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Matthew Penick  
President 2021-2022

# MESSAGE FROM THE PRESIDENT:

To Community Members,

Welcome to another year of Cyclone Rocketry! We are grateful to be back on campus this fall. Last year we faced challenges as an organization, including the cancellation of Spaceport America Cup competition, limited in-person meetings, and decreased lab access. We overcame these difficulties and completed our build cycle, and successfully launched Renegade last April.

We have set exciting goals to push ourselves to new heights this year. Our primary focus is designing and building an exceptional rocket to win the 10,000 ft SRAD category at Spaceport America Cup 2022. This will be a six inch diameter carbon fiber vehicle powered by a student researched and developed solid rocket motor. In addition to our main project, we are working on a 30,000 ft research vehicle, the first of many steps toward our multi-year goal of reaching space. As in previous years, we value personal High Powered Rocketry (HPR) certifications, and seek to increase access for club members to earn these achievements.

Every year we grow and change, yet our mission remains the same: *"To educate, challenge, and inspire Iowa State students, the community, and future generations about rocketry, science and engineering, and space exploration"*. Cyclone Rocketry offers valuable technical and teamwork experiences to develop our members' skills and prepare students for careers in engineering. We require funding to continue our programs and produce club hardware. With your help, Cyclone Rocketry will have an extraordinary year. Thank you for considering sponsorship.

Matthew Penick  
President, Cyclone Rocketry



# WHO ARE WE?

Cyclone Rocketry develops, manufactures, tests, and operates high power rockets. We promote the personal and professional development of our members by offering unique engineering experiences not available through classwork or other organizations. Our members range in background, with over three colleges and nine departments represented in the club. Through hands-on, practical technical and teamwork learning, we are preparing the next generation of engineers and leaders for industry. Since the founding of Cyclone Rocketry in 2017, a multitude of our alumni have contributed to the leading edge of aerospace within prestigious companies and organizations.

We participate annually in the Spaceport America Cup (SAC), an international rocketry competition. Our vehicle for the 2022 SAC will be a six inch diameter rocket constructed primarily of carbon fiber, machined aluminum, and fiberglass. Our six subteams are each researching and developing functional subsystems to ensure success at the SAC.



## OUR MISSION:

*“To educate, challenge, and inspire Iowa State students, the community, and future generations about rocketry, science and engineering, and space exploration”*

# THE TEAMS

Here are the summaries of our six subteams, and the exciting projects and ambitious goals they have set for themselves for the 2021-2022 academic year.

The Avionics team logo is a circular emblem with a purple border. Inside, there's a stylized circuit board with various components. The word "AVIONICS" is written in a semi-circle at the top, and "CAMPUS ROCKETRY" is written in a semi-circle at the bottom.

## AVIONICS

Avionics is tasked with tracking and recording the rocket's position and other important parameters throughout all mission phases. This provides an insight into how the rocket and various subsystems are performing. Aspirations for this year include implementing a new software testing environment, upgrading printed circuit board designs, implementing a Kalman filter to better control airbrake deployment, and continuing to refine pre-flight system verifications when the rocket is fully assembled and on the launch tower.

The Aerostructures team logo is a circular emblem with a red border. It features a central image of a composite material structure, possibly a fin or a body tube, with various tools and materials around it. The word "AEROSTRUCTURES" is written in a semi-circle at the top, and "CAMPUS ROCKETRY" is written in a semi-circle at the bottom.

## AEROSTRUCTURES

Aerostructures designs, manufactures and tests airframe components such as fins, body tubes, and the nosecone. The primary materials used are carbon fiber and fiberglass due to their physical and mechanical properties. The team has invested in advanced tooling to enable more in-house manufacturing capabilities. Utilizing new technologies and processes, the team's goal is to manufacture all aerostructures components at Iowa State University. This will reduce cost, increase customizability, and most importantly give members a wide experience with different composite manufacturing techniques and structural design and simulation tools that will benefit their engineering careers.

The Mechanical team logo is a circular emblem with a red border. It features a central image of a mechanical assembly, possibly a piston or a valve, with various tools like a wrench and a screwdriver around it. The word "MECHANICAL" is written in a semi-circle at the top, and "CAMPUS ROCKETRY" is written in a semi-circle at the bottom.

## MECHANICAL

Mechanical is responsible for the design and manufacture of mechanical systems for the rocket. This year the mechanical team is focused on designing a piston ejection system to aid recovery systems ejection during rocket separation. In addition, the mechanical team designs, optimizes, and manufactures the various metal rocket components, including aluminum bulkheads, centering rings, and nose tip.



# PAYLOAD

Payload designs a particular static or dynamic experiment to be launched on the competition rocket. Previous experiments include the utilization of piezoelectrics to generate electricity from flight vibrations, the deployment of medical polymers for disaster or first aid applications, and the use of magnets for internal component stabilization. The high altitudes, force loading, and vibrations of the rocket flight profile allow for highly unique experiments to be conducted. The payload subteam undergoes a one year design/build cycle and is a critical component in the Spaceport America Cup.



# PROPULSION

Propulsion is tasked with researching, designing, fabricating, and testing rocket motors to lift the club rocket to a desired altitude. Through the years, the propulsion team has developed motors ranging from 29 to 54 mm in diameter, and is now preparing to static test a full scale 98 mm flightworthy motor. Ongoing testing will increase confidence in the current propellant formulation and motor hardware design. This leads to the ultimate goal of powering the SAC club rocket on a student researched and developed motor.



# RECOVERY

Recovery is responsible for getting the rocket down safely. Our advisor quotes: "It's easy going up, the hard part is coming down". The recovery team designs parachute geometries, separation methods and ejection processes. The team also manufactures parachutes, which are integrated with shock chord and other hardware to complete the system. Goals for this year include the design of a dual deploy recovery system, and the design and testing of an updated main parachute geometry.



## OTHER FOCUSES

Cyclone Rocketry is involved in other projects in addition to Spaceport America Cup. As an organization, we are focused on offering the best member experience possible, which requires continuous club development. For a rocketry organization this means the development of capabilities for higher and faster flight, leading to the successful launch and recovery of a vehicle over the Karman Line. To this end, we are designing a 30,000 ft research vehicle to be used as a testbed for both known and developing technologies. Future years will build off our learning and allow us to grow closer to our ultimate goal.



While subteam experience leads to depth of knowledge in a particular domain, our personal High Powered Rocketry (HPR) certification program aims to give members an overall understanding of rocketry by building and flying their own rockets. The club offers end-to-end knowledge and logistical support for certification through Tripoli Rocketry Association by providing students access to subsidized level one and level two HPR kits. Certified members earn a sense of pride for their accomplishments and better contribute to club projects with their increased design, manufacturing, test, and operation skills.





# WAYS TO GIVE

Monetary donations for rocket and propulsion hardware development

Material Donations including -

- 6061/7075 aluminum
- PCB printing services
- Carbon fiber tow or cloth (dry or pre-impregnated)
- Composite sandwich panel cores (Amrid Nomex)
- Related composite layup material (peel ply, vacuum bag sheets, and breather materials)
- Pressure transducers, strain gages, cameras, and other hardware integrated directly into the rocket and test equipment

Design Reviews from experts in industry to help with development of solid rocket motors and flight vehicles



# DONOR BENEFITS

## BY TIER

Name listed on website	Community <\$500
Receive our Shop Talk news letter	Ignition \$500+
Visibility on t-shirt	
Personalized thank you from our team	Boost \$1,000+
Paragraph on our website highlighting our sponsorship	
Visibility on our rocket and banner	Apogee \$2,500+
Promotion on team media (LinkedIn, Facebook, Instagram)	
Access to team media for company promotion	Premier \$10,000+
Significant visibility on our rocket, t-shirt, and banner	
Logo flown on a separate flag at Spaceport America	
Prominent visibility on our rocket, t-shirt, and banner	

# THANK YOU!

Cyclone Rocketry requires financial support to achieve our mission. We offer promotion and media benefits to our sponsorship partners. We are happy to tailor partnerships options if requested. The club, our mission, and our outcomes are not viable without sponsor support. We are immensely grateful for those who invest in us.

For further sponsorship inquiries please contact [cyclonerocketry@gmail.com](mailto:cyclonerocketry@gmail.com). Checks may be mailed to the Iowa State University Foundation (2505 University Blvd, P.O. Box 2230, Ames, 50010) designated to Rocket Shop (our student organization designation). All donations are eligible for tax benefits.

Feel welcome to reach out with any questions. On behalf of the Cyclone Rocketry team, thank you!