

TARC 2018 Frequently-Asked Questions

<http://www.rocketcontest.org/faqs.cfm>

2018 Competition

Can you describe the current contest (2018) in a nutshell?

- Submit an application for a team of three to ten students (grades 7-12) before December 1, 2017.
- Build a model rocket that carries two raw hen eggs to an altitude of 800 feet, stays airborne for between 41 and 43 seconds, and returns the rocket to the ground using recovery devices of the team's choice, with all sections of the rocket remaining connected together for descent.
- The rocket must have a gross liftoff weight of no more than 650 grams, a minimum length of at least 650 millimeters, and be powered by commercial rocket motor(s) of class "F" or smaller with no more than 80 N-sec of total impulse across all motors. It must use two different diameter body tubes, with the lower tube containing the rocket motor being no less than 64 millimeters in diameter (typically this would mean using a BT-80 commercial body tube) and the upper tube containing the eggs being no less than 57 millimeters in diameter (typically a BT-70 body tube).
- Fly your rocket for an official qualification score between September 1, 2017 and April 2, 2018.
- If your score from the sum of two flights is one of the 100 best, you will be invited to compete for a share of the \$100,000 prize package in a national fly-off on May 12, 2018.

When is the deadline to enter the 2018 competition?

The deadline to complete and submit an application is December 1, 2017.

What is the date of the National Finals this year and where will it take place?

The official date is Saturday, May 12, 2018 at Great Meadow in The Plains, VA, about 50 miles west of Washington, DC. The rain date will be Sunday, May 13, 2018.

What do I get for my \$125 entry fee?

Your team gets: the TARC Handbook, a discount on your [Perfectflite altimeter](#), a discount on rocket design and flight simulation software either [RockSim](#) or [SpaceCAD](#), and rocket component discounts from TARC [vendors](#).

Team Management

How did the winning teams prepare for previous competitions?

They got started early and they worked at the project steadily all year—time management is key! They flew lots of practice flights--in all weather conditions. They gathered a lot of data about how the weather, wind, and other factors affected each flight. They solicited help from local or online NAR mentors. They assigned specific responsibilities to each team member. They had great supervisors and most importantly, they had fun and never gave up.

How much should my team expect to spend to build and test-fly the rockets for the TARC competition?

Based on experience from previous years, teams that are fully successful and complete a good qualification will have flown at least 10 practice flights and have built several rockets. The total cost of entry fee, rocket motors and rocket parts to do this is typically between \$500 and \$1000. Costs can be minimized if these are purchased from our recommended [vendors](#). It is possible to spend less than \$500 if the team is experienced and efficient, or more if the team does an exceptionally large number of practice flights.

Can we install the flight simulation software on more than one computer?

Please contact the software companies individually as their policies vary.

How can my school afford to send an entire team to the finals?

One hundred of the best teams from across the country will be invited to compete in the finals on May 12, 2018, at Great Meadow, The Plains, VA. We recommend reaching out to your local community to find sponsors. If one of the 25+ TARC sponsors or one of the 300+ AIA member companies has a facility near you reach out to their community relations team early on and get them involved in your rocket building process. Many companies are a great resource for site visits, expert advice, and financial resources. Also consider other organizations in your community that are supportive of education and technology and ask them to sponsor you.

The entire team does not necessarily have to come to the finals, although we require at least one member plus the supervising teacher/adult, or parent of a team member, to attend if a team is selected. All teams selected for the finals must make their own travel and lodging arrangements. The TARC staff has reserved blocks of motel rooms near the fly-off site at special rates for TARC teams. This information will be provided to teams accepted for the fly-offs.

Can teams sell decal spots on their rocket to raise money to participate in the contest?

Yes! This is a great way to fund your team's participation in the Team America Rocketry Challenge. Also, your sponsors may get national coverage if you qualify for the finals and win the contest.

Who can participate in the event?

- Teams of 3-10 students currently enrolled in grades 7 through 12.
- The application for a team must come from a single school or a single U.S. incorporated non-profit youth organization (excluding the National Association of Rocketry, Tripoli Rocketry Association, or any other rocket club or organization).
- There is no limit to the number of teams that may be entered from any single school or organization, but no more than the best three 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, will be invited to attend the Finals.
- Teams may have members from other schools or other organizations.
- Teams must be supervised by an adult approved by the principal of the school, or by an officially-appointed adult leader of the youth organization.

Our middle school includes 6th graders. Can they be team members?

No. The minimum grade level to compete in the contest is 7th grade.

Can a team be registered before all the members have been selected?

Yes, but when you register you must have at least three members on your team. Your application will be returned if it does not. You can add or remove team members later, up until the first qualification flight attempt, as long as you maintain a team size between three and ten total. After your first qualification flight, members may be dropped, but not added.

Can team members be changed at a later date?

Yes, but they cannot be added after the team's first qualification attempt. The only exception to this is that if a school has more than three teams that have qualification scores better than the national selection cutoff score for the Finals, membership of the three teams from that school that are invited to the Finals may be adjusted to include students from other teams with qualification scores better than the cutoff (within the limit of ten students per team). You can drop a team member at any point.

Can a group other than a middle or high school (CAP, 4-H, Scouts, etc.) enter the contest? How do homeschoolers enter this contest?

Yes, members of the same chapter or unit of a U.S. incorporated non-profit youth organization can form teams and enter the contest, as long as they are all students in 7th through 12th grades. Homeschoolers can enter as part of a school team with permission of that school's principal, or they can enter by being part of a local chapter of a non-profit organization (Scouts, etc. but not an NAR or TRA club) outside of the school context. If there is a local organization specifically for homeschoolers and at least one of the students is a member of this, this counts as a "non-profit organization" as well, as long as it is legally incorporated.

Safety Compliance - National Association of Rocketry

I don't know a lot about rocketry. Where can I get help?

The co-sponsor for this event is the National Association of Rocketry (NAR). The NAR has a nationwide network of local clubs with experienced rocketeers standing by to provide advice and make their launch sites available for your flights. Many adult NAR will be "mentors" and available to assist individual teams in their local area. If there is not a mentor in your local area, you may work with one in another state via phone or email. Please visit the Team America section of the NAR website at www.nar.org for the latest list of mentors.

I have heard that model rockets require various forms of government permits and permissions to fly. What is required?

Model rockets weighing less than 3.3 pounds at liftoff and having in them only model rocket motors from the TARC approved motor list that have no more than 4.4 ounces (125 grams) total of rocket propellant among them all require no Federal permits or permissions to purchase, possess, store, or fly. You must fly model rockets in a manner that does not endanger aircraft in flight (see the NAR Safety Code in your TARC Handbook), but no FAA airspace notification or waiver is required to fly them and there is no restriction on how far away airports must be from where you fly them. Although model rocketry is legal in all 50 states, some local towns or counties have ordinances restricting or prohibiting model rocket flying.

Are these rockets dangerous?

Sport rocketry is one of the safest activities in the United States. Rockets flown in accordance with the common-sense Safety Code of the NAR are extremely safe. The rockets are powered by prepackaged, commercially-made, and rigorously NAR safety-tested solid fuel motors that are available at local hobby stores. The handbooks provided to each team provide all the guidelines and training any team needs to fly their rockets in complete safety. In addition, the NAR provides those individuals who choose to join the NAR with a \$5 million liability insurance policy, and teams with a teacher and 3 or more student members who join the NAR may also get (for \$15), this same insurance coverage for the owner of their launch site.

We have tried the posted list of NAR/TARC mentors, but there are none near enough to us to meet with us in-person to help. What can we do now?

Some TARC teams end up with no in-person mentor, either by choice or by necessity, and still manage to launch successful qualification flights. It's just a little more difficult, not impossible. The TARC Handbook and the week-by-week guide to what teams are supposed to be stepping through provide a lot of the guidance that a mentor would do in person, if they are read, understood, and followed. The "Handbook of Model Rocketry", offered for sale to teams at a discount rate from NAR Technical Services is the best start-from-scratch text ever written on how to do model rocketry.

The rocketry companies listed in the Handbook that specifically cater to TARC teams can help you on the phone in picking supplies and components if you still cannot interpret their catalogs after reading these resources. And the NARTARC Yahoo group at <https://groups.yahoo.com/neo/groups/NARTARC/info> that we tell all teams to join is a good place to post questions online to get "virtual" mentoring or to ask for one of the mentors who is on this forum to contact you by private e-mail for some direct virtual mentoring.

The only place and time where you absolutely need a real live in-person NAR adult member is as the official observer for the local qualification flight(s) that come at the end of the team's building and practicing, but no later than the annual qualification flight deadline. You can do this by having an NAR volunteer come to you, by traveling to an organized NAR club launch, or if both of these are too hard then as a last resort by having some impartial local adult, not related to any team member or employed by the team's sponsoring organization, join the NAR (online at www.nar.org is easiest) simply for the purpose of being the flight observer.

Where can I find an observer for my qualification flight who is a Senior NAR member?

Your first place to look is the list of NAR local rocket launches on the [NAR website](#). If the NAR launch list is not useful, try calling the nearest section. If this does not work and there is a NAR "mentor" nearby, ask him for help. It is OK to have an impartial adult who is not related to any member of the team and is not affiliated with the team's school become a NAR member to be an observer. However, it is always better to use an experienced rocketeer to do the observer duties, because they can offer advice and tips at the same time. If your team has a NAR mentor who is not related to anyone on the team or employed by the school, that mentor can also serve as your flight observer.

How does the National Association of Rocketry (NAR) Membership Discount Program for Team America participants work?

NAR membership is not required to participate in the Team America event. However, participants may find it beneficial to join the NAR for the \$5 million insurance coverage for launches. The NAR has developed a special program for the Team America Rocketry Challenge. Under this program, if the supervising teacher joins at the regular adult (Senior) rate of \$62 per year, the student members of the teacher's team can join for \$12 off the regular rate of \$25 for Junior (age 15 and under) or Leader (age 16-23) membership. Student members who take advantage of the discounted rate will not receive the Sport Rocketry magazine.

Are there any options for our required qualification flight if the nearest NAR section's launch site is a long drive away?

An official NAR launch is preferred, but you can also use any adult NAR member in your local area or have an impartial adult (not related to any team member or affiliated with the school) join the NAR to do this, to avoid pre-fly-off long-distance travel.

There is not a NAR section close to us. How do we set up a launch site?

If there is not a NAR section nearby, then you simply need to locate an open field of suitable size (approximately 1500 X 2000 feet), get permission from the landowner, and comply with any local laws regarding model rocketry. Model rocketry falls under the National Fire Protection Association's Code 1122, which local fire officials should be familiar with. There is a safety handout in the last appendix of the Team America Handbook that you should read and can share with concerned landowners and public safety officials. If the landowner requires liability insurance, your team can obtain it by joining the NAR.

Rules for Rocket, Testing, Building and Flying

Can we use the parts from a rocket kit in our TARC entry? What parts am I allowed to use for our design? Is our rocket allowed to contain metal parts?

The rules state that all Team America rockets must be built and flown in accordance with the Model Rocket Safety Code of the National Association of Rocketry (NAR). Under this Code, you may only use lightweight, non-metal parts for the nose, body, and fins of your rocket, those parts which are the main structure of the vehicle. Major internal body parts which are rigidly attached to the body (such as rods that run a good fraction of the length of the body) are considered to be part of the "body" and may not be metal. Carbon, fiberglass, and plastics are all acceptable non-metallic building materials for any part of the rocket. You are allowed to use metal engine hooks, electronic circuit boards, and (if you wish) commercial re-loadable rocket engine casings.

You can fly a kit for practice and learning flights, but you must advance to an original design for your actual qualification and finals flights. For this official rocket you can use parts from several kits or any part you want from one kit, as long as you don't use one complete kit with minimal modifications. We want to see originality and design effort go into the rocket that you compete with; it is a major learning objective for TARC.

You may not build the rocket motor. Your rocket must be powered only by commercially-made model rocket motors (F power level and below) that are listed on the TARC Approved Engine List. You may not use a combination of rocket motors that contain more than a combined total of 80 Newton-seconds of total impulse.

What size eggs do we have to use in the contest? Who provides the eggs?

The rules for TARC specify that the eggs must weigh between 55 and 61 grams and be no more than 45 millimeters in diameter. This is usually a Grade A large, although not all Grade A eggs fall within that weight range. We will weigh and provide the eggs at the final fly-off. It is the team's responsibility to provide their own eggs in the proper weight/size range for practice and qualification flights.

Can I bring my rocket down in two or more sections for recovery?

No, all portions of the rocket must remain connected together in some manner (shock cords or line) during recovery; no part may separate. If the rocket drops a part (such as a nose cone, payload section, or rocket motor casing) that falls separately it will be disqualified.

What recovery device can I use for my rocket?

We are not specifying a required type, size, or configuration for the rocket's recovery system, only that the rocket return safely. You can use one or more parachutes of any size, a streamer, deployable helicopter blades, glider wings, etc. with or without onboard autonomous control systems. You may not use human-in-the-loop radio control, and you may not add power from electric motors or other powered machinery; TARC Rule # says, in part, that the rocket: "...must be powered only by commercially-made model rocket motors of "F" or lower power class."

What are the specific detailed instructions and rules for the timers who time my local qualification flight attempts?

The first instruction for the timers is to read the TARC rule on "Duration Scoring", which says, in part: " The duration score for each flight shall be based on total flight duration of the rocket, measured from first motion at liftoff from the launch pad until the moment that the first part 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."

This rule leaves a few details and situations unstated:

- If the rocket flies out of sight on boost, the timers should keep their stopwatches running until they gain sight of the rocket on recovery, and then proceed as described above.
- If only one timer sees it at first, he/she should coach the other onto the rocket and the other timer should keep his/her stopwatch running until he/she also gains sight. If he/she never gains sight independently, score his/her time as "lost" and use the time of the single timer, like the stopwatch malfunction situation described in the Rules.
- If neither timer ever sees the rocket, it has scored a "time lost" and does not count as an official flight (this will not be true at the fly-offs).

- Use of binoculars is OK (these will not be used at the fly-offs), but in the experience of the NAR these tend to hinder timers more than they help them for flights where the intended duration is only around 45 seconds.

What are the qualification flights all about? How many qualification flights is each team allowed? What is the deadline to conduct the qualification flight?

Hundreds of teams are entering the Team America Challenge from across the country, but our final grand championship fly-off in Northern Virginia can only accommodate 100 teams. In order to qualify to attend this fly-off each team must conduct a minimum of two and no more than three qualification flight attempts in the actual presence of a current adult (age 21 or above) member of the NAR, no later than April 2, 2018.

A qualification flight attempt must be declared before the rocket's motor(s) are ignited. Once an attempt is declared, the results of that flight must be recorded for submission.

If the rocket then misfires and does not leave the launch pad, the attempt does not count as one of the official tries. If the rocket does leave the launch pad, even if not all motors ignite, and even if the flight experiences some other flight vehicle failure, the flight attempt is official. If a rocket experiences a catastrophic failure of one or more rocket motors (burst casing or ejected engine grain) in flight, the attempt may, at the team's discretion, not be counted as official.

The supervising teacher/adult or the NAR observer in the case of unsuccessful official qualification flight attempts must submit the score report on qualification flights to the AIA offices by April 2, 2018. The top 100 teams will be announced no later than April 6, 2018. Practice flights, before and after your qualification flights, and in a variety of wind and weather conditions, are highly encouraged.

To record altitude data, can we use another brand of altimeter that has the same performance specifications as the Perfectflite APRA or Pnut?

The only TARC-approved altimeters are the Perfectflite APRA, Pnut, and FireFly; your official score must come from the same altimeter design as everyone else is using. Other altimeters of other types may be used for other purposes, such as flight control, but not for scoring.

My altimeter has a digital port that lets me download data to a computer screen for post-flight evaluation. If I think that the altitude beeped or flashed out by my altimeter is not accurate, may I use the downloaded data to do a screen interpretation of what the correct score should be?

No. The score used for official purposes in the TARC competition, both for qualification flights and the Finals, must be the number beeped or flashed out by the altimeter post-flight and nothing else. Downloaded data can be used for post-flight analysis but not for scoring.

How much help can the supervising teacher/adult, mentors, or other individuals who are not on our team provide on our rocket?

None. The rocket that you enter into the Team America event must be entirely designed, built, and flown by the student members of the team. You may get help from outside sources in learning how to build and fly rockets in general, use altimeters, do multi-staging of rockets, design launch systems, etc. You can buy or borrow launching systems. You can practice-fly with a local NAR section and learn how to become an expert rocket flier. But when it is time to do your real design and either your qualification flight or your real flight at the fly-off, this must be done by team members alone. Supervising teachers/adults are not considered members of the team for this purpose.

I have been unable to get some of the rocket motors listed on the TARC list as approved for this event, where can I get them or what can I do?

You have two options. Design your rocket to fly with the motors that are available to you, including using clusters of two or three of these motors. Or find a mail-order dealer (starting with those listed on the recommended TARC vendors list on the TARC website) who has the motors you want and can ship them to you.

The motor that I am interested in using for my TARC rocket has a slightly different manufacturer-labeled designation or total impulse than the motors on the TARC Approved Motor List. Can I still use it in my TARC rocket?

For purposes of determining if a motor is approved for TARC, only three things count: the manufacturer name, the labeled total impulse class, and the labeled average thrust designation.

The codes that count for our official purposes are the first letter ("E", "F", etc.) which indicates the motor's total impulse class; and the one or two digits before the dash ("23", "24", etc.) which indicate the motor's average thrust in Newtons.

Some manufacturers, particularly Aerotech, have other additional labeled designations such as "W", "FJ", "Econojet", etc. The Aerotech letter coding is a proprietary indication of propellant chemical formulation and the extra words are just brand names.

The final digit or digits after the dash in a motor's official designation indicate the motor's delay time between motor propellant burnout and ejection charge activation, in seconds. There are a few cases where the value we list for delay time on the TARC list is not the same as the delay time value that the manufacturer advertises in his catalog. This is because the motor delivered a different delay time (generally by one or two seconds) in the NAR's official certification testing, after the manufacturer printed his catalog. We allow such motors for use in TARC despite this minor delay-time marking discrepancy.

Concerning total impulse, some Aerotech motors were slightly redesigned for ease of manufacture in the last several years and their total impulse post-redesign is slightly different from the original design. Both old and new-design motors are in circulation. The TARC motor list reflects the original-design total impulse of these motors; we do not yet have official NAR data for updating the total impulse. It is important to teams to know the correct total impulse of the motor they intend to use, but either version is approved for use in TARC as long as the three key factors on the motor label match what is on the TARC motor list.

The rocket motor that I want to use in my TARC flight is listed in my simulation software but not on the TARC approved rocket engine list. Can it be added to the list or can I use it anyway?

You need to go to the list of TARC-approved rocket motors and select in your software only one of those motors that is on the TARC-approved list.

Can the student members of my team (under age 18) fly "reloadable" model rocket motors in TARC?

Yes. The Consumer Product Safety Commission requires that metal-casing reloadable model rocket motors be sold only to persons age 18 or older, but there are no regulations prohibiting a younger person from assembling and flying a reloadable model rocket motor that was purchased by someone else such as the team's adult advisor.

I want to use an electronically-actuated ejection charge system in my rocket, using loose black powder or Pyrodex powder in a small igniter-fired container to blow out the parachute. Is this permitted?

No. Separate pyrotechnic charges are specifically prohibited by the TARC rules. TARC rockets must be prepped and flown in the competition and in their preceding qualification flights by the student team members without adult assistance, so an adult with a Low Explosives Users Permit is not a solution to the black powder ejection charge issue. There is no legal solution, and the rules prohibit it. It is permitted to use a standard igniter to burn through an actuating string in an onboard system; a single igniter with no augmenting powder charge is not a "pyrotechnic charge". There are commercial devices and systems that use compressed gas to eject recovery devices or that mechanically release bands that hold recovery devices closed until preset altitudes; these are permitted.

Can the rocket be launched from a rail?

Yes. During your local practice and qualification flights you may use either a rail or a ¼-inch diameter, 6-foot launch rod. However, at the national Finals you will be required to use only a rail, rods will not be permitted. The contest organizers will provide 6-foot 1-inch rails and a standard one-clip-pair per pad multi-pad launch system for all teams to use at the finals. However, teams are

welcome to bring their own launch systems, pads, etc., to launch their rocket during qualifications and at the finals.

Can radios such as tracking beacons or radio-control systems be used, and if so are there any frequency limits?

Radio-control systems are not permitted in TARC rockets, only "autonomous" onboard control systems such as timers or computer systems (e.g. Arduino) may be used to control the flight duration of the rockets. Transmit-only tracking beacons for post-flight location of the rocket are permitted.

We would like to build a composite or plastic rocket for the Team America Rocketry Challenge. Would we be violating the rules if we had a trained technician mold it for us or 3-D print it for us using our design specifications?

Yes, you would be violating the Team America Rocketry Challenge rules. The flight vehicle must be made by the student team members. Having a custom flight vehicle part fabricated by a composite or plastics company or by a company that does custom fin cutting (even if it is to your design) does not constitute sale of a "standard off the-shelf product" and is not allowed. Having a mandrel fabricated to your specifications that you wrap fiberglass on to make your rocket body would be OK. In this case the company is making a tool that you are using to make the part that flies. Having parts made on a 3-dimensional printer would be OK as long as the students write the program and run the printer.

What does the requirement to use two different body tube diameters in my design mean?

This new requirement means that you must make your rocket with two different types (diameters) of body tube as external airframe surface,. The lower of the two tubes , containing the rocket motor, must be no less than 64 millimeters in diameter, which will typically mean using the "BT-80" body tube type., The upper part of the body that contains the eggs must be no greater than 57 millimeters in diameter, which will typically mean using the "BT-70" body tube type. Connecting these two dissimilar tubes will require some sort of "transition" piece. There are details in the TARC Handbook about which vendors offer these as pre-made items, or you can fabricate your own.

What does the new requirement for how the rocket motor must be retained in the rocket mean?

Most teams have been using clips, hooks, or screw-on caps to retain the rocket motor in their rocket during flight, particularly when the ejection charge goes off, to make sure that when this charge goes off it blows the nose and parachute out rather than kicking the motor out instead. However, some teams have continued to use tape on the motor casing to retain it in the rocket by friction alone. This has proven to be a major source of unreliability and safety hazard for TARC rockets, so we are now requiring a positive, non-friction, retention technique for the rocket motor. It is permissible to have the motor mounting tube stick out a bit from the bottom of the rocket and the rocket motor to stick out a bit from that tube, and then wrap high-temperature tape (not masking tape, think Gorilla tape

or similar) externally around both the exposed tube and motor casing as a means of positive, non-friction-based retention.

I have read all the frequently asked questions, the rules, and have scoured both this website and the NAR website. However, I still have questions or concerns about the contest. What should I do?

Contact us at rocketcontest@aia-aerospace.org.