



AMERICAN
ROCKETRY
CHALLENGE



2026–2027 ROCKETRY STARTER KIT

TABLE OF CONTENTS

THE BASICS

- 3 About the Competition
- 4 2027 Rules Explained
- 5 Scoring

SCHEDULE

- 6 Week by Week Suggested Schedule of Activities

OTHER INFORMATION

- 9 About Sport Rocketry
- 10 Essential Rocketry Vocabulary
- 11 Rocket Parts
- 14 Sample Letter for Sponsors





AMERICAN ROCKETRY CHALLENGE

THE WORLD'S LARGEST STUDENT ROCKET COMPETITION



The American Rocketry Challenge (ARC)—now in its 25th year—is the world's largest student rocket competition, with more than 5,500 students nationwide competing annually. The competition provides students in 6th – 12th grades the opportunity to design, build, and launch model rockets and gain hands-on experience solving engineering problems.

ARC is organized by the Aerospace Industries Association and the National Association of Rocketry with the generous support of several industry, government, and academic sponsors and partners. The annual challenge is the aerospace industry's flagship program designed to encourage students to pursue academic and career opportunities in science, technology, engineering, and math.

WHAT WILL TEAMS GAIN FROM PARTICIPATING IN THE CHALLENGE?

- Hands-on Engineering Experience
- Understanding of STEM Concepts
- Simulation Software Expertise
- Teamwork and Leadership Development
- Problem-Solving and Communication Skills

WHAT ARE THE RULES?

Teams are made up of 3 to 10 students between 6th and 12th grade and an Adult Team Advisor. Teams may have or request help finding a Rocketry Mentor to assist with rocketry concepts and skills.

The rules vary slightly each year to provide a new challenge to competitors. The [2027 Rules](#) require teams to design, build, and launch a model rocket that carries a raw grade A large egg to an altitude of 750 feet, stays airborne for 36 - 39 seconds, and returns the rocket to the ground safely with the egg intact.

WHAT IF I DON'T KNOW MUCH ABOUT ROCKETRY?

The American Rocketry Challenge features a nationwide network of aerospace professionals and rocketry experts from the National Association of Rocketry and other partners who are excited to mentor your team. These mentors can help with the organizing, rocket building, and career pathway exploration.

WHAT ARE THE KEY DEADLINES?

- | | |
|------------------|-----------------------------------|
| • July 15, 2026 | Registration Opens |
| • Dec. 6, 2026 | Registration Closes |
| • April 4, 2027 | Qualification Flights Reports Due |
| • April 13, 2027 | Finalists Announced |
| • May 16, 2027 | National Finals |

WHAT HAPPENS WHEN WE WIN?

After official qualification flights are submitted, the Top 100 teams are invited to attend the National Finals near Washington, DC.

Teams competing at the National Finals aim to capture their share of more than \$100,000 in awards. There are also special awards for activities throughout the day.

The team that places first at the National Finals wins a trip to represent the United States in the International Rocketry Challenge, hosted at the Paris Air Show in Paris, France in June 2027. The United States rocketry team competes against the winning teams from France, Japan, Ukraine, and the United Kingdom.

Visit rocketrychallenge.org to learn more.



@RocketryChallenge



Contact us at rocketrychallenge@aia-aerospace.org.

American Rocketry Challenge 2027 Explained

3

For flight qualification flights, the rocket must reach an altitude of 800 feet. Teams are penalized one point for every foot above or below the goal.

2

Rockets must use at least two different-diameter body tubes. One must be a 12-inch or greater length with 66 millimeter diameter. All others must be no less than 9 mm different from that (larger or smaller) in external diameter.

1

Teams of 3 to 10 students work together to design and construct a rocket. The overall length must be no less than 650mm and the weight must not exceed 650 grams.

4

The rocket must descend safely connected (tethered) together using one or more parachutes for recovery

5

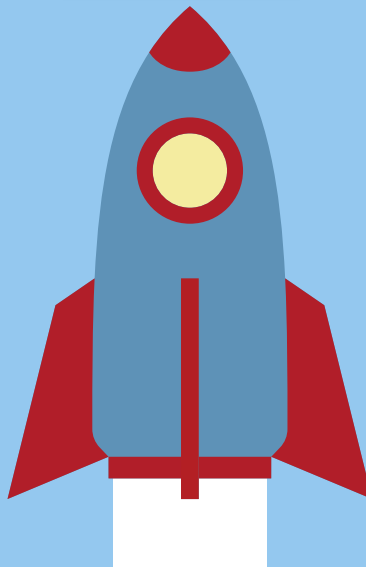
The duration of the payload section with the egg should be between 37 and 40 seconds. Teams are penalized by four points for each second outside that window.

6

At the National Finals, the rockets will be required to reach two new altitude goals of 775 or 825 feet within 37-40 seconds regardless of the altitude target.



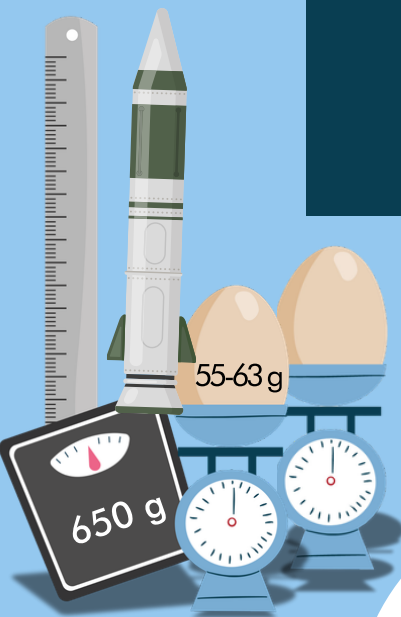
American Rocketry Challenge: Scoring



Teams are ranked on the combined score from their two best flights, the lower the score the better!

$$\text{score for each flight} = \frac{\# \text{ of feet over/under target height}}{\text{target height}} + \left(\frac{\# \text{ of seconds over/under target time}}{\text{target time}} \times 4 \right)$$

$$\text{Flight 1} + \text{Flight 2} = \text{Total Score}$$





AMERICAN ROCKETRY CHALLENGE 2027

THE WEEK BY WEEK SUGGESTED SCHEDULE OF ACTIVITIES FOR TEAMS



This is a suggested schedule, teams will work at their own pace! Required deadlines are in blue.

WEEK OF OCTOBER 5, 2026

- Ensure all team information (school/organization and Adult Team Advisor information, student information, parent permission form requests, etc.) is entered properly at <https://apply.rocketrychallenge.org>.
- Register early! Registration will close on December 6.
- Your registration must be paid and submitted no later than December 6, 2026.
- Registration fees are \$195.

WEEK OF OCTOBER 12, 2026

- Assign team responsibilities (such as project management, airframe, propulsion & ignition, launch system, fundraising etc.).
- Get a rocketry mentor (see the list of available NAR mentors at <https://rocketrychallenge.org/mentors/>).
- Watch the instructional video “How to Build and Fly a Model Rocket” on YouTube: <https://youtu.be/gYh1pWWhoQXE>.
- Review the Team Handbook, 2027 Rules, and the Frequently Asked Questions on <https://rocketrychallenge.org/resources>.
- Review recommended rocket parts and preferred vendors: <https://rocketrychallenge.org/resource/2027-team-handbook/>.
- Order the Rocksim flight-simulation and rocket-design computer programs at the official team discount price directly from the vendor after you have completed your 2027 registration, or download the freeware Open Rocket program.

WEEK OF OCTOBER 21, 2026

- Purchase an inexpensive, one-stage rocket kit to familiarize your team with rocket building & flying. Estes has a number of resources available for newcomers to rocketry and beginner products.
- Locate a place to fly rockets (or a nearby NAR launch to attend and fly at, see the “Launch Windows” calendar at www.nar.org or contact the nearest NAR club or section).
- Develop a plan to raise money to purchase rocket supplies for two rockets and motors for at least 10 test and qualification flights. Your fundraising may also cover your travel to the National Finals!

WEEK OF OCTOBER 26, 2026

- Buy a comprehensive book on model rocketry, such as G. Harry Stine’s “Handbook of Model Rocketry.”
- Load the rocket design and flight simulation computer program that you purchased.
- If you require “site owner” insurance for the place where you will be flying, have the Adult Team Advisor and at least three team members join the NAR, and order NAR site owner insurance.

WEEK OF NOVEMBER 2, 2026

- Fly a basic one-stage model rocket.
- Order your Perfectflight altimeter (discount with team number) after you have completed your 2027 registration, or order the Altimeter ONE or TWO.

WEEK OF NOVEMBER 9, 2026

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

WEEK OF NOVEMBER 23, 2026

- 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 your design (starting with the official vendors in the [Team Handbook](#)) and purchase required parts and rocket motors.

DECEMBER 6, 2026 – REGISTRATION CLOSES

Registration will close on December 6 at 11:59PM Eastern Time, so make sure you have paid and clicked the “submit” button!

WEEK OF NOVEMBER 30, 2026

- Design and build (or purchase) the electrical launch system and the launch pad (preferably with a one-inch rail), if you do not have a local rocket club’s system available for your use.

WEEK OF JANUARY 4, 2027

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

WEEK OF JANUARY 11, 2027

- 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 OF JANUARY 18, 2027

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

BY FEBRUARY 1, 2027 YOU SHOULD (BUT ARE NOT REQUIRED TO):

- Test-fly your initial design (without altimeter), making sure you leave time to redesign, rebuild, and re-fly well before the March 30 submission deadline if this initial flight/design is not successful.
- If your first flight is 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, conduct post-flight failure analysis and re-design.

BY MARCH 1, 2027 YOU SHOULD (BUT ARE NOT REQUIRED TO):

- Make your first official qualification flight attempt in front of a NAR adult member observer.

APRIL 4, 2027 – QUALIFICATION FLIGHTS REPORTING DEADLINE

BY APRIL 4, 2027 YOU MUST:

- Make your final official qualification flight attempts (minimum of 2 required and up to three permitted) in front of an NAR adult member observer.
- Submit your qualification flight reports in the registration portal no later than 11:59pm Eastern Time.



APRIL 13, 2027 – NATIONAL FINALISTS ANNOUNCED

APRIL 13, 2027

- If notified of selection to attend the National Finals, make reservations at one of the hotels identified by the organizers and conduct fundraising to cover travel and lodging.
- Continue test-flying to fine tune rocket design to know how to reach the National Finals target altitudes, which will be between 775 and 825 feet, but will not be 800 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 National Finals vendor.

NO LATER THAN APRIL 29, 2027

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

MAY 15, 2027 – NATIONAL FINALS

- The Top 100 teams in the country compete at the National Finals for \$100,000 in awards, the title of National Champion, and a trip to the Paris Air Show to compete in the International Rocketry Challenge.



Visit rocketrychallenge.org to learn more.



@RocketryChallenge



Contact us at rocketrychallenge@aia-aerospace.org or 703-358-1000.



Essential Rocketry Vocabulary

Aerodynamics

The way air moves around things.

Apogee

The highest point a rocket reaches, peak altitude.

Ballast

Weight added to the rocket to control its altitude or stability.

Deploy

To unfold or come out of something to be used, like a parachute.

Drag

A force acting opposite to thrust caused by friction from the air moving past the rocket.

Escape velocity

The velocity required to escape the pull of Earth's gravity and travel beyond orbit.

Fuel

Something that releases stored chemical energy. Rockets use solid or liquid fuels that burn and release hot gas that, pushes the rocket forward or up.

Igniter

The device in a rocket that starts the fuel burning.

Payload

What a vehicle carries, cargo.

Recovery

Return of a rocket to Earth. Often rockets have a parachute to slow this return.

Rocket

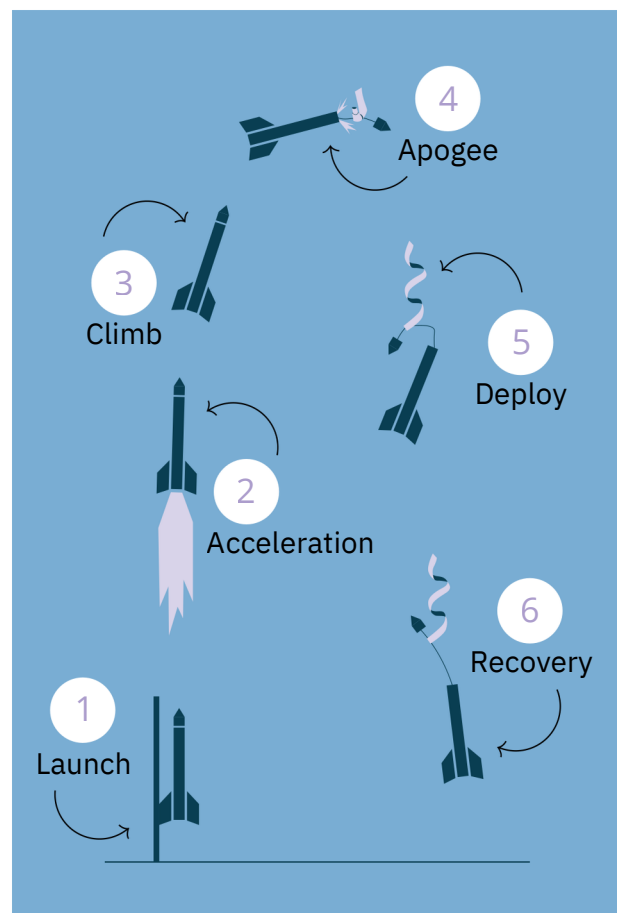
A vehicle that is propelled by the expulsion of hot gas through a small opening called a nozzle to create thrust.

Separation

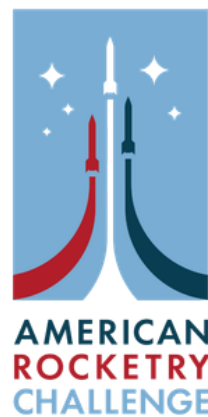
When a section of a rocket breaks off, or separates, from the main rocket.

Stage

A part of a rocket that has its own rocket motor.

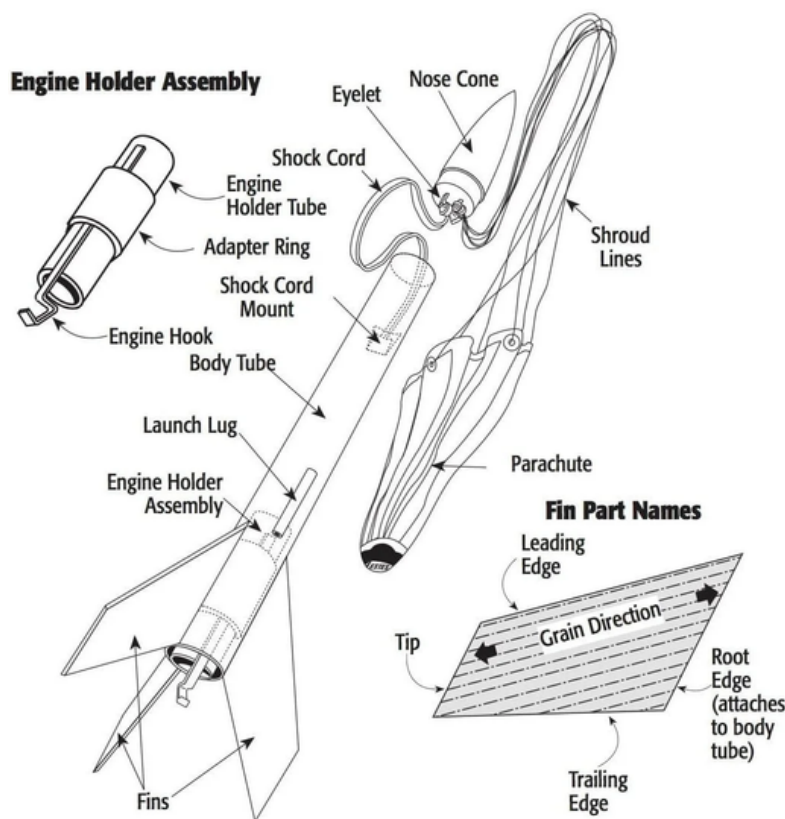


Typical Component Parts for a Rocket & Where to Find Them



Rocket Part Specifics

Model Rocket Nomenclature



Main Body Tube -typical choices are:

T-70/BT-70: 2.22 inch (56mm) outside diameter: Apogee (available with or without 3 fin slots); BMS (available with or without 4 fin slots); T-80/BT-80: 2.60 inch (66mm) outside diameter: Apogee (available with or without 3 fin slots); BMS (available with or without 4 fin slots); Estes (non-slotted)

Shock Cord: 2-foot "200-400-pound" (breaking strength) Kevlar cord

(available from Apogee, BMS, or eRockets) wrapped around engine mount, with 2-3 feet of 1/4 inch sewing elastic tied to the end which is then tied to a screw eye in the transition piece to the egg capsule

Parachute: typical choice is nylon cloth parachutes

Sunward brand from Apogee; Topflight brand from BMS or eRockets; or Semroc brand from eRockets

Parachute Protection

9 x 9-inch reusable flameproof cloth blanket (Sunward, Madcowor Dinochutes brands) (Apogee and eRockets); Disposable flameproof paper wadding (Estes)

Nose Cone

For T70 tubes: BNC70AJ or BNC70BB (BMS balsa); PNC-56A (Apogee plastic); For T80 tubes: BNC80BB (BMS balsa) or PNC80BB (BMS plastic); NC-80B (Estes plastic); PNC-66A (Apogee plastic)

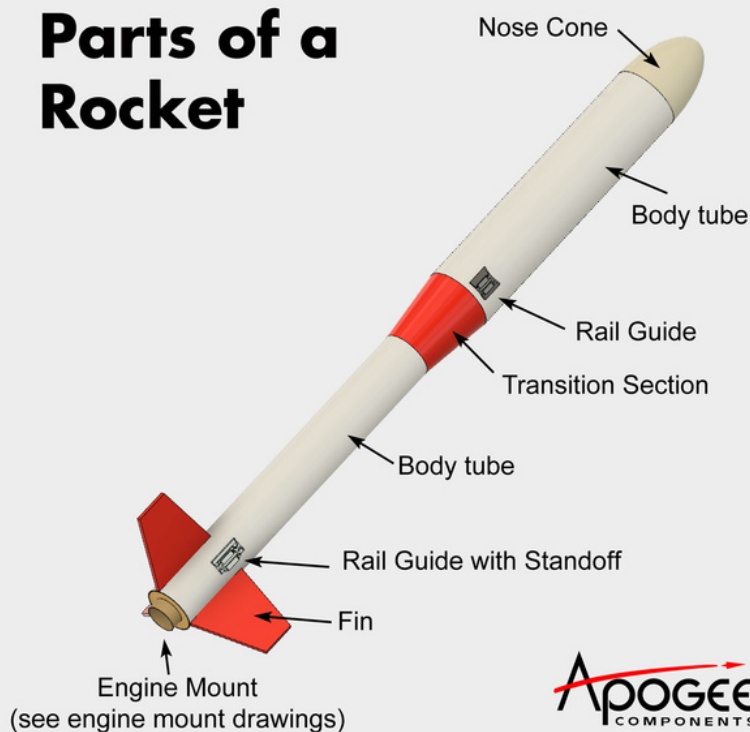
Transition Section

If upper and lower body tubes are the same diameter, transition section is cylindrical: NB70 (for T70 tubes), NB80 (T80 tubes) (both BMS); "Semroc" brand balsa nose blocks (eRockets); balsa bulkheads. If one tube is T-80 and the other is T-70, transition section is conical: balsa TA7080 (BMS); blow mold plastic 70-80 transition (Apogee)

Fins: typical choices are 1/8-inch thickness balsa or 1/16 to 1/8 inch thickness plywood

Multiple precut shapes with through-the-wall tabs that fit in slotted body tubes (Apogee and BMS); or buy sheets of balsa at local craft store and cut your own

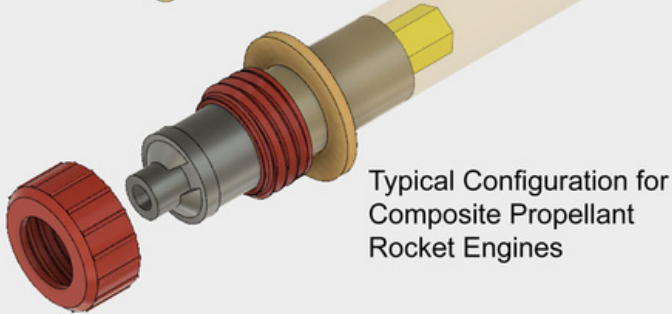
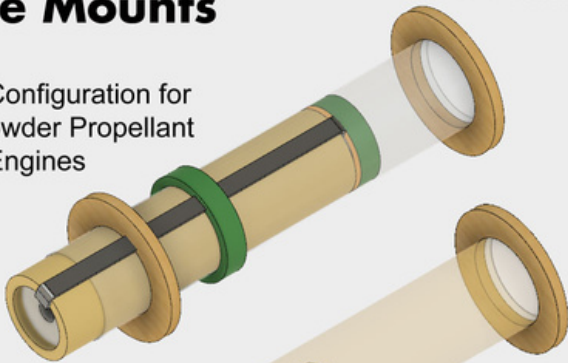
Parts of a Rocket



Variations on Engine Mounts



Typical Configuration for
Black Powder Propellant
Rocket Engines



Typical Configuration for
Composite Propellant
Rocket Engines

Rail Guide or Button: "1010" or "10/10" size

Buttons that screw on available from Apogee, BMS, or eRockets;
glue-on rail guides available from Apogee

Centering rings (use plywood types)

For 24mm engines in T70: CR5070W (BMS); or from Apogee
For 24mm engines in T80: CR5080W (BMS); or from Apogee
For 29mm engines in T70: CR52H70W (BMS); or from Apogee
For 29mm engines in T80: CR52H80W (BMS); or from Apogee
For two 24mm engines clustered in T70: M2T5070W (BMS)

Engine Mount Tube

For 24mm engines: T50 (BMS); BT-50 (Estes or Apogee) For
29mm engines: T52H (BMS); 29mm motor mount tube (Estes or
Apogee); T-29 tube

Engine Retainer

Engine hook for Estes engines: 2.75" for D12, 3.75" for E12.
Available from Apogee, BMS, or Estes. 4.9" for Estes 29mm
engines available Screw-on cap type for Aerotech & Cesaroni
engines: Estes 24mm or 29mm plastic retainer sets (Estes,
Apogee, or eRockets)

Rocket Part Vendors:

Estes Rockets: <https://estesrockets.com/product-category/accessories-parts/>

Apogee Rockets: <https://www.apogeerockets.com> (see the "ARC Supplies" section)

Balsa Machining Service (BMS): <https://www.balsamachining.com> (see the "ARC Parts" section)

Visit rocketrychallenge.org to learn more.



@RocketryChallenge



Contact us at rocketrychallenge@aia-aerospace.org or 703-358-1000.



Sample Letter for Sponsors

Dear [NAME],

We are excited to share that [school/organization] is participating in the American Rocketry Challenge, the world's largest student rocketry competition, and we need your support!

This year, over 5,500 students nationwide are gaining invaluable hands-on engineering experience by designing, building, and launching model rockets from scratch. Our goal is to reach the National Finals in Washington, DC in May 2027, and compete for the title of National Champion.

The challenge this year is to launch a rocket carrying two raw eggs to a height of 800 feet and return them safely to the ground within 37 to 40 seconds, without cracking the eggs. It really is rocket science! As we aspire to make it to National Finals and be among the best teams in the country, we will be learning lifelong skills in teamwork, perseverance, and STEM.

Achieving National Champion status in rocketry is no small feat, so we need your help to make it happen. Your financial or material donation will help us gain critical momentum and inspire us to pursue careers in these fields. [Include information about your team here.] Your contribution is an investment in the future of STEM and will help us reach new heights!

If you are interested in supporting our team, please contact [Adult Team Advisor Name], at [email address] or [phone number]. We hope you will join us on this exciting journey and help us lift off!

Thank you for your consideration and support.

Sincerely,

[TEAM SIGNATURE]

Visit rocketrychallenge.org to learn more.



@RocketryChallenge



Contact us at rocketrychallenge@aia-aerospace.org or 703-358-1000.