figure out based on your data how to adjust your rocket's launch angle for different wind speeds to get a vertical flight and its weight for different temperature conditions to get the right altitude

1. Launching system. Consider the launching system to be an integral part of the flight vehicle system design, not an afterthought. Of course, the system has to be electrical and incorporate the standoff distance, safety interlock switch, and other requirements of the Safety Code, and it must be on the ground (no balloons!). But it also has to be able to provide the right amount of electrical current and voltage to fire your rocket motor(s) igniter(s), and it must provide rigid guidance to the rocket until it has accelerated to a speed where its fins can properly stabilize it (generally about 40 ft/sec). At the Finals, an electrical launch system will be provided that can fire a single igniter of any type with 12VDC and 18 amps of current through one set of clips, and the launching devices provided will be 6-foot-long, 1-inch rails. Use of launch rods is OK for local practice flying and qualification flights, but rods will not be available or permitted at the Finals. If your design requires something different (such as a tower-type launcher or cluster-motor "clip whip"), you must bring your own equipment and power source. In any case, you will need to have (or borrow) a system for pre-Finals test-flying. You may want to have one team member assigned the job of designing and building the launcher, particularly if you do not use a commercially-made system. Estes Industries has recently released a rail-type launch pad if you do not want to build your own.

2. Federal Aviation Administration (FAA). Model rockets that weigh 3.3 pounds (1500 grams) or less and have less than 4.4 ounces (125 grams) of propellant (i.e. ARC rockets) are exempt from flight regulation by the FAA; it does not take FAA notification or clearance to fly them anywhere in the U.S. This is explicitly stated in Federal Aviation Regulations (FAR) Chapter 101.1. Of course, you must follow the NAR Safety Code and not fly when aircraft are nearby or might be endangered or alarmed by your flight!

3. Launch Site. The launch site for the American Rocketry Challenge National Finals is about 1500 feet by 2500 feet of treeless closely-mowed grassland. If the winds at National Finals are light, recovery will be easy; in windy conditions (above 15 miles/hour), rockets that achieve a 39-sec duration may be a challenge.

The site you use for pre-Finals flight testing may or may not be large, but note the minimum site dimensions in the NAR Model Rocket Safety Code, which depend on the size of the motor(s) in your rocket. The first and most important thing you must have at a launch site is permission from the owner! If your school or organization has a suitable site and supports this event, your problem is easily solved. Otherwise, you must work with local park authorities, private landowners, etc. for permission to use a suitable site. There are generally two concerns expressed by landowners concerning rocket flying:

- **Perceived Danger:** The NAR handout at Appendix 12 summarizes the safety of this hobby and may be used (along with the NAR Safety Code at Appendix 3) to assure site owners of the safety practices that are in place. The accident rate for model rocket flying is nearly zero and it is hundreds of times safer than most organized athletic contact-sport events!
- **Perceived Liability Concerns:** If you are a member of the NAR, or if you are a member of an ARC team flying at a launch organized and run by an NAR "section" (club) you have personal coverage of up to $5 million against the consequences of an accident that occurs while you are flying, as long as you are following the NAR Safety Code. See Appendix 11 for more information on this insurance coverage. If your organization, school, school district, or other landowner of your rocket launch site requires liability insurance, your team can obtain "site owner insurance" coverage for this potential liability by having your supervising teacher/adult and at least one student member of the team members join the NAR and then having the supervising teacher/adult charter the group as an NAR "section" (club) of the "organizational" type. See the NAR website at https://www.nar.org/find-a-local-club/submit-a-club for more information. This insurance is not available to provide personal coverage for school officials or organization officials, only for the legal owner of launch sites. This additional coverage, which is only available to chartered NAR sections, requires filling out an online form available on the NAR website at this same location.

4. Launch Safety at National Finals. Your rocket and your launch system (if any) will be inspected for flight safety by an event official before they may be used in the National Finals. Any discrepancies noted there must be corrected before flight is allowed. **AT NATIONAL FINALS, YOUR ROCKET MUST HAVE PREVIOUSLY BEEN SUCCESSFULLY TEST-FLOWN AND YOU WILL NOT BE ABLE TO DO ANY TEST FLYING THERE ON THE DAY OF OR DAY BEFORE.** You must also be prepared to show and explain any complex rocket features affecting flight such as electronic timer systems, etc. The pre-flight safety check will also look for the following types of things:

- Do the motors (or motor) have sufficient thrust (average thrust to liftoff weight ratio 5 or greater) to give the rocket a safe liftoff velocity from its launcher?
- Is the rocket stable (CG at least one caliber ahead of CP) with motor(s) and egg installed?
- Are the motor(s) used listed on the American Rocketry Challenge 2026 Approved Engine List, and are they clearly not modified in any manner by the user?
- Are the fins and rail buttons attached securely and straight?
- Is the recovery system (shock cords and anchors, parachute material, etc.) sturdy enough to withstand the shock of opening with that rocket?
- Does the design have a positive mechanical means (hook, screw cap, etc.) to prevent any expended motor casings from being ejected in flight?
- Does the launch system (if the team provides its own) comply with Safety Code requirements for interlocks and standoff distance; and does the launcher have sufficient length (6 feet is minimum) and stiffness to guide the rocket securely until it reaches safe speed? Launch rods will not be permitted.

Important note: It is against the law to travel by airliner with rocket motors in your luggage. We will provide information on how to advance-order Finals motors for onsite delivery.

Section 7. QUALIFYING AND PRACTICE FLIGHTS

Practice-fly early and often. Only by test-flying can you master the skills of recovery system deployment, egg cushioning, and overall flight reliability and repeatability needed for success. Teams that make National Finals have usually done over 20 practice flights prior to their official qualification flights to achieve the score needed to qualify.

Each team that enters this competition must conduct at least two and no more than three NAR-observed "qualification" flights, fill out the attached score form for each one, scan it, and return it to AIA as part of the score submission process. The only method for submission of successful qualification flights is via the registration portal. Submitting through the portal will give you instant notification that your score was received. For technical support, please email rocketrychallenge@aia-aerospace.org. NAR observers who observe a qualification flight attempt that is not successful (i.e. crash, separation, or one or more broken egg) are asked to e-mail the form for that flight directly to the AIA at qualificationflights@aia-aerospace.org. Plan ahead for weather (rain or wind that "scrubs" a launch day), problems with the rocket's flight, etc. and do not wait until the last minute to try and fly this flight. Teams must provide their own egg and timing stopwatches for all qualifying and practice flights; pre-measured eggs and timers with watches will be provided by the NAR at the Finals.

Selection of the top 100 teams will be made on the basis of the lowest (best) 100 scores reported on the qualification flight forms submitted by a team. Score for any single flight is the total difference (in seconds and hundredths) by which the average timer-measured flight duration was outside the target range of 36.00 to 39.00 seconds (always a positive number) multiplied by FOUR; plus the total difference (in feet) between the altimeter-reported altitude and 750 feet (always a positive number). The final score for determining Finals eligibility is the sum of the two best (of the 2 or 3 permitted attempts) scores submitted by a team. Note that any cracking of the egg carried by the rocket is disqualifying.

The top 100 qualifying teams (but with a limit of no more than two from any single school or other sponsoring organization), based on their reported scores, will be invited to attend the competitive National Finals event that will be held on May 16, 2026 (alternate Finals date will be May 17, 2026, in case of bad weather) at the Great Meadow Outdoor Center, 5089 Old Tavern Road, The Plains, Virginia. All teams who submit a qualification flight form will be notified of their status by April 15, 2026 by ARC, and the list of those accepted will be posted at www.rocketrychallenge.org. Notification will be sent to you using the email addresses provided during the registration process.

An official qualifying flight must be declared before the motors are ignited and must be observed by a an adult member of the National Association of Rocketry, who must be impartial, i.e. not related to any member of the team (including the supervising adult), and not a paid employee of the school, a student at the school, or a member of the non-profit organization sponsoring the team. This NAR observer is one of your two required flight timers. In addition, a second impartial person not on the team (who does not have to be a member of the NAR, or an adult) must be the second flight timer. There are three ways to obtain an NAR observer if you do not already know of a qualified local NAR adult member who is ready to do this for you:

1. Attend an organized launch run by an NAR section, and fly your rocket at that launch. You can also use these launches as a place to practice-fly before you do your official qualification flight. These launches are listed in the "Launch Windows" Calendar on the NAR web site, www.nar.org. Always call a launch's point of contact before attending to confirm the time and place of the launch.

2. Contact the nearest section or chartered club of the NAR to see if they have launches not listed on the web site. Check the NAR site for a list of these sections and contact information.
3. Contact someone on the list of volunteer mentors posted in the ARC registration system. Many mentors live in places remote from an NAR section.

Obtaining an observer and providing stopwatches **is the responsibility of each team. Plan ahead** to find an observer for your qualification flight(s). **Do not wait** until late March to try to find someone on a day's notice to observe your flight. It is not reasonable or required for them to drive a long distance to do so. Upon request, we will send you a roster of every adult NAR member in your state to help you find a nearby qualification observer. Contact rocketrychallenge@aia-aerospace.org if you need this assistance. Not every NAR member is aware of the American Rocketry Challenge program, so you may have to explain it a bit first when you call one who is not already signed up as a mentor.

If there is no NAR member available within reasonable distance (and this will be true in a number of areas of the US), it is OK to have an impartial adult become a NAR member in order to be an observer. An impartial adult is someone who is not related to any member of the team or its supervising adult, and is not a paid employee or student at the team's sponsoring school/organization. NAR membership can be ordered online and is effective the day it is ordered. Observers who joined too recently to yet have a membership card and number may record their membership number as "PENDING" on the qualification flight form, and we will check with NAR Headquarters to get the membership number. Experienced rocketeers are certainly preferred to do the observer duties because they can usually understand the rules better and offer advice and tips at the same time—but experience is not absolutely required. We do not pre-approve observers, but we will check the form they sign to verify that the observer who signs is a current NAR adult member.


NAR
L3HARRIS
FINALIST

AMERICAN ROCKETRY CHALLENGE 2026
QUALIFYING/SELECTION FLIGHT REPORT

TEAM'S SCHOOL/ORGANIZATION: ______________________________

AIA TEAM NUMBER: ____________ ADULT SUPERVISOR: ______________________________

DATE OF THIS FLIGHT: ________________ QUALIFICATION ATTEMPT # (Circle) 1 2 3

FLIGHT REQUIREMENTS (ALL MUST BE CIRCLED "YES" OR THE FLIGHT IS DQ)

Did this rocket weigh less than 650 gm at takeoff, with egg and motors, was it 650mm or more long, and did it use a single diameter of body tube that was at least 47mm in diameter? YES / NO

Did it use motors from the ARC approved list containing a total of no more than 80 N-sec total impulse? YES / NO

Did it contain one Grade A large, raw hen's egg and an ARC-approved altimeter? YES / NO

Did the rocket keep all parts connected together during recovery, and use parachute recovery? YES / NO

Did this rocket make a safe flight under the ARC 2026 rules & NAR Safety Code? YES / NO

Did the rocket land safely and without any human intervention? YES / NO

Did the egg carried by the rocket remain uncracked after the flight? YES / NO

SCORING

TIMER # 1 (NAR OBSERVER): _____ . _________
SEC HUNDREDTHS

TIMER # 2 (OTHER ADULT): _____ . _________
SEC HUNDREDTHS

AVERAGE TIME: _____ . __________
SEC HUNDREDTHS

ALTIMETER ALTITUDE: ___________ FEET

EXCESS ABOVE 39.00 SEC: ___ . ____

MULTIPLY EXCESS BY 4: ____ . ____

OR

SHORTFALL BELOW 36.00 SEC: ___ . ____

MULTIPLY SHORTFALL BY 4: ___ . ____

+

DIFFERENCE FROM 750 FEET: __________
(NO NEGATIVES)

+

FINAL SCORE (SUM) ____ . ____
Put <u>only</u> "DQ" if any answers above are "no"

SUPERVISING TEACHER/ADULT CERTIFICATION

I certify that the student members of this team designed, built, and flew this rocket without my assistance and, to the best of my knowledge, without the assistance of any other adult or any person not on the team. I also certify that no more than the allowed number of official qualification flight attempts were made by this team, and that the team information on file at AIA is current. I understand that team membership can no longer be changed and only team members on file at AIA with valid parent consent forms are eligible to receive awards.

SIGNATURE: ____________________________ PRINT NAME: ______________________________

ADULT N.A.R. MEMBER OBSERVER CERTIFICATION

I certify that I am an NAR member age 21 or older who personally observed this flight, and the above initials and scores are mine, based on my observations. I certify that I am not related to any team members or affiliated with their school or non-profit organization, that this flight was conducted in compliance with the rules of the ARC competition, and that this flight was declared to me to be an official qualification flight before its liftoff.

SIGNATURE: _________________________ PRINT NAME: ______________________PHONE:_____________

NAR NUMBER: __________ CITY, STATE: _______________________ EMAIL: ______________________

SUBMIT USING ONLINE PORTAL AT ROCKETRYCHALLENGE.ORG (Successful flights only)
NO LATER THAN 11:59 PM (EST) MARCH 30, 2026
Team must submit this form if flight is successful;
NAR observer submits via e-mail for DQ (disqualification) flights at qualificationflights@aia-aerospace.org.

Section 8. GUIDELINES FOR N.A.R. OFFICIAL FLIGHT OBSERVERS

The American Rocketry Challenge program and the NAR count on the local NAR flight observers to be impartial and honest in the way that they score official ARC qualification flights, and to understand and enforce the rules and requirements consistently. Here are some guidelines for this duty:

1. **Be an NAR member**. You must be a current dues-paid adult (age 18 or older) member of the NAR as of the day of a flight in order to observe a flight. Membership in other organizations does not count. This is your responsibility to get right; the team trusts you and has no way to know your status. Joining or renewing online the morning of the flight, before the flight, is OK. We check observer membership status in the NAR database for every score report.

2. **Be impartial.** You cannot be related to any member of the team or employed by the organization that sponsored the team, or a student at the same school. If you are their mentor (which is permissible, but only if there is no other choice) you must not bend any rules for "your" team.

3. **Report all flights.** Teams only get three official qualification flight attempts. Any attempt must be reported to AIA except as noted in #4 below: by the team if successful, by the NAR observer if a DQ. No do-overs due to disappointing performance, weather issues, etc.

4. **All flights count.** Qualification flights must be declared before motor ignition, and must be counted and reported to AIA if the motor ignites, with the following exceptions:
    1. Flights that stick on the launch pad and fire the motor without lifting off do not count.
    2. Flights that experience a catastrophic motor failure do not count. Such failures are explosions that blow out either end closure or rupture the casing. Inaccurate delay times, "chuffing" ignition start-ups due to igniter mis-installation, or failures of reloadable motors due to user mis-assembly are not catastrophic failures and flights that experience these still count as official attempts.
    3. Flights that land in a place too dangerous for recovery or that drift away and are not recovered on the day of flight do not count, and cannot subsequently be counted even if found, once this basis for non-counting has been claimed by the team or declared (for safety reasons) by the NAR observer.

5. **Time accurately**. Two people must time the flight, using digital stopwatches accurate to 0.01 seconds, and one of these timers must be the official NAR observer. Timing is from first motion on the pad until the moment the first part of the rocket touches the ground (or tree or building!) or is lost from direct visibility due to distance, terrain, trees, etc. If one timer's stopwatch malfunctions, use the single remaining time.

6. **Report the apogee altitude based on the altimeter's external signal (beeps, flashes, or screen display) only**. Apogee altitudes interpreted off a digital download to a computer post-flight can be used for flight analysis, but the official altitude score must only be what the altimeter beeps, flashes, or displays on its screen.

7. **Disqualify a flight if you have to**. If a rocket drops off a part in flight, goes unstable, streamlines in dangerously on recovery, or cracks the egg then the flight must be disqualified. The NAR observer takes custody of the score report for such flights and must send it in to AIA.

Section 9. RESOURCES

This Team Handbook is the most important resource you need to participate in the American Rocketry Challenge. In addition, many answers to questions on competition specifics may be found in the Frequently Asked Questions section at www.rocketrychallenge.org/faq. There are many resources that may be useful in learning the basic rocketry skills needed to succeed in ARC or in getting the supplies necessary to participate, including:

www.nar.org	The web site of the National Association of Rocketry, the nation's oldest and largest non-profit model rocket consumer and safety organization. From this you can link to one of the NAR's 250 sections or local clubs, for advice and general assistance. You can join NAR online, to get insurance plus NAR's magazine "Sport Rocketry". Members have access to many online technical resources on the hobby.
http://www.apogeerockets.com/Rocket_Software/RockSim_Educational_TARC	RockSIM is an approved simulation software for ARC and is the most sophisticated of these software systems; information on its use and other rocket information can be found here.
http://openrocket.sourceforge.net/	"Open Rocket" free downloadable rocket design/simulation software.

The following are vendor-supporters of the NAR and ARC who have the rocket supplies and components needed for most designs, at reasonable price and good service.

www.balsamachining.com	Balsa Machining Service (BMS) in Pahrump, NV, 800-537-6232. A manufacturer/vendor of body tubes, balsa nose cones, model rocket motors, and other components for model rockets (look for the "TARC parts" page).
https://www.apogeerockets.com	Apogee Components in Colorado Springs, 719-535-9335. A manufacturer/vendor of body tubes, fins, model rocket motors, and other components for model rockets.
http://www.asp-rocketry.com/	Aerospace Specialty Products (ASP) in Gibsonton, FL. A manufacturer/vendor of body tubes, plastic nose cones, parachutes, transition sections, and a special ARC learner's kit.
www.wildmanrocketry.com	Wildman Rocketry. Free "Wildman Club" membership for registered ARC teams, providing discount on motor and parts.
http://cart.amwprox.com/	Animal Motor Works. Registered team discounts for rocket motors.
www.estesrockets.com/rockets/tarc	Estes Industries, the largest model rocket manufacturer, offers a special parts assortment for ARC, a rail-type launcher, and a discount on D, E, and F motors

Rocketry Mentors

The NAR has developed a nationwide list of experienced rocketeer mentors who are willing to be a resource to teams. A Rocketry Mentor is an adult rocketry expert advisor who helps a team learn basic rocketry skills and shows them where to get rocket supplies and launch sites. They can do this in person, by phone/video, or via e-mail. Teams are not required to have Rocketry Mentors, and mentors are not required to be NAR-approved (i.e. you can get local help from non-NAR rocket experts.) There is a list of NAR-approved mentors on the ARC website for your convenience, with contact information that is visible to registered teams only in the registration system. You may contact any mentor on the list, regardless of the state you or they live in.

Friend of the Team Program

The Aerospace Industries Association (AIA), who co-organizes ARC, is excited to launch the *Friend of the Team* Program in 2025-2026! This program connects American Rocketry Challenge teams with volunteer supporters who can provide additional expertise to support their work. This may include rocketry expertise, advice on fundraising, assistance raising the profile of the team in the community, leadership development, or any other area where the team needs additional help. Volunteers come from AIA member companies who sponsor the competition. Many of their employees are eager to support teams. Adult Team Advisors may express interest in additional support on behalf of the team here: https://www.surveymonkey.com/r/friend-of-the-team.

Fundraising Advice

Fundraising advice can be found in Appendix 10 of this Handbook.

APPENDIX 1.

THE FINALS

If your team's qualification flight scores earn one of the 100 invitations to come fly in the National Finals and compete for top awards, you may wonder – what comes next?

First, understand that the Finals are a three-day program, Friday May 15 through Sunday May 17. On Friday there are optional but really enjoyable events during the day. Each has a different capacity limit, so sign up early once you have received your National Finals invitation:

- Rockets on the Hill – Friday morning, some teams will go to Capitol Hill to display and talk about their rockets to members of Congress and staff, and to hear government leaders speak
- Tours – Friday afternoon, a tour is offered at the Udvar-Hazy Center of the National Air and Space Museum. Additional tours may be added in the coming months.

On Friday evening all teams must register and obtain their field and meal credentials at the Welcome and Orientation. Doors open starting at 6 PM. A pre-launch training session and safety brief starts at 7:30 PM sharp. This all takes place at the Metz Middle School in Manassas, VA and all teams need to arrive in time for this.

Saturday of Finals is flying day at Great Meadow, in The Plains, VA. Two weeks prior, every team is pre-assigned a **specific non-negotiable** launch time and launch pad for their flight during the day. First flights in the first round are at 8:30 AM (these 24 teams need to be on the field at 6:45 AM) and the final ones are completed by 12:30 PM. After that, the top-performing teams get a chance for a second flight (to a different altitude goal), with the winner being the team with the best (lowest) sum of scores across the two flights. Finals flights are done by 4:00 PM. The awards ceremony is at 5:00 PM with possible post-ceremony events.

Sunday is "reserve" day, just in case the weather is so bad on Saturday that flying is impossible. This actually happened in 2024! If the flying happens on schedule on Saturday, Sunday becomes your day to go sightseeing – or depart early.

When you are notified of your National Finals selection you are given two weeks (until April 24 – no exceptions) to commit to attending and to register your attendees, or your spot will be given to an alternate.

- It is not required that all team members attend, but there is no proxy-flying if none can attend, and the team must register one responsible Adult in Charge who will accompany them.
- Registration requires payment of the National Finals registration fee of $365 for each team attending the Finals. Payment must be made by the confirmation deadline – no exceptions.
- Travel expenses to the Finals are the responsibility of the team. A list of convenient and reasonably-priced hotels in Manassas will be provided, but there are no pre-arranged room blocks.

APPENDIX 2.

RECOMMENDED SCHEDULE OF ACTIVITIES FOR ARC TEAMS

Week 1-11 below refers to the elapsed time since the team is first organized. You should not wait until team entry forms and payment are received and accepted by AIA to get started.

WEEK 1

- Ensure all team data (names, e-mail, etc.) on file in the ARC registration portal is correct

WEEK 2

- Assign team responsibilities (such as project manager, airframe, propulsion & ignition, launch system, fund raising etc.)
- Get a Rocketry Mentor (see the list of available NAR mentors in the ARC registration portal and reach out to them now)
- Watch the 6-part instructional video "How to Build and Fly a Model Rocket" that is provided on YouTube at www.youtube.com/watch?v=gYh1pWHoQXE
- Download the Team Handbook & Rules and the Frequently Asked Questions from www.rocketrychallenge.org, and have all team members read both
- Begin research on rocket parts supply sources (starting with the "official suppliers" listed in the ARC Handbook)
- Order the flight-simulation and rocket-design computer programs (RockSIM), at the ARC Team price directly from Apogee after you have registered as a ARC team, or try out the less-sophisticated downloadable freeware program "Open Rocket".

WEEK 3

- Purchase an inexpensive one-stage rocket kit to familiarize team with rocket building & flying, and build it. A good basic kit specifically for ARC teams is available from Aerospace Specialty Products, see https://www.asp-rocketry.com/model-rocket-building-resources/tarc.cfm
- Locate a place to fly rockets (or a nearby NAR launch to attend and fly at, see the "Launches" event calendar at www.nar.org or contact the nearest NAR club or section listed there
- Develop a plan to raise required funds for purchase of rocket supplies covering at least 2 rockets and motors for at least 10 test and qualification flights and potentially for travel to the flyoffs.

WEEK 4

- Obtain a comprehensive book on model rocketry, such as G. Harry Stine's *Handbook of Model Rocketry*, and have all team members read it.
- Load the rocket design and flight simulation computer program that you purchased, and have team members learn to use it
- If you require "site owner" insurance for the place where you will be flying, have the teacher and at least one team member join the NAR, become an NAR "section" (club), and order NAR site owner insurance. See Appendix 11 for additional information about NAR insurance.

WEEK 5

- Fly a basic one-stage model rocket
- Order your Perfectflite official altimeter directly from Perfectflite. Jolly Logic altimeters are available from a variety of vendors or directly from the manufacturer https://www.jollylogic.com/ but there is no discount.

WEEK 6

- Using the computer program and the knowledge gained from reading and from building basic rockets, develop a first design for your ARC entry

WEEK 7

- Using the computer program, conduct flight simulations of your design with various rocket motors on the approved motor list, to determine the best motor(s) to use
- Locate sources for the materials needed to build the ARC design (starting with the official vendors in the ARC Handbook) and purchase required parts and rocket motors

WEEK 8

- Design and build (or purchase) the electrical launch system and the launch pad (preferably with a one-inch rail) to be used with your ARC entry, if you do not have a local rocket club's system available for your use. The Estes Industries “Pro Series” launch controller https://estesrockets.com/products/pro-series-ii-launch-controller and rail launch pad https://estesrockets.com/products/pro-series-launch-rail-system are a commercial option.

WEEK 9

- Begin construction of your initial design for your ARC entry
- Locate a NAR adult member who can serve as your official observer for your qualification flights, if you do not already have an NAR Mentor who will do this.

WEEK 10

- Develop a pre-flight checklist for your flight and assign responsibility for each of the duties to a member of the flight team
- Test your launch system by test-firing igniters without installing them in rocket motors

WEEK 11

- Weigh your completed rocket and re-run computer flight simulations with actual rocket weights

  Watch the recorded presentation on how to conduct ARC flight testing at https://www.youtube.com/watch?v=lge0QT0uPKw

December 6, 2025 at 11:59 PM ET – ARC Team Registration Deadline

By February 1 you should (but are not required to):

- Test-fly your initial ARC design (without altimeter), making sure that you leave time to redesign, rebuild, and re-fly before the qualification flights deadline if this initial flight/design is not successful!
- If your first flight is fully successful, test-fly again with stopwatch timing and the altimeter installed. Repeat test flights until you hit the design targets.
- If your first flight is not successful, do post-flight failure analysis and re-design.

By March 1 you should (but are not required to):

- Make your first official qualification flight attempt in front of an NAR Senior member observer

March 6, 2026 – Rocket Reels Challenge Deadline (formerly called Marketing Competition)

March 30, 2026 at 11:59 PM ET – Qualification Deadline

- Before this date, make your final official qualification flight attempt (either 2 or 3 attempts total are permitted) in front of an NAR adult member observer
- Submit your qualification flight reports to the ARC online portal

April 6, 2026 – Mission Debriefing Challenge Deadline (formerly called Presentation Competition)

By April 6:

- Top 100 teams will be announced as National Finalists
- If notified of selection to attend the National Finals flyoffs, make reservations at a nearby hotel and conduct fund-raising to cover entry fee, travel and lodging. Make travel arrangements.
- Continue test-flying to fine tune rocket design to be able to achieve any altitude target between 725 and 775 feet.
- If you plan to travel to the flyoff by airline, order rocket motors for flyoff to be shipped to the Finals receiving point at Aurora Flight Sciences or delivered on-site by a Finals vendor

By April 24:

- This is the deadline to confirm participation in National Finals
- Alternates will be notified by this evening at the latest if they will be invited.

By April 29:

- Invited alternates must confirm or decline participation in National Finals

NO LATER THAN May 1

- Complete and test-fly the actual rocket to be used in the flyoff. This flyoff rocket must have been test-flown before arrival at the flyoff, as there is **no opportunity for test-flying at the National Finals flyoff site or anywhere else in the area**.

May 6, 2026 at 11:59 PM ET - LaunchPad League Deadline

May 16, 2026 – National Finals, Great Meadow, The Plains, VA

APPENDIX 3

NATIONAL ASSOCIATION OF ROCKETRY
MODEL ROCKET SAFETY CODE

Revision of August 2012

1. **Materials.** I will use only lightweight, non-metal parts for the nose, body, and fins of my rocket.
2. **Motors.** I will use only certified, commercially made model rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer.
3. **Ignition System.** I will launch my rockets with an electrical launch system and electrical motor igniters. My launch system will have a safety interlock in series with the launch switch, and will use a launch switch that returns to the "off" position when released.
4. **Misfires.** If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.
5. **Launch Safety.** I will use a countdown before launch, and will ensure that everyone is paying attention and is a safe distance of at least 15 feet away when I launch rockets with D motors or smaller, and 30 feet when I launch larger rockets. If I am uncertain about the safety or stability of an untested rocket, I will check the stability before flight and will fly it only after warning spectators and clearing them away to a safe distance. When conducting a simultaneous launch of more than ten rockets I will observe a safe distance of 1.5 times the maximum expected altitude of any launched rocket.
6. **Launcher.** I will launch my rocket from a launch rod, tower, or rail that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up, and I will use a blast deflector to prevent the motor's exhaust from hitting the ground. To prevent accidental eye injury, I will place launchers so that the end of the launch rod is above eye level or will cap the end of the rod when it is not in use.
7. **Size.** My model rocket will not weigh more than 1,500 grams (53 ounces) at liftoff and will not contain more than 125 grams (4.4 ounces) of propellant or 320 N-sec (71.9 pound-seconds) of total impulse.
8. **Flight Safety.** I will not launch my rocket at targets, into clouds, or near airplanes, and will not put any flammable or explosive payload in my rocket.
9. **Launch Site.** I will launch my rocket outdoors, in an open area at least as large as shown in the accompanying table, and in safe weather conditions with wind speeds no greater than 20 miles per hour. I will ensure that there is no dry grass close to the launch pad, and that the launch site does not present risk of grass fires.
10. **Recovery System.** I will use a recovery system such as a streamer or parachute in my rocket so that it returns safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket.
11. **Recovery Safety.** I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places.

LAUNCH SITE DIMENSIONS		
Installed Total Impulse (N-sec)	**Equivalent Motor Type**	**Minimum Site Dimensions (ft.)**
0.00--1.25	1/4A, 1/2A	50
1.26--2.50	A	100
2.51--5.00	B	200
5.01--10.00	C	400
10.01--20.00	D	500
20.01--40.00	E	1,000
40.01--80.00	F	1,000
80.01--160.00	G	1,000
160.01--320.00	Two Gs	1,500

APPENDIX 4.
ROCKET REELS CHALLENGE
(formerly called Marketing Competition)

Your team puts in a tremendous amount of work each year competing, and the whole world deserves to see what you've done! In the Rocket Reels Challenge, you and your teammates create a video up to two minutes in length to generate excitement about your team, ARC, and aerospace and space exploration. First place in this challenge will receive a $3,000 cash award and second place will earn $1,500!

Sound exciting? Click here to go to our website and read the latest rules, see last year's entries, and find out how you can be this year's winners!

Requirements:

- Only members of a single team may contribute to the video. Multiple teams may not join together, even if from the same school or organization.
- The video must be made entirely by the student team members.
- The video must be between 30 and 120 seconds in length.
- The video must be shot in at least 720p.
- The video must be uploaded to YouTube or Vimeo and an active link must be provided in the submission.
- The video must use the correct, current name and logo of the competition (ARC, not TARC)

Beyond that, it's all up to your team!

Submissions: Submissions are completed online through our entry form found at: https://www.surveymonkey.com/r/rocket-reels

Submissions are due by 11:59pm ET on March 6, 2026.

APPENDIX 5.
Mission Debriefing Challenge
(formerly called Presentation Competition)

On top of strong design, construction and flight-testing skills, aerospace engineers must also be able to communicate to others what they have done and how they did it. The Mission Debriefing Challenge assesses how well a team can explain their rocket's design, how their test flight data drove their choices, and how well they came together to make it all happen. At the International Rocketry Challenge (IRC), a team's presentation accounts for 40% of the overall score. U.S. champion teams almost always have to spend their prep time not working on their rockets, but developing presentations! Teams can get a leg up on their international competitors and be ready for the IRC by competing in the Mission Debriefing Challenge. Click here to go to our website and read the latest rules, see last year's entries, and find out how you can be this year's winners!

Any registered team that has flown at least three test flights with a rocket complying with 2026 rules is eligible to compete. These do not need to be official qualification flights, and they do not need to be entirely successful flights. Entries are not limited to only teams that have qualified for the Finals, any registered team that has made at least this many flights is eligible. No more than one team from any school or organization may submit a presentation and teams may not combine to present.

Teams should use Microsoft PowerPoint, Google Slides, or other similar software to create their presentations. Presentations must include a cover slide that contains the sponsoring organization or school name, as well as their team number. Speaker notes for the cover slide must list the names of the students who created the presentation. Presentations may use no more than 20 slides, excluding the cover slide. No animations, embedded videos, special effects, or transitions are permitted. Teams are, however, encouraged to use speaker notes to help provide context to each slide. Speaker notes are limited to 200 words per slide. This does not include text already on the slide. All submissions must be in .pdf format. Before submitting, teams should double-check to ensure that their .pdf version includes any speaker notes

Teams that are concerned about accurately referencing rocketry fundamentals should go to the ARC website Resources page. There, a wealth of videos, articles, and handbooks cover many aspects of rocketry that you'll need to reference in your presentation if you want to succeed.

Submissions are due by 11:59 PM ET on April 6, 2026 via this form:
https://www.surveymonkey.com/r/ARC-mission-debriefing-26

Live presentations for the top 5 submissions will be held on Saturday afternoon, May 2, 2026. Winners will be announced at the Finals award ceremony on May 16 but do not need to be present at that ceremony to win.

A panel of NAR judges will review submitted presentations and score them based on the following six equally weighted categories:

1. Explain your rocket. How did your team reach this design? What are the dimensions, construction materials, weight, and motor type selected, and how were these decisions decided?

2. Teamwork. Teamwork is critical in the aerospace industry. How did each member of the team contribute to your efforts, such as rocket design, construction, flight testing, or other elements of the team's operation, including outreach, fundraising, and the writing of this presentation?

3. Rocket science – How did your team do the tradeoffs among rocket drag, weight, and motor selection to try to achieve the altitude performance target in your initial design? How did you select parachute size? How did you account for different weather conditions at the time of launch in your plan to achieve the performance targets?

4. Flight testing – How did your team use flight data collection and analysis to refine your approach to the mission and make the adjustments after flights to try to achieve a better score? How did you intend to make adjustments to the rocket at the Finals, depending on whether the target altitude was 725 feet or 775 feet for your first flight there? Does the presentation document at least three flights (successful or not) with a 2026 rules-compliant rocket?

5. Lessons learned – What lessons did you learn from your experience about how to do a team-based engineering design and construction project, and how would you change your approach for future competitions?

6. Presentation Quality. Were the slides numbered, uncluttered, not excessively wordy, and present information clearly? Did they tell a coherent end-to-end story and cover the five key subjects (above) of the judging? Did they comply with format and content requirements and use grammatical English with proper spelling? Did they use appropriate techniques to display data? Did the speaker notes relate to and clarify the material on the slides without merely repeating it?

Following this initial scoring, the top-ranked five teams will be invited to do a live (online) 15-minute presentation and 10-minute question & answer session to this panel of judges on the afternoon of May 2, 2026 between 2pm and 5pm EST. **Your team should not enter this competition unless you can commit to have all (or all but one) team members present at the final oral presentations if your team is selected.** Final places will be awarded on the basis of a combination of the scores from this and from the initial judging. The first-place team will be awarded $3,000 along with a commemorative plaque. The second-place team will receive a $1,500 award.

APPENDIX 6:
LAUNCHPAD LEAGUE

Welcome to the Launchpad League! Get ready to explore the world of model rocketry through teamwork, creativity, and hands-on challenges. The Launchpad League is a high-flying, point-scoring, team-powered adventure through the universe of model rocketry, where your smarts, curiosity, and teamwork fuel your ascent to the top of the leaderboard.

In this league, you'll blast off by attending interactive webinars, submitting questions that ignite great discussions, and lending a hand to your fellow rocket teams. You'll earn **Launchpad League Miles** for each mission-critical task you complete—whether that's tuning into a Launchpad Live workshop, gathering local teams for a Rocket Round-up, or entering a Mission Extension Challenge.

Every activity is designed to bring you one step closer to being a rocketry legend. The more you engage, the higher your team climbs. Think of it like a space race, but instead of just speed, you win by showing dedication, learning the science behind the sizzle, and fueling others' flights as well as your own.

So if you're ready to launch your passion, build real skills, and join a community of other student rocketeers who are just as obsessed with flight and firepower as you are—then the Launchpad League is your countdown to greatness.

Who is eligible: All teams who have opened applications are eligible to participate in Launchpad League events and activities. Only fully valid and registered teams are eligible to win.

What to do: The next page shows many ways to earn Launchpad League Miles, but more opportunities will be added throughout the year. A Launchpad League website will open August 1 with further information on how to submit an entry.

Examples of How to Earn Launchpad League Miles

Engagement
Launchpad LIVE: Attend a Launchpad LIVE online workshop where you'll meet and learn from a professional at one of our sponsor companies. You'll hear about their career journey, engage in Q&A, and chat about how their work applies to your ARC endeavors.
Rocket Round-up: Host a meeting of teams from 3 or more schools or organizations who are competing in ARC this year. (virtual or in person)
Mission Extension Challenge: Enter one of the other Mission Extension Challenges (Rocket Reels or Mission Debriefing Challenge)
Aerospace-Focused Location Tour: Tour a local sponsor facility, airport, university lab, museum, etc.
Launchpad League Reflection: Create a video, blog, or photo journal to share your journey (different from Rocket Reels video, though footage may be reused)
Community Outreach Event: Host an event or workshop to get members of your community excited about rocketry! This must be different from a regularly scheduled launch event.
Early Registration: Register your team by November 1!
Submit Qualification Flights Early: Submit all team qualification flights by March 1!
Many more ways to earn Miles will come up throughout the year. All opportunities will be listed or added to the Launchpad League webpage starting August 1!


VCCS
ROCKETRY
SONIC
VCCS
Kings
FINALIST

APPENDIX 7.

NATIONAL ASSOCIATION OF ROCKETRY CERTIFIED MODEL ROCKET MOTORS APPROVED FOR USE IN ARC 2026

The commercially-made model rocket motors listed below have been subjected to rigorous safety and reliability testing conducted by the NAR Standards & Testing (S&T) Committee and are the only ones approved for sale in the U.S. or for use in this Challenge. All motors listed here are in current production. Every motor listed here will continue to be approved for use in the ARC 2026 event regardless of any subsequent announced changes to the NAR's overall official engine certification list. This list may be expanded if new motors are certified during the period of ARC; this expansion and any revised list will be communicated to all those teams enrolled in the ARC.

IMPORTANT NOTE: There are motor types in the databases for the rocket flight simulation programs (RockSim, Open Rocket, etc.) that are NOT on this approved motor list for a variety of reasons. And not all motor types listed here are readily available all the time, depending on manufacturer.

Download "Motor Data Sheets" from the NAR web site if you desire additional information. Each data sheet contains a thrust curve together with values from a test firing, including measured average thrust and total impulse, plus 32 data points for use in altitude simulation computer programs.

Abbreviation	Full Manufacturer Name
Aerotech	Aerotech
Cesaroni	Cesaroni Technology Incorporated
Estes	Estes Industries
Quest or QJet/AT	Quest Aerospace Education (a subsidiary of Aerotech)

Note: (R) following the listed casing dimensions denotes that the motor is a reloadable motor system certified only with the manufacturer-supplied casing, closures, nozzle, and propellant. Reloadable motors are not available for sale to persons under age 18, per U.S. Consumer Products Safety Commission regulations. But if the performance of these types of model rocket motor happens to be exactly what you need for your design, your supervising teacher/adult advisor can purchase them and supervise your use of them.

Manufacturers of E and F motors often use letter codes right after the motor average thrust value on the label (e.g. the “FJ” in an F23FJ motor type) which designate the type of that manufacturer’s propellant used in the motor. This code, or the absence of a code, does not affect status of certification for ARC.

Motors with “sparky” propellant or with an average thrust higher than 80 N are officially classified as “high power motors” even if their total impulse is in the F power class or below, and such motors are not listed or approved for use in ARC. Motors that are no longer in production are also not listed and may not be used.

NAR CERTIFIED MODEL ROCKET MOTORS
APPROVED FOR USE IN ARC 2026

As of June 16, 2025

Designation		Mfgr.	Casing Size (mm)	Propellant Mass (grams)	Total Impulse (N-sec.)
1/2A3-2T,4T		Estes	13 x 45	2.0	1.25
A3-2,4,6T		Estes	13 x 45	3.3	2.50
A10-0T		Estes	13 x 45	3.6	1.88
A10-3T,PT		Estes	13 x 45	3.8	2.50
C6-0,3,5,7		Estes	18 x 70	10.8	9.0
C11-0,3,5,7		Estes	24 x 70	12.0	9.0
C12-4,6,8		QJet/AT	18 x 70	10.4	9.8
C18W-4,6,8		Qjet/AT	18 x 70	5.6	9.8
D8-0,3,5		Qjet/AT	24 x 70	22.0	18.6
D9W-4,7	R	Aerotech	24 x 70	10.1	20.0
D12-0,3,5,7		Estes	24 x 70	21.1	17.0
D13W-4,7,10	R	Aerotech	18 x 70	9.8	20.0
D15T-4,7	R	Aerotech	24 x 70	8.9	20.0
D16-4,6,8		Qjet/AT	18 x 79	12.5	12.4
D20W-4,6,8		Qjet/AT	18 x 70	8.7	13.8
D22W-4,7,10		Qjet/AT	24 x 87	12.0	19.3
D24T-4,7,10	R	Aerotech	18 x 70	8.8	18.5
E12-0,4,6,8		Estes	24 x 95	35.9	27.2
E16-0,4,6,8		Estes	29 x 114	40.0	33.4
E16W-4,7	R	Aerotech	29 x 124	19.0	40.0
E18W-4,8	R	Aerotech	24 x 70	20.7	39.0
E20W-4,7		Aerotech	24 x 65	16.2	35.0
E22SS-13°	R	Cesaroni	24 x 69	13.4	24.2
E23T-5,8	R	Aerotech	29 x 124	17.4	37.0
E24C-4,7,10		Aerotech	29 x 110	18.4	36.3
E26W-4,7,10		Qjet/AT	24 x 70	18.3	27.8
E28T-4,7	R	Aerotech	24 x 70	18.4	40.0
E30T-4,7		Aerotech	24 x 70	17.8	33.6
E30-4,7		Estes	24 x 70	17.8	33.6
E31WT-15°	R	Cesaroni	24 x 69	11.2	26.1
E35W-5,8,11		Qjet/AT	24 x 113	25.4	39.4
E75VM-17°	R	Cesaroni	24 x 69	10.4	24.8
F15-0,4,6,8		Estes	29 x 114	60.0	49.6
F20W-4,7		Aerotech	29 x 73	30.0	51.8
F22J-5,7	R	Aerotech	29 x 124	46.3	65.0
F23FJ-4,7		Aerotech	29 x 83	30.0	41.2
F24W-4,7	R	Aerotech	24 x 70	19.0	50.0
F25W-4,6,9		Aerotech	29 x 98	35.6	80.0
F26FJ-6,9		Aerotech	29 x 98	43.1	62.2
F26FJ-6		Estes	29 x 98	43.1	62.2
F27R-4,8		Aerotech	29 x 83	28.4	49.6
F29-12A	R	Cesaroni	29 x 98	30.9	54.8

F30FJ-4,6,8		Aerotech	24 x 90	31.2	47.0
F30WH/LB-6A	R	Cesaroni	24 x 133	40.0	73.1
F31CL-12A	R	Cesaroni	29 x 98	25.7	55.5
F32T-4,6,8		Aerotech	24 x 90	25.8	56.9
F32WH-12A	R	Cesaroni	29 x 98	29.9	52.8
F35W-5,8,11	R	Aerotech	24 x 95	30.0	57.1
F36SS-11A	R	Cesaroni	29 x 98	29.5	41.2
F36BS-14A	R	Cesaroni	29 x 98	25.6	51.5
F37W-6,10,14	R	Aerotech	29 x 99	28.2	50.0
F39T-3,6,9	R	Aerotech	24 x 70	22.7	50.0
F40W-4,7,10	R	Aerotech	29 x 124	40.0	80.0
F41W-5,8,11		Qjet/AT	24 x 114	30.0	45.5
F42T-4,8		Aerotech	29 x 83	27.0	52.9
**F44W-4,8		Aerotech	24 x 70	19.7	41.5
F50T-4,6,9		Aerotech	29 x 98	37.9	80.0
F50T-4,6		Estes	29 x 98	37.9	80.0
F51BS-13A	R	Cesaroni	24 x 101	22.0	49.9
F51CL-12A	R	Cesaroni	24 x 133	33.0	75.0
F51NT-10	R	Aerotech	24 x 70	26.5	55.1
F52C-5,8,12		Aerotech	29 x 112	30.0	66.2
F52T-6,8,11	R	Aerotech	29 x 124	36.6	78.0
F59WT-12A	R	Cesaroni	29 x 98	26.1	57.0
F62T-S,M,L	R	Aerotech	29 x 89	30.5	51.0
F62FJ-10	R	Aerotech	24 x 95	32.2	47.6
F63R-10	R	Aerotech	24 x 95	27.6	49.5
F67C-6,9,14		Aerotech	29 x 112	36.8	77.5
F67W-4,6,9		Aerotech	29 x 89	30.0	61.1
F70WT-14A	R	Cesaroni	24 x 101	22.5	52.9
F79SS-13A	R	Cesaroni	24 x 133	40.1	67.8

Additional notes:

- The manufacturer-reported total impulse and propellant mass of motors often differs from the values reported above, which are based on testing by the NAR Standards & Testing Committee. The values above are the ones that will be used in ARC.

****** Aerotech F44 motors made before August 2024 are not recommended for use due to performance reliability issues that have been corrected in recent production.

APPENDIX 8.

PARACHUTES

All rocket recovery devices are designed to produce aerodynamic drag to slow the descent of the rocket once they are deployed. The drag on a falling object increases as the square of its velocity. When a descending rocket stabilizes at terminal velocity, the drag forces on all the connected parts of the descending rocket at that velocity exactly offset its weight and its acceleration becomes zero. No matter how far it falls after this, the rocket's descent velocity will not further increase. The heavier a rocket, the higher this terminal velocity will be. The larger and more "draggy" a rocket is in its recovery configuration, the lower this terminal velocity will be.

There is an excellent tutorial on how to determine appropriate parachute size and design and estimate parachute descent rate in the Apogee Rocketry "Peak of Flight" newsletter issue #149, at https://www.apogeerockets.com/education/downloads/Newsletter149.pdf

For 2026, if your rocket goes up 750 feet and takes 8 seconds after liftoff to reach this altitude and deploy its parachute, and you want the total flight duration to be 38 seconds, then the descent terminal velocity that you want for the rocket is 750 / (38 – 8) = 25 feet/second. Remember that at the Finals your flight altitude goal will be different but your duration goal will remain unchanged, so you will have to have a plan for adjusting your rocket's descent rate. The heavier the rocket, the more drag it will need on recovery to achieve a velocity this small. Higher recovery drag is easy to achieve with a parachute, just make it bigger in diameter. The factors other than size that affect how a parachute performs (how much drag it has) include:

- Weight of the rocket hanging under the parachute
- Shape (which determines the "drag coefficient" of the parachute)
- Length of shroud lines (which can be adjusted by "reefing" or tying a knot partway up the shroud lines)
- Number of shroud lines
- Type of material (fabric vs plastic)
- Size of "spill hole" in the center of the parachute
- Interaction with other parachutes where two or more are being used

There are two ways that teams can get parachutes: make buy a premade chute of the appropriate size from one of the many parachute vendors servicing the rocketry hobby; or make a parachute yourself from scratch. The former is easier. It is strongly recommended that you use parachutes made of a strong fabric (e.g. ripstop nylon) and not thin plastic; and that the shroud line be sewed on, not attached with tape.

Some of the vendors who make rocket parachutes are listed below. Remember that under the 2026 rules you cannot get a commercial parachute (or any other part of your rocket) custom-made to your specifications, you have to buy and use a standard-stock item available to all or fabricate your own.

Aerospace Specialty Products, www.asp-rocketry.com
Top Flight Recovery, http://topflightrecoveryllc.homestead.com/ (sold via Balsa Machining Service, www.balsamachining.com or Apogee, https://www.apogeerockets.com/)

APPENDIX 9.
ALTIMETERS

DESCRIPTION

The altimeters approved for use in ARC 2026 (the Perfectflite Pnut, and Firefly models and the Jolly Logic Altimeter ONE and Altimeter TWO) are "maximum altitude altimeters" that precisely measure the air pressure at the altitude where your rocket is located every 0.05 seconds and convert this to an above-ground altitude value. The altimeter senses the liftoff of the rocket from the sudden air pressure drop that results from its altitude change, then senses the maximum altitude that the rocket subsequently reaches, and "freezes" and displays this maximum altitude thereafter using a piezoelectric buzzer (Pnut), flashing light (Firefly), or screen display (Altimeter ONE or TWO). It will not work on flights that achieve less than 160 feet altitude above ground level. It is accurate to better than 1 percent of the measured altitude, which is far better accuracy than any other altitude-measurement technique readily available to hobby rocketeers.

USING THE ALTIMETER

Read and follow the detailed manufacturer usage instructions provided with the altimeter. Always handle them by the edges when testing or installing to avoid touching any of the circuitry. Never store the device bare in a clear plastic bag; use a small cardboard box or wrap the altimeter in a paper towel inside a plastic bag. Do not use tape on the altimeter, and use care to keep it clean and dry. Protect it from the fumes and residue created by rocket motors and their ejection charges by installing it in a compartment of your rocket that is totally sealed from motors and charges. Make sure that it cannot "rattle around" in this compartment and get damaged in flight..

The altitude achieved by the rocket (and the altitude read by the altimeter) depends on launch site altitude and air temperature. If you live at an altitude much different from the American Rocketry Challenge launch site (600 feet above sea level), or fly when the temperature much different from the temperature on "Finals" day in May, your rocket will go to a different altitude (and the altimeter will read a different altitude) than it will at the Finals. You need to compensate for this. The flight-simulation programs (such as RockSim) have user inputs for ambient air temperature which will accurately adjust predicted altitude for its effect on aerodynamic drag on the rocket (rockets go higher in the thinner air of hotter days).

In addition, the computation algorithm inside the altimeter that converts measured air pressure changes during flight into flight altitude is based on the assumption that ambient temperature at the ground is 58 degrees F (15 Celsius). If the temperature is different from one flight to the next, the altimeter-calculated altitude will change even if the flights go to precisely the same geometric altitude. Colder air temperatures lead to higher altimeter-reported altitudes (the opposite effect of temperature on aerodynamic drag). The actual geometric altitude achieved in a flight can be determined by multiplying the altimeter reading by a factor of $(273.15 + T)/288.15$ where T is the ambient temperature in degrees Celsius. No manual post-flight adjustment for temperature is permitted in calculating or recording official altitude scores, so if you want to hit the same altimeter-reported altitude on flights flown at different temperatures you will have to make allowance in rocket weight for both this temperature effect and the effect on aerodynamic drag.

An altimeter must be mounted in a "sealed" chamber which must have a vent hole or holes to the outside. A sealed bulkhead below the altimeter chamber is necessary to avoid the vacuum caused by the aft end of a rocket during flight. A sealed bulkhead above the altimeter chamber is necessary to avoid any pressure fluctuations that may be created at the nose end of the rocket. If the front of the payload section slip fits to another section such as a nosecone, then the fit must be as free as possible from turbulence. A breathing hole or vent (also known as a static port) to the outside of the rocket must be in an area where there are no obstacles above it that can cause turbulent air flow over the vent hole. Do not allow anything that protrudes out from the rocket body to be in line with and forward of a vent hole. Vents must be neat and burr free and on an outside surface that is smooth and vertical where airflow is smooth without turbulence.

It is better to use multiple (preferably four) static ports (vent holes) instead of just one. Never use two. Very strong wind blowing directly on a single static port could affect the altimeter. Multiple ports evenly spaced around the rocket tube may help cancel the effects of strong wind on the ground, the effects of transitioning through wind shears during flight, the pressure effects of a non-stable liftoff, or the pressure effects that occur due to flipping and spinning after deployment. Ports must be the same size and evenly spaced in line around the tube. For most ARC rockets the best configuration is four 0.02" holes (and no bigger than 1/32") spaced at 90 degree intervals around the circumference of the body tube. Using a larger hole will increase wind noise on the data. It will also increase the likelihood and magnitude of spikes in the data when the rocket separates, which can affect the apogee reading. Since the goal of the competition is consistency, clean data is essential. In order to get the cleanest data, the sampling holes should NOT be oversized, and ejection should be slightly after apogee so any turbulence-induced noise on the data will not spike up over the true apogee height.

If the altimeter is reporting an altitude of some very small value (a number less than 160, the launch detect trigger altitude) post-flight, this is a result of it getting a brief (approximately 0.1 second) vacuum spike due to a wind gust over the vent hole or other causes. The altimeter would see the altitude going from 0 to over 80 to 160 in 0.1 second (more than 800 feet per second, obviously not a valid reading around apogee) so the spike itself would be excluded from the apogee reading. Any small number that the altimeter does display (4, 8, 12...) would just be the result of background or wind-induced noise.

After power is applied to the altimeter you have approximately 25 seconds to install it and close the rocket before it begins looking for a pressure change to signify launch. If you are handling the altimeter after the 25 second period has elapsed, you could trigger it prematurely. When the altimeter is "launch ready" it is sensitive to handling, wind gusts, and light in the sensor hole. The altimeter should be safely inside the rocket with the altimeter compartment closed before this occurs.

If the altimeter remains silent or has no display post-flight, there are a number of possibilities. First is a weak battery. Battery voltage must be at least 3.7 volts for the Pnut. The Jolly Logic devices indicate a percentage charged. Second (for the Perfectflite Pnut) is that the altimeter lost power briefly during flight due to the power plug on the Pnut jarring loose, even momentarily. This often happens if the altimeter is free-floating in a compartment and can slam around, which is a bad practice. The altimeter should be padded to protect it from shock.

For more information on these altimeters see the vendor sites:

Perfectflite: http://www.perfectflite.com/altimeters.html
Jolly Logic: https://www.jollylogic.com/

APPENDIX 10.
FUNDRAISING

Participation in ARC generally requires a team to raise between $800 and $1000, not including the costs for Finals registration ($365) and travel to the National Finals. We want to provide you with some ideas to help you get going in your efforts to raise funds for ARC supplies and other related expenses. Below are some things that other teams have done successfully in the past.

- Host an event and charge admission. Carwashes, concerts, pasta dinner, pancake breakfast, bake sale, garage sale, rocket demonstration, etc. Be creative!
- Participate in organized fundraising activities - school sports concession stands, restaurant fundraiser nights, donuts, entertainment books, raffle tickets, candy or gift wrapping, calendars, flowers or wreaths.
- Contact local businesses for donation of parts and materials for the construction of your rocket designs - places such as hobby shops, hardware stores, home supply/construction, etc. Teams in the past have gotten things such as carpeting remnants, foam padding and a multitude of other supplies donated simply by asking. Often local stores may offer you a discount, so be sure to ask about that as well.
- Sell decal logo spots on your rockets. This is a great way to fund your team's participation in the American Rocketry Challenge and an easy way for you to give your sponsors something tangible in return for their financial support. Be sure to remind your sponsors that their logos may get national as well as local media coverage if you qualify for the finals or even win the competition!
- Ask people and groups directly to support your team financially. Think about the organizations, businesses or people in your community that are supportive of education and technology. These are good places to start. You may need to do a little research and brainstorm with your teacher supervisor and family members to come up with some good leads.
- Create a team press release and submit it to your local area media (you can find a sample press release in the Team Starter Kit). This is a great way to alert people in your community to your activities and get them interested in what your team is doing!

If you have a unique fundraiser, let us know! Reach out to us on our Instagram (@rocketrychallenge).


AEROSPACE

APPENDIX 11.

QUESTIONS AND ANSWERS ABOUT INSURANCE
NATIONAL ASSOCIATION OF ROCKETRY

1. What activities does NAR individual insurance cover?

NAR insurance is general liability coverage included as part of NAR membership benefits. Individual insurance covers the insured NAR member for accident losses solely arising out of NAR sport rocketry activities, including both model and high power rockets. It protects the owner of the model in the event his rocket causes damage or injury to the person or property of another.

2. What are the coverage limits of the insurance?

The NAR policy limit is $5,000,000 per occurrence and $5,000,000 aggregate per annum.

3. What are the deductibles for the insurance?

The NAR policy has a $5,000 deductible per Bodily Injury & Property Damage Claim. Members are personally responsible for payment of the first $1,000 of the deductible. If a member is responsible for more than one claim in any NAR policy period, they will be responsible for the entire amount of the NAR deductible. In the event of a claim filing, failure to pay the deductible may be cause for the loss of membership benefits.

4. When do NAR insurance benefits kick in on a claim?

NAR individual insurance is primary coverage, meaning it applies before other applicable coverage you might have (such as a homeowners' policy).

5. If my rocket hurts someone at a club launch (with or without NAR Safety Codes followed) does the NAR insurance cover it completely?

If all NAR Safety Codes were followed when the incident took place, NAR insurance will cover individual members up to the existing limits in the policy (up to $5 million annually). Your insurance is void if you do not follow the NAR Safety Codes.

6. If I get hurt at an NAR sponsored activity, does the NAR insurance cover medical expenses?

Yes. The NAR policy has a medical payments provision for accidents during NAR operations. The applicable limit for this coverage is $5,000. This would also apply if a fellow club member were to be injured. Other medical insurance coverage you possess must be exhausted first.

7. My team has non-NAR-members attending our launch. Are they covered by NAR insurance when they fly with us?

Only if they are at a launch sponsored by a “section” or club of NAR. At NAR section launches, all registered members of an ARC team are covered. Otherwise flights by non-members are not covered by NAR insurance. To obtain coverage, they must join and become members of NAR.

8. Does this cover rocket-related injuries only? What if I am injured while simply walking across the launch field?

Coverage applies to losses arising out of NAR sport rocketry activities only. "Activity" would include meetings, launches, etc. An injury on the premises of such an activity would be part of the activity.

9. Does the NAR insurance cover property damage? If my rocket damages a car is this covered? Are we covered if a rocket hits a house and causes damage?

Property damage to "third parties" is covered. Coverage for property damage to the member's own property is also covered. Any existing member insurance (in this case, auto insurance) would be primary. Fire damage coverage is limited to $1,000,000 per occurrence.

10. Are we covered if a rocket hits someone who is not part of the launch?

Yes. The individual NAR member has coverage over and above any existing personal liability coverage (e.g., homeowner's policy). The NAR, and the applicable NAR Section, are also covered. Flights by non-NAR members are not covered.

11. Can NAR offer a rider to allow the individual rocketeer to purchase extra coverage above the policy limits?

Currently the NAR's insurance provider has no provisions for additional coverage.

12. Does my insurance expiration date match my membership expiration date?

All NAR members are additional insureds on the NAR policy as long as they have paid their membership dues and are entered on the NAR membership list.

13. Does my insurance (as a teacher Senior member) cover my students too?

Only if they are also members of the NAR. If your students are not members, then your NAR member insurance does not cover them when they fly rockets.

14. Will the NAR insurance cover claims related to use of non-certified motors?

No. NAR insurance is null and void if the accident involves a Safety Code violation. Use of uncertified motors is prohibited by the NAR Safety Codes.

15. Who is protected under NAR Section (club) insurance?

This insurance protects the group, corporately, against liability claims during activities sponsored by the group. If the group is sued as a result of a rocket accident, insurance would pay for the expenses resulting from the lawsuit, plus damages awarded. Individual members may still be held liable for their own actions. ARC teams may, if they wish, fill out the NAR section charter application and become chartered NAR sections as long as they have the required number of NAR members on the team.

16. Is there any difference between individual and Section (club) insurance as far as what it covers?

No. Policy limits and coverage are the same for individuals, Sections, and site owners.

17. What about the site owner insurance we can get as a Team? What does it cover?
The optional additional coverage for the site owner is to defend him/her from third-party liability claims brought against them as the owner of the property, due to covered activities of the Section. This coverage can only be obtained by chartered NAR sections, and an ARC team can easily charter themselves as an "organizational" type NAR section as long as they have an adult supervisor and at least one student who are NAR members. See the NAR website: https://www.nar.org/find-a-local-club/submit-a-local-club

18. How can I assure a landowner that this insurance is valid and reputable??
The NAR Section (which can be an ARC team) can deliver an insurance certificate listing the landowner as an additional insured regarding NAR activities on their site. This certificate will provide the site owner with policy facts such as limits, effective dates, and the insurance company providing the coverage. We recommend keeping one copy on file with your records and providing another copy to your landowner. Your landowner can then contact our insurance agency directly with any questions.

19. If someone is injured by a rocket that is launched and the loss of income and medical damages exceed NAR coverage ($5 million) and the landowner's personal policy combined, what happens?
The landowner is the least likely party to be found negligent and legally liable for injuries from a rocket. If, however, a court found the owner legally liable for the loss, and his NAR insurance and all other insurance he has becomes exhausted, the landownerwould be personally liable for the balance.

20. When a team member who belongs to the NAR is flying, does the team's Adult Team Advisor need to be present?
There is no requirement for an adult to be present at a launch. However, we strongly encourage a responsible adult to attend all flying events. In all cases, we strongly recommend that a Range Safety Officer be appointed and on duty at all times.

21. Is there anything my ARC team can do to minimize the risk of paying a judgment?
Yes! Follow the NAR Safety Codes. Use only certified motors at your launches. Make sure there is a designated and safety-conscious Range Safety Officer (RSO) supervising your launches at all times. If in doubt, err on the side of safety.

22. Can I contact someone if I have questions about insurance?
NAR members (only) may call or email bob.blomster@japrice.com at the J. A. Price Agency: (952) 944-8790, Ext. 127. Bob can address and help with your NAR insurance issues only.

National Association of Rocketry

SPORT ROCKETRY: AMERICA'S SAFE, EDUCATIONAL AEROSPACE HOBBY

WHAT IS SPORT ROCKETRY?

Sport rocketry is aerospace engineering in miniature. This popular hobby and educational tool was founded in 1957 to provide a safe and inexpensive way for young people to learn the principles of rocket flight. It has grown since then to a worldwide hobby with over 12 million flights per year, used in 25,000 schools around the U.S. Its safety record is extraordinarily good, especially compared to most other outdoor activities. It is recognized and permitted under Federal and all 50 states' laws and regulations, and its safe and inexpensive products are available in toy and hobby stores nationwide. Sport rocketry has inspired two generations of America's young people to pursue careers in technology.

WHAT IS A SPORT ROCKET?

A sport rocket is a reusable, lightweight, non-metallic flight vehicle that is propelled vertically by an electrically-ignited, commercially-made, nationally-certified, and non-explosive solid fuel rocket motor. For safety reasons no rocket hobbyist is ever required or allowed to mix or load chemicals or raw propellant; all sport rocket motors are bought pre-made. Sport rockets are always designed and built to be returned safely and gently to the ground with a recovery system such as a parachute. They are always designed to be recovered and flown many times, with the motor being replaced between flights. Sport rockets come in two size classes: MODEL rockets, which are under 3.3 pounds in weight, have less than 4.4 ounces of propellant, and are generally available to consumers of all ages; and HIGH-POWER rockets, which are larger, use motors larger than "G" power, and are available only to adults.

ARE THESE ROCKETS LEGAL?

Model rockets are legal under the laws and regulations of all 50 states and the Federal government, although some local jurisdictions may have ordinances restricting their use. Model rockets are regulated by the National Fire Protection Association (NFPA) Code 1122, which is adopted as law in most states. They are specifically exempted from Federal Aviation Administration (FAA) air traffic control by Part 101.1 of Federal Aviation Regulations (14 CFR 101.1) and may be flown anywhere without FAA clearance. They are permitted for sale to children by the Consumer Product Safety Commission under their regulations (16 CFR 1500.85 (a) (8)). They are permitted for shipping (with appropriate packaging and labeling) by the Department of Transportation and U.S. Postal Service. They are not subject to regulation or user licensing by the Bureau of Alcohol, Tobacco, Firearms & Explosives (BATFE). They are endorsed and used by the Boy Scouts, 4-H Clubs, the Civil Air Patrol, and NASA.

High power rockets are regulated under NFPA Code 1127. Because of their size and power they are not available to people younger than age 18. Their flights are subject to FAA air traffic regulations, and purchase of the larger motors for these rockets generally requires user certification by a national rocketry organization, plus BATFE licensing in some cases. Despite these greater legal restrictions, high power rockets are also very popular. They also have an outstanding safety record.

IS THIS HOBBY SAFE?

Over 500 million model rockets have been launched since the hobby's founding and our simple Safety Code procedures have almost totally eliminated accidents and injuries. Injuries are rare and generally minor. They are almost always the result of failure to follow the basic safety precautions and instructions provided by the manufacturers. Sport rocketry's record shows that it is safer than almost any sport or other outdoor physical activity. The hobby operates under the simple and easy-to-follow Model Rocket and High-Power Rocket Safety Codes of the National Association of Rocketry, which have been fine-tuned by professional engineers and public safety officials over the past 60 years to maximize user and spectator safety. The foundations of these Safety Codes are that sport rockets must be electrically ignited from a safe distance with advance warning to all those nearby, must have recovery systems, must be flown vertically in a suitably-sized field with no aircraft in the vicinity, and must never be aimed at a target or used to carry a pyrotechnic payload. All sport rocket motors are subjected to extensive safety and reliability certification testing to strict NFPA standards by the National Association of Rocketry or other national organizations before they are allowed to be sold in the U.S.

AREN'T THESE ROCKETS FIREWORKS?

All Federal and state legal codes recognize sport rockets as different from fireworks. Fireworks are single-use recreational products designed solely to produce noise, smoke, or visual effect. They have few of the designed-in safety features or pre-consumer national safety testing of a reusable sport rocket, and none of the sport rocket's educational value. Fireworks are fuse-lit, an inherently dangerous ignition method that is specifically forbidden in the hobby of sport rocketry. Sport rockets are prohibited from carrying any form of pyrotechnic payload; their purpose is to demonstrate flight principles or carry educational payloads, not blow up, make noise, or emit a shower of sparks.

WHO ARE THE EXPERTS ?

The oldest and largest organization of sport rocketeers in the U.S. is the National Association of Rocketry (NAR). This non-profit organization represents the hobby to public safety officials and federal agencies, and plays a key role in maintaining the safety of the hobby through rocket engine certification testing and safety code development. The NAR also publishes Sport Rocketry magazine, runs national sport rocketry events and competitions, and offers liability insurance coverage for sport rocketeers and launch site owners. You may reach the NAR at:

National Association of Rocketry
Post Office Box 1058
Marshall, VA 20116
http://www.nar.org

You may purchase copies of the NFPA Codes 1122 or 1127 regulating sport rocketry (or view them online for free) from:

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02269-9101
http://www.nfpa.org