COLLEGE OF ENGINEERING



What is ESRA, and what is our mission?

• ESRA - Experimental Sounding

Rocket Association.

• Non-profit organization founded in 2003 for fostering and promoting engineering knowledge and experience in rocketry

What's A Sounding Rocket?

- Effectively any rocket with a solid-fuel motor that carries a scientific payload
- They are defined by being relatively cheap and quick to manufacture

• The IREC Competition

- IREC Intercollegiate Rocket Engineering Competition hosted by ESRA
- The competition is held between university teams across the world, with 150 teams this year

• Our Goals for the Competition

- Reach the 30,000 ft. threshold
- Deploy a payload
- Return successfully!
- We have to build our whole rocket from scratch and mix our own rocket fuel too!

• How we approached our mission

- Split our large team into subteams
- Each subteam handles a specific aspect of
- design and manufacture • This helped our team to save time and work
- faster in their respective fields



Mechanical, Industrial, and Manufacturing Engineering



Experimental Sounding Rocket team seeking success at Spaceport America

Main Chute

- 120in diameter toroidal design
- Slows rocket's descent to ~21 ft/s for landing
- Student manufactured

Nosecone • Follows the

- Von Karman line, a special supersonic curve for minimal drag
- Refurbished from a previous team's rocket
- Tipped with aluminum

Avionics bay

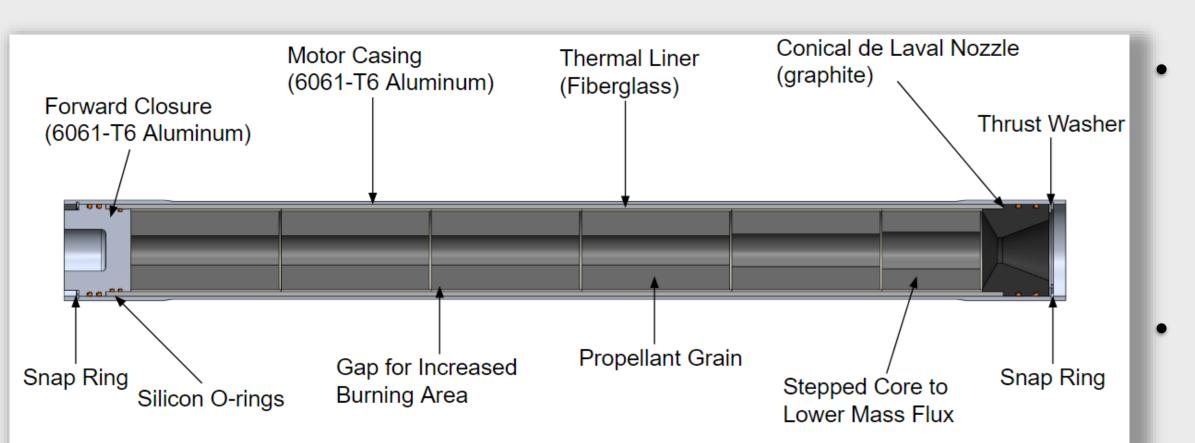
- GPS tracking
- Radio telemetry
- Sensors and deployment computers
- Cameras on the sides align with holes for recording during flight

Drogue Chute

- Deploys at apogee to slow the rocket while minimizing drifting
- Slows descent to 85 140 ft/s
- Final design will be X-form
- Chute is 48 inches in diameter

Payload • Farming robot, made to plant and water seeds upon deployment • Deploys at 1,500 feet • Three main sections: • Water tank **Electronics bay** • Seed disperser **Rocket Fins** • Hollow fins of 1/4in G10 Fiberglass • Filled with Nomex Honeycomb to reduce weight • Carbon Fiber layup for reinforcement

Designing and Packing A Custom Motor



Snap rings are used to secure all motor components in place to increase the re-usability of the motor and decrease the severity of motor destruction in the event of a Catastrophic Take-off (CATO)

"NEW BEGINNINGS"

- The motor case is 5 feet long and made of 6061-T6 Aluminum. The casing was designed to be thicker at the forward and aft end of the motor to accommodate the indent of the snap ring grooves.
- The fiberglass thermal liner serves as an insulator, preventing the heat of the burning propellant from weakening the aluminum case.
- O-rings on the nozzle and forward closure are used to seal the motor and prevent gas and heat from escaping around the nozzle.

safely.

Structures & Aerodynamics

The structures & aerodynamics team are responsible for designing the airframe to survive launch forces and minimize drag and weight. Parts such as the nosecone, fins, body tubes, and bulkheads are all their responsibility.

Payload

The payload team designed and built the farming robot for land rehabilitation. The 10cm x 10cm x 30cm robot utilizes a spinning plate to launch seeds and water. The payload is deployed at 1,500 feet and contains an independent recovery system.



#MIME.302

Meet the Team

Propulsion

The propulsion team designed, tested, and built the custom solid rocket motor that launched the 130 lbs rocket to 30,000 feet.



Avionics & Recovery

The avionics & recovery team designed and built the flight computers, recovery harness, and parachutes for the rocket. They are responsible for

tracking of the rocket

and ensuring it lands





