We are Rice Eclipse.

Rice Eclipse is Rice University’s student rocketry team. Our mission is to enrich the education of our members with project-based learning to develop cutting edge aerospace technologies. We develop launch vehicles, rocket engines, avionics hardware, and avionics software to compete in the annual Spaceport America Cup intercollegiate rocketry competition.

We are brought together by a passion for learning and innovation, and every member is dedicated to helping his or her teammates reach their full potential as future engineers, scientists, and people, no matter their skill level or academic level.
President’s Letter

Dear Friends of Rice Eclipse,

I hope that this letter finds you in good spirits and better health. My name is Nick Ess, and I am the President of Rice Eclipse Rocketry Team for the 2021 - 2022 academic year. We are Rice University's student rocketry team. We are the largest project-based engineering design team at Rice, with over 50 active student members from diverse backgrounds and fields of study. Our mission is to provide Rice students with aerospace design experiences to develop their technical and leadership skills, empowering them to be successful engineering professionals. We aim to reignite aerospace education at Rice University, and to keep the spirit of President Kennedy’s Moon Speech alive and well at this university.

This is a pivotal year for the club, and we are the hitting the ground running this Fall. We are carrying out a testing campaign of Titan II consisting of at least three hot-fires, and returning the Luna engine to full capabilities. We will design, build, launch, and recover our new rocket, “Minerva,” in the 30k COTS division at the 2022 Spaceport America cup. We will complete the development cycle of ARCA and utilize it for numerous engine tests, and develop our auto-recovery system and perform test flights with it using a retrofitted airframe.

Our new engine, Titan II, and upcoming rocket are two crucial steps towards our eight-year goal of launching a rocket with our own motor to 30,000 feet. Our competition rocket this year will build off of years of experience from our Aerodynamics and Structures Team, and prove once and all that we employ safe and dependable modeling and building techniques. In addition, we are introducing novel equipment this year, such as a flight computer that will send live telemetry to ground control, a new scientific payload, and most importantly an overhauled recovery system. However, Athena suffered a component failure in its recovery system that led to a ballistic return. The team is responding to this by confirming our ability to launch and recover a supersonic rocket with Minerva, along with implementing a slew of improvements. Titan II, our 1,200 lbf thrust monster of an engine, was recently completed and faces a battery of tests this year. We hope to achieve two main things: first, validate the engine’s ability to perform a burn safely while producing the necessary thrust to get our rocket to 30,000 feet, and second, carry out a highly organized, methodical, and well-documented testing program as the club as a whole completes our multi-year effort to function as an organization rather than a collection of hobbyists.

Through these projects, and more, we intend to continue to provide each and every one of our members with a one of a kind experience in engineering, teamwork, and fun. We will proudly carry on our policy of welcoming anyone and everyone who is interested in our team, regardless of year, major, or experience level.

Clear Skies,

Nick Ess

President | nick.ess@rice.edu
Student Leadership

Officer Board

Nick Ess  
President

Renly Liu  
Chief Financial Officer

Alp Yakici  
Public Affairs Officer

Justin Guilak  
Chief Safety Officer

Bryn Gerwin  
Chief Engineer and  
Vice President

Prithve Shekar  
Aerodynamics and  
Structures Lead

Steven Zhao  
Propulsion Lead

Rosemary Lach  
Avionics and Software  
Lead

Team Leads

Aerodynamics

Spencer Darwall  
Airframe

Adam Chiu  
Structures

Savannah Tiemann  
Composites

Nancy Lindsey  
Recovery

Erick Morales  
Launch Rail

Jake Sperry  
SAC Payload

Grace Walters  
Certificates

Bria Romero  
Proxima Engine

Jonathan Lloyd  
Titan Engine

Andrew Bare  
Ground Systems

Rafe Neathery  
Nozzle

Eli Case  
Fluid Flow

Juan Roman Jr.  
Chemicals

Avionics and Software

Clayton Ramsey  
Static Testing and Diagnostics

Robbie Kenworthy  
Flight Instruments

Alex Holzbach  
Research and Development
The Titan II engine is Rice Eclipse’s design for a flight-optimized hybrid rocket engine. This engine will be used as the propulsion system for the team’s 2023 Spaceport America Cup 30,000 ft SRAD rocket. Three revisions of the engine’s design were completed and reviewed and the engine was fabricated over the past two years. This year, we will perform an exhaustive series of tests on the motor using our new testing and diagnostic system, ARCA, in order to gauge its readiness for flight. This engine is culmination of eight years of experience and work by the Propulsion team.

Minerva - 30k COTS Rocket
2022 Spaceport America Cup Rocket

This year’s rocket will be a supersonic vehicle completely designed and built in-house by the team from carbon fiber, aluminum, and fiberglass. This rocket will be our final stepping stone towards building Archimedes - the vehicle that will be powered by our Titan II hybrid rocket engine for the 2023 Spaceport America Cup. We will perfect our design and building techniques, overhaul our recovery system, implement a new flight computer, and launch a new scientific payload from a lab on campus.

Titan II Rocket Engine
Manufacturing and Testing

2021 - 2022 Trajectory
Meet the Team

73 Active Members
Fall 2021

“Active” is defined as students who attended 2+ general team meetings during the academic year.

Careers

20+

Employers Represented

- Blue Origin
- California Institute of Technology
- Con Edison Clean Energy
- Daily Thermetrics
- The Boeing Company
- Ekta Flow
- Leidos
- Lockheed Martin
- GE Healthcare
- Intralox
- NASA Johnson Space Center
- NASA JPL
- Northrop Grumman
- Rice University
- Raytheon Technologies
- Rocket Lab
- Safran Aerosystems
- SpaceX
- Stanford University
- Stellar Solutions
- University of Virginia
- Viasat

Majors

- Mechanical Engineering
- Computer Science
- Electrical Engineering
- Chemical and Biomolecular Engineering
- Chemistry
- BioEngineering
- Materials Science and Nanoengineering
- History

Project Participation

- Public Affairs, 1.1%
- Finances, 4.7%
- Avisonix, 21.9%
- Propulsion, 32.4%
- Aerodynamics, 34.4%
Aerodynamics

Spaceport America Cup

Rice Eclipse competes annually in the world’s largest intercollegiate rocketry competition, the Spaceport America Cup. For three years, Eclipse competed to deliver a scientific payload to as close to 10,000 ft as possible using a commercially available motor. Last year, the team built and flew the supersonic rocket Athena to 25,500 ft, a feat that required supersonic flight, onboard computing, and a sophisticated recovery system to accomplish. However, a component failure led to a failed recovery. This year, we are perfecting our design process and building a new and improved rocket to launch to 30,000 feet at the 2022 Spaceport America Cup and preparing to build Archimedes next year, which will be our first vehicle featuring our own engine - Titan II.

Certificate Launches

Rice Eclipse provides students with an opportunity to learn about high powered rockets at no cost to our members. Through the Tripoli Rocketry Association, students can obtain official certifications in high powered rocketry after designing, building, and flying their very own rockets. All material and motor costs are paid for thanks to the support of our sponsors.
Propulsion

Titan II Hybrid Rocket Engine

The Titan II engine is Rice Eclipse’s flight-optimized hybrid rocket engine, and will be the most powerful rocket engine the team has designed to date. This engine will be used as the propulsion system for the team’s 2023 Spaceport America Cup 30,000 ft SRAD rocket. Beginning with a series of “inert” flows of nitrogen through the plumbing, cold flows using our Nitrous Oxide oxidizer, and culminating in a series of hot fires, we will gather as much data as possible on the ground before beginning our work to integrate it with an airframe next year.

Luna/Proxima Hybrid Rocket Engines

Luna is Rice Eclipse’s 50 lb thrust hybrid rocket engine. It is the team’s propulsion testbed, allowing small-scale, quick-turnaround tests of components like fuel grains, injectors, and nozzles, to improve our larger engines. Development has just begun on its successor, Proxima.

Mobile Test Stand

Eclipse’s overhauled mobile test stand is capable of conducting static hot-fire tests of engines up to 1600 lbs of thrust. The engine can be safely transported to the test site in a horizontal configuration, and is raised to a vertical configuration using a pair of pneumatic pistons.
RESFET - Testing Software

Rice Eclipse’s Software for Engine Testing (RESFET) is Eclipse’s in-house software suite for rocket engine test data acquisition and post-test analysis. The suite consists of three software packages: Dashboard, Core, and Analytics.

Scientific Payloads

Rice Eclipse’s Spaceport America Cup rockets always fly scientific payloads in a CubeSat format, which include an avionics package. Our experiment this year will be to design and test the internal support structures of a thermal management device for spacecraft that is sponsored by NASA by building our own prototype models and testing their survive-ability while still maintaining function under high vibrations and launch loads.

ARCA - Test Data Acquisition System

ARCA is Eclipse’s student-designed data acquisition system for rocket engine tests. It commands firing sequence functions such as ignition and valve actuation, and records data from the engine load cells, thermocouples, and pressure transducers.

RTR - Flight Data Acquisition System

Real-Time-Rocket (RTR) is an ongoing development project to acquire real-time telemetry from the avionics module on our rockets and transmit that data directly to our ground stations. The end goal of this project is a full, custom flight computer.
We at Rice Eclipse are proud of the work we do outside of our projects to engage with the Houston community. Rice Eclipse participates in a variety of outreach activities devoted to STEM education and spaceflight awareness. Eclipse is a regular participant in the local Cub Scouts Rocketry Day, where we help Cub Scouts prepare their rockets for launch. Eclipse has also given presentations at multiple Cub Scouts meetings on the basics of rocketry. Eclipse additionally participates in Rice University’s Reach for the Stars, an event to inspire young girls to pursue aerospace careers.

Along with these, Rice Eclipse does outreach work in the Houston aerospace and engineering communities. The team has presented at the Houston Maker Faire, NASA Safety Day at Johnson Space Center, and multiple gatherings of industry representatives and Rice alumni. We believe that these activities are critical to inspire the next generation of Houstonians to look towards the stars and empower them to pursue their interests.
How to Help

The continued success of Rice Eclipse depends on the generosity of private donors and corporate sponsors. Join our team of partners, so we can keep providing Rice University students with the technical and leadership skills they need to succeed as engineers.

Monetary donations are essential for parts and supplies used in rocket and engine manufacturing.

Material donations from graphite nozzles to engine machining are implemented directly into rocketry projects.

Rice Eclipse is a 501(c)(3) non-profit, tax-exempt organization, so all donations to the team are tax-deductible.

Support us at https://riceconnect.rice.edu/donation/support-rice-eclipse
Sponsorship Levels

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Suborbital - $500+
- Name and logo on T-shirt, website, project posters, and promotional materials
- Shoutouts on team social media
- Regular project updates

Orbital - $1,000+
- Name and logo displayed underneath the Rice Eclipse banner in team workspace and at team events
- Team shirts made available to sponsors

Interplanetary - $2,500+
- Sponsor an engine test, rocket launch, or other team event
- Speaker invitation to general meeting
- Dedicated company banner displayed underneath Rice Eclipse banner in team workspace and at team events
- Small logo displayed on 2022 Spaceport America Cup rocket
- Name and logo on the hybrid engine mobile test stand

Interstellar - $5,000+
- Rockets, rocket components, and Rice Eclipse members available for presentations at corporate events
- Logo prominently displayed on 2022 Spaceport America Cup rocket
- Company’s promotional material handed out at team events

All sponsorship levels include benefits of the above levels.

Non-monetary donations will be given an equivalent sponsorship level based on the value of goods and services provided.
Last Year’s Sponsors

Interstellar

OEDK
Oshman Engineering Design Kitchen

Interplanetary

Chevron
DaVinci Maker Labs
REA RICE ENGINEERING ALUMNI

Rice University
George R. Brown School of Engineering
Rice University
Rice Center for Engineering Leadership (RCEL)

Orbital

Student Activities
President’s Programming Fund
Rice University Student Center

Rice University
Electrical and Computer Engineering

Rice University
Rice Space Institute

First Mode
Tri-Gemini LLC
Texas Space Grant Consortium

Suborbital

Globe Engineering Company, Inc.

Blue Origin
Lockheed Martin