



2014-2015 Sponsorship Guide  
[www.RiceX.org](http://www.RiceX.org)



## Letter From the President

Dear prospective sponsor:

Thank you for taking the time in viewing our sponsorship packet.

RiceX is Rice University's Aerospace Engineering club, available to all students who have an interest in the Aerospace sciences, regardless of major. Recently the club has experienced a surge of interest and new members eager to gain experience and learn about Aerospace Engineering. In response to this, the club officers decided to establish a long term goal for the club to successfully launch a hybrid rocket on a suborbital trajectory and recover it intact. We believe that this goal will provide the club members with unique aerospace engineering experience not achievable in classes or in other university clubs. To this end, the club's goal for this academic year is to build a small scale hybrid rocket and use it to compete in the Advanced category of the 10th Intercollegiate Rocket Engineering Competition (IREC). Accomplishing this short-term goal will provide the team members with valuable experience required to design the club's next iteration of rockets.

The IREC is hosted in Green River, UT, on June 24-27, 2015. The competition requires us to lift a 10 lb payload to 25,000 feet AGL. Several teams from countries around the world including Brazil, Turkey, and India meet together during these days to launch rockets together and network. The IREC is unique from other rocketry competitions in that it does not specify what the payload should be. The teams are free to decide what kind of payload to fly, allowing the teams to show their creativity and ingenuity in whatever way they prefer. Besides launching and recovering the rocket, the competition requires teams to submit design review packets and presentations periodically throughout the year to the IREC judges. The teams also must design a poster for their respective project and present it during the competition dates. This competition will not only grow our team members' design, analysis, and fabrication skills, but will also push them to develop effective technical presentation and writing techniques essential to today's engineering world.

Our team will need help to accomplish its goals. Besides advising from our faculty mentor, RiceX will require other help in the form of sponsorships. RiceX would like to request your support to help us build our rocket and compete in the IREC. Any aid in any form will be greatly appreciated no matter the amount. The expected expenditures of this year's project includes the cost of raw materials to build the rocket body and motor, the electronics necessary to build a flight computer and a ground support station, chemicals to develop hybrid motor propellants, travel costs, and machining work. Towards the end of this document a list of our available sponsorship levels and their benefits is presented. Your donation will not only ensure the success of our team but will also ensure the success of our team members when they enter the workforce by providing an opportunity for them to gain real engineering experience. If you are unable to contribute with a monetary or material donation, please consider reviewing our design. As undergraduate students, we have barely put our foot in the door of aerospace engineering, and we realize that we will need advising help. We will receive advising from our faculty mentor, but we would like to ask for advising from engineers in the industry. We implore you to examine our designs and please send us any suggestions or questions you may have. Design reviews, questions, and suggestions are contributions that can turn out to be more valuable than any monetary or material donation. These contributions will be compensated for as well. Please continue to read this document for more information concerning the club and please do not hesitate to contact us with questions or comments.

Sincerely,

Sarah Hernandez  
RiceX President  
srh3@rice.edu

### Rice Space Exploration and Propulsion Group

As Rice University's Aerospace Club, Rice Space Exploration and Propulsion Group(RiceX) is committed to educating and training interested students of all majors in the aerospace sciences. RiceX is the result of the reorganization of Rice's Aerospace club, formally known as Rice AIAA. Although RiceX retains the title of Rice University's student chapter of AIAA, the new name of the club reflects its new goals set for the next few years.

The long term goal of RiceX, estimated to be carried out in the next four years, is to launch a custom rocket into suborbital space. To accomplish this, the RiceX team will set goals for each academic year, with each year's goals building upon the accomplishments of RiceX the previous year. The goal set for the 2014-15 academic year is to design and build a rocket to compete in the 10th Intercollegiate Rocket Engineering Competition. Experience gained from competing in this competition will be invaluable to RiceX next year as it begins designing its suborbital rocket.

In addition to this, RiceX hosts speakers and talks from members in the Aerospace Community, from former NASA CAPCOMs to high-level executives of Boeing. These talks provide both members of RiceX and the general Rice community with networking opportunities that can possibly turn into internships or positions at aerospace companies.

The private spaceflight industry is booming. RiceX will prepare students to meet and overcome the challenges they will face as NewSpace grows.

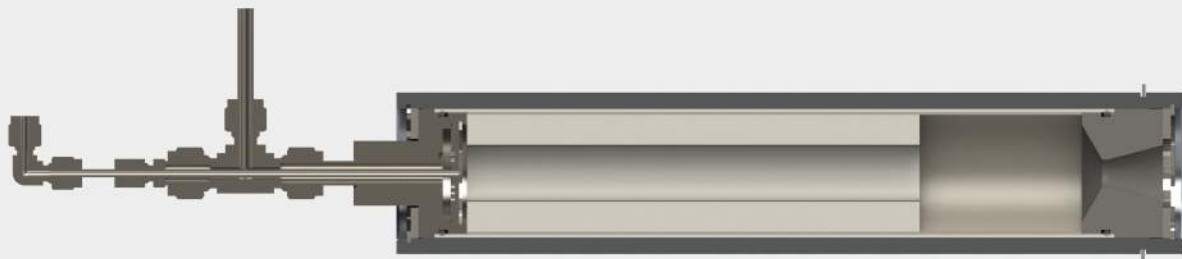


## Defining Spaceflight for a New Generation

In order to prevent the club from falling into a cycle of defining goals for each academic year that are unrelated to each other, a long term goal was sought to tie each year's goals together towards a common purpose. To this end, the goal of building a rocket that will reach suborbital space was established. This goal will challenge our members, will grab people's attention, and will result in an accomplishment shared by only a handful of other organizations.

Flying a rocket to suborbital space has not been done very many times before because it is a very difficult task to accomplish. Historically, it has been virtually impossible for a university organization to accomplish this goal due to the extreme dangers associated with large amounts of solid composite propellant and the prohibitive costs of developing a liquid motor. Recent advancements in hybrid rocket technology have enabled RiceX to realistically set the goal of reaching suborbital space. In addition, RiceX plans to build a flight computer based around the same systems that are currently used at NASA and SpaceX. We believe that access to this new technology and the innovative spirit within RiceX will ensure the success of our suborbital rocket when we fly it in four years.

Within the four years leading up to our suborbital rocket's flight, our members must become experts on the systems that will be used in our suborbital rocket. Our propulsion team will gain expertise in designing, building, and testing custom rocket motors. Our avionics team will learn how to build a professional-level flight computer and will learn how to face the unique challenges associated with installing complex electronics in a cramped space on a rapidly moving rocket. Our aerodynamics and structures team must become acquainted with modeling the aerodynamic forces on a rocket, using those models to predict the flight path, and building the physical rocket itself that will safely house all the subsystems and will facilitate a successful launch and recovery. To get our members familiar with designing a rocket and its subsystems, RiceX will be entering the Intercollegiate Rocket Engineering Competition this year.



RiceX Test Motor



### The Intercollegiate Rocket Engineering Competition(IREC)

The IREC is an annual competition held by the Experimental Sounding Rocket Association(ESRA) that challenges university students to build some of the most complex amateur rockets ever built. The IREC's participants are split into two categories: basic and advanced. The basic category is very similar to the NASA USLI competition in that students are allowed to use commercially available rocket components and accessories, and has a target altitude of 10,000 feet. The advanced category encourages students to build custom rocket motors, requires students to build their own rocket components, and has a target altitude of 25,000 feet. Unlike the USLI, the IREC does not have specific payload requirements; students are encouraged to come up with innovative payloads or even recruit a K - 12 school class to design a payload. In addition, teams are not limited to a specific budget; teams that compete in the IREC are allowed to spend as much money on their rocket as they want.

RiceX plans to enter the IREC this year and compete in the advanced category. Even though the design of the rocket is far from done as of October 2014, a few general design choices have been made. Our rocket will be constructed with a mostly fiberglass airframe. We believe that fiberglass will give us a balance between strength, weight, machinability, and cost. Aluminum and carbon fiber may be used in areas where it is deemed necessary to ensure the structural integrity of the rocket. Our flight computer has been chosen to be a National Instruments myRIO. We chose this controller because of its speed and versatility with due to its integrated FPGA and its large number of I/O pins that will allow us to measure and control several parameters of our rocket. Lastly, our rocket will be powered by a custom hybrid motor that will use N<sub>2</sub>O as its oxidizer and either HTPB, paraffin wax, or a mixture of the two as its fuel. All of these features and more will make RiceX's rocket one of the most complex rockets at the IREC.



The rocket we plan to build for the IREC will be a feat of engineering that encompasses imagination and ingenuity. Our rocket, while being somewhat similar structurally, is vastly more complex than most high power rockets. The competition rules state that all components must be student-designed and built, so we will not be able to use commercially available rocket kits, fins, and avionics bays. In addition, because our rocket will be powered by a hybrid motor, we must build ground support equipment that will automate the oxidizer filling and launch processes. The hybrid motor itself must be built from scratch. This requires us to buy stock material, machine parts, and test our motors on custom-made test stands.

RiceX has predicted the costs of our rocket's subsystems and support equipment, and has consolidated them into categories to provide a total cost for the academic year. Additional information about how RiceX arrived at these cost predictions can be provided upon request.

<b>Aerodynamics and Structures</b>	<b>\$2,750</b>
- Rocket main structural components	\$1,500
- Recovery harness	\$150
- Parachutes	\$750
- Parachute deployment	\$150
- Misc.	\$200
<b>Propulsion</b>	<b>\$8,250</b>
- Test motor and small test stand	\$2,000
- Flight motor and large test stand	\$4,000
- Motor ground support equipment	\$1,250
- Propellants/Consumables	\$1,000
<b>Avionics</b>	<b>\$3,000</b>
- Flight computer, sensors, actuators	\$1,000
- Flight computer power supply	\$200
- Wires, cables, and connectors	\$200
- Test stand and launch pad electronics, radio	\$1600
<b>Other</b>	<b>\$1,500</b>
- Travel to Utah to compete in IREC	\$1,500
<b>Total</b>	<b>\$15,500</b>

RiceX is seeking sponsorship and donations from groups and individuals who share our passion for educating students and furthering the advancement of aerospace sciences. As a student organization, RiceX would like to reestablish Rice University as a premier leader in the space industry and reaffirm its unique relationship with NASA. Entities who offer assistance to RiceX will be recognized for their contributions in several ways as shown below. Non-monetary contributions, such as mentorship or materials, are welcome and will be recognized as well, and all sponsorship levels are negotiable. Please feel free to contact us with any questions.

### **Suborbital | \$100**

- Name and Logo on website

### **Orbital | \$500**

- Name on website and team shirts
- Shoutout in end-of-year video

### **Interplanetary | \$1,000**

- Receive regular project status updates
- Access to team resumé bank
- Name and Logo on website and team shirts

### **Interstellar | \$5,000**

- Rockets, rocket components, and officers available for presentations at corporate events
- Logo on all rockets launched and in presentations of technology

### **Intergalactic | \$10,000**

- Company name and logo displayed prominently in videos, pictures, and presentations of technology
- Logo displayed prominently on all rockets launched

**Note: All sponsorship tiers include incentives of tiers above**

*The success of the RiceX is dependent upon the contributions from generous donors and sponsors. We would like to reiterate that your help is an investment in not only the future of the team at Rice University, but the advancement and spread of ideas involving space exploration.*