

AMERICAN ROCKETRY CHALLENGE MENTORS AND OBSERVERS

The American Rocketry Challenge (ARC) event was developed by the NAR in cooperation with the Aerospace Industries Association (AIA), the trade association that represents the nation's largest aerospace manufacturers in Washington. The event has been endorsed and publicized by NASA, the USAF, the FAA, the Department of Defense, and virtually every teachers' organization in the U.S. 15,227 teams and over 90,000 students entered in ARC's first twenty-one years, from all 50 states plus various US territories. Both the AIA and the NAR want to use this event to spark interest among students in pursuing a career in aerospace. The NAR's wants to solidify our reputation as the nation's premier resource for sport rocketry educational applications and to foster growth of young members. We want to build the next generation of "born again rocketeers" who will fly with us as young people, then rejoin and stay with us in 10-15 years as they get established in their careers and have children.

Each team that enters ARC pays a fee (\$175 in ARC 2024). Teams can download the ARC Team Handbook and view a NAR-produced "How to Build and Fly a Model Rocket" video online on the AIA page on YouTube (or the NAR website). After registration they must order one of the designated electronic pressure-sensing altimeter types from the manufacturer (Perfectflite) at a special ARC price and can get the RockSim software at a special ARC price. The newly-allowed Jolly Logic altimeters (Altimeter ONE and TWO but not THREE) are not available at a discount.

OBSERVERS. Each team is required, sometime between May 21, 2023 and April 8, 2024, to conduct two (and may conduct up to three) official "qualification flights" in front of an NAR adult (age 21 or older) member observer who verifies compliance with the event rules (posted on the AIA website www.rocketcontest.org), serves as one of the timers for measuring the flight's duration, reads the altimeter altitude, and inspects the egg post-flight. The team then reports the results of those flights to the AIA offices by midnight on April 8, 2024. We select finalists based on the results of the sum of the two best (lowest) scores of the two or three submitted. Any number of practice flights is permitted. The observer can be a mentor, or anyone else (including a new NAR member) who is not related to a team member or employed by their school or other sponsoring organization, but **MUST** be an NAR adult member. The 100 best-scoring teams from these qualification results are invited to a May 18, 2024 fly-off in the DC area to determine the ARC winners and award \$100,000 in prize money plus a free trip to the Farnborough (England) Air Show in July to fly off against the British, French, and Japanese winners.

MENTORS. We ask that mentor volunteers (who do not have to be NAR members and can be related to team members) do all that they can to encourage and support any team member or teacher sponsor who contacts them for advice. This can be done by phone and e-mail for teams that are too far away for easy travel. More detailed mentor guidelines are provided below. Please read the Handbook and rules carefully. PLEASE do not design any team's official entry or help them in the building of it; this is supposed to be a learning experience that the student team members have on their own, without adult participation. It is a contest for students, not their parents, teachers, or mentors.

Please encourage team members to join the NAR. The NAR is offering a special membership deal for ARC: students can join using the "family rate" discount (\$12 off the Junior/Leader membership price of \$30) if their teacher joins as a full-rate Senior member. Like family memberships, only the "full rate" (adult) member gets the magazine. But all get NAR insurance, and all get the NAR Member Guidebook. ARC teams with a teacher and one or more student NAR members can get launch-site-owner site insurance from the NAR by chartering as an "organizational" NAR section. Thanks for "paying forward" and helping to build the next generation of America aerospace professionals and NAR members.

MENTOR GUIDELINES

It is not required that mentors do all of these things for every team that they mentor. Do what you are comfortable with doing and have time to do. These suggestions for your role with a team are listed in priority order.

1. Make contact with middle or high schools in your area to recruit them to enter ARC by the entry deadline. Once all entries are known, a list of them will be sent to you by the NAR; please try to make contact with schools in your area that have entered and let them know you are available to them for advice and assistance.
2. Tell students where and how to obtain rocket-building supplies, parts, and motors. There are multiple "official" vendors for ARC who offer special discounts to the teams. The ARC Handbook has a list in it of these vendors.
3. Teach students, or point them toward resources to help them learn, such basic model rocket skills as construction, recovery techniques, and clustering. Remember that TARC is not a high-power rocketry event that necessarily needs the advanced materials and technologies of this aspect of sport rocketry! Encourage them to purchase and read Stine's "Handbook of Model Rocketry" -- available at a special rate of \$20 for TARC teams from NAR Technical Services.
4. Advise teams on rocketry safety and help them avoid designs or actions that would be unsafe, or that would violate the NAR Model Rocket Safety Code. Regardless of other guidelines, please intervene with advice if you see a team about to do something that is clearly unsafe.
5. Help students obtain a launch site for their test and qualification flights. This can either be the site of an established and supportive rocket club (NAR or TRA), or at a site arranged by the team with your advice (on field size) and assistance (as a resource to provide information on rocket safety, NAR insurance, and safety procedures).
6. Lend teams launching equipment, point them toward groups that already have such equipment the teams could use, or help them design and build a launch system.
7. If you are a current NAR adult (age 21 or older) member, and not related to any team member including the adult supervisor or employed by their school, serve as the official NAR flight observer for teams' local qualification flights. Remember that teams can only make three official qualification flight attempts (the best two of no more than three count for their score) and must declare in advance of a flight whether it is such an attempt.
8. If possible and if you wish to do this, provide advice and contacts to teams to assist in their efforts to raise funds to buy their rocketry materials, and/or to finance their trip to DC if they are selected to attend the final flyoff.

Please remember: No one except the student members of a team may participate in the design, construction, or pre-flight prepping of a rocket that the team uses in a qualification flight attempt or as their rocket for the final flyoff.

MENTOR SUGGESTIONS

These are suggestions for your working relationship with any team that you mentor.

1. Encourage teams not to underestimate how much time it will take to design, build, and test-fly a successful, reliable TARC design. They should start their design and building work earlier and plan to have more test flights than they realize. The average successful team in previous years that made it to the flyoffs had made over 15 practice flights and had crashes, lost rockets, or other unexpected problems in the process. The winning teams typically have even more practice flights than this.
2. Have teams "walk before running"; encourage them to actually watch the online video, read the TARC Handbook, and read the "Handbook of Model Rocketry", then build and fly simple one-stage model rockets (without egg payload, initially) before beginning their TARC design. Aerospace Specialty Products makes a special "learner" kit available to TARC teams at a reasonable price for this purpose. Then have the team fly their TARC design without the expensive altimeter until the design is fully proved in test flights.
3. Encourage teams to act as teams, with division of labor and responsibility among the members and no single person doing it all. Logical tasks for individuals would include project manager, flight simulation specialist, payload specialist, launch and ignition specialist, recovery specialist, parts and component ordering specialist, rocket construction technique specialist, etc.
4. Encourage teams to use a rocketry flight simulation program (SpaceCAD or RockSIM, or Open Rocket) to verify the stability and likely performance of their model before its test flights. It is cheaper to crash a rocket on a computer than on the field!
5. Encourage teams not to make their rockets more complex than necessary and to make them reasonably light. The complexity may produce ideal flight performance on the computer, but it is likely to lead to discouraging reliability problems in flight testing. Lighter rockets are encouraged by the limit on liftoff mass (650 grams) and combined rocket motor total impulse (80 N-sec).
6. Help teams understand the importance of designs that reliably achieve straight-up flights; such designs are far less susceptible to unpredictable performance in windy weather (which may occur at the flyoffs) and have far more repeatable altitude performance.
7. Be positive and encouraging to teams when they face difficulties in construction or in flight testing. Point out to them that the previous winners all had failures in the process but learned from them and persevered to final success. Convince them that they can actually do this, and can succeed at making a good, qualifying flight.

FLIGHT OBSERVER GUIDELINES

The TARC program and the NAR count on the local NAR flight observers to be impartial and honest in the way that they score official TARC qualification flights, and to understand and enforce TARC 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 21 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 (including the adult supervisor employed by the organization that sponsored the team. If you are their mentor (which is permissible, but only if there is no other choice and you are not also the official adult supervisor of the team) 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 #3 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:
 - Flights that stick on the launch pad and fire the motor without lifting off do not count.
 - 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.
 - 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 or flashes) 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 or flashes.
7. **Disqualify if you have to.** If a rocket drops an rocket motor casing, goes unstable, streamlines in dangerously on recovery, or cracks an 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.