

SENIOR Design Day

Department of Mechanical &
Energy Engineering
University of North Texas

Nov 16
2018

EST. 1890

UNT | COLLEGE OF
ENGINEERING

SENIOR Design Day

Setup Projects in Main Hallway

8:00 AM to 9:00 AM - Discovery Park Foyer

View Projects in Main Hallway

9:00 AM to 10:00 AM - Discovery Park Foyer

Lunch

11:30am to 1:00PM

Design Presentations

10:00 AM to 3:30PM

Award Ceremony - MEE Office

3:30PM - 4:00PM

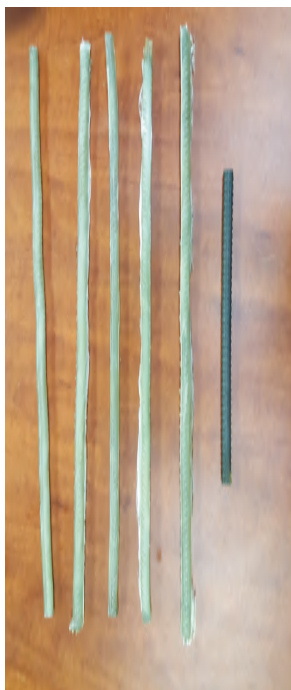
ROOM F175

10:00AM	Energy Efficient Aquaponics
10:30AM	Alpha Squad
11:00AM	Innovative Robotics
11:30AM	DPD (Discovery Park Dudes)
12:00PM	Weed Eater
12:30PM	MFG (Mean Fricken Green)
1:00PM	H2O
1:30PM	Mean Green Methane Machine
2:00PM	Steel Reserves
2:30PM	Rocket
3:00PM	L.A.C.I.

Steel Reserves

Alex Solorzano, Brandon Deason, Casey Miller, Usman Uddin

The Steel Reserves took on the challenge of making composite reinforcement bar, known as rebar, that is comparable or better than traditional steel rebar. Our original project was a system to produce composite rebar which future students would use for further research. The scope of the project was narrowed to small batch production and testing. The production variables included chosen fiber type, resin type, fiber-to-resin volume fraction, and fabrication techniques. For our team to consider our product a suitable substitute for steel rebar, testing for standards in accordance with ASTM A615 was necessary. These standards set requirements for the rebar's geometry, tensile properties, and flexural properties. Verification of the rebar's properties was done through tensile, flexural, and pull out testing or SolidWorks analysis.



Alpha Squad

Ian Brown, Geoffrey Little, Junior Johnwan, Johnathan Salazar

The project goal was to create a system in which incoming packages can be sorted and shelved automatically utilizing a UR10 collaborative robot.

Working in tangent with a programmed motor controlled carriage the robot can interact with many more entities than if the robot was stationary. While the robot performs simple pick and place operations, the logic within the controlling computer dictates where the robot carriage should go.

Specific requirements and challenges of this project include creating a mechanism that can safely and quickly move a UR10 robot to different location along a linear rail. Paired with a custom end effector and bins that neatly stack boxes for the robot to pick up, the system integrates multiple components. This system, implemented in the proper environment, can reduce labor, eliminate sorting errors, and produce a measurable ROI.



KUEHNE+NAGEL

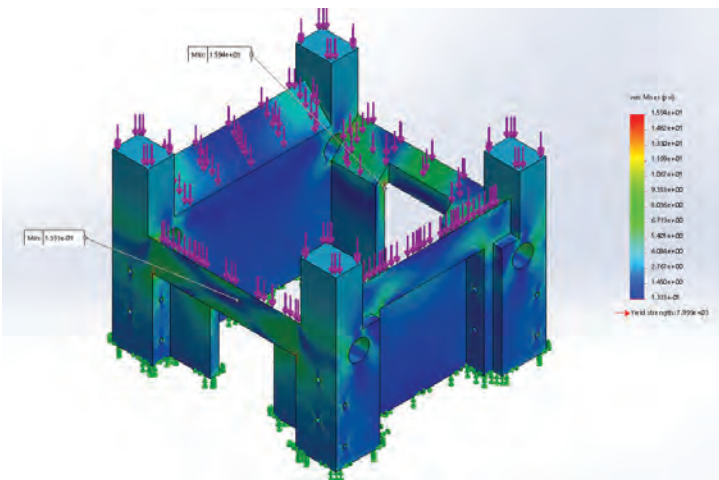
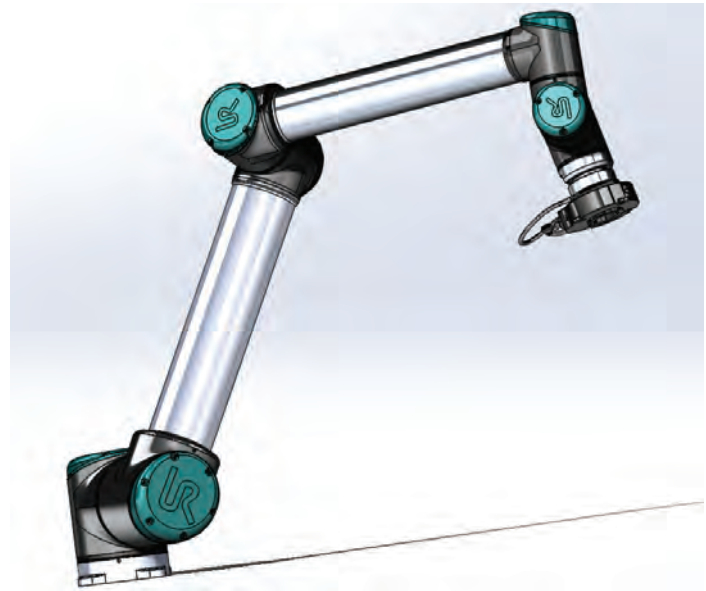
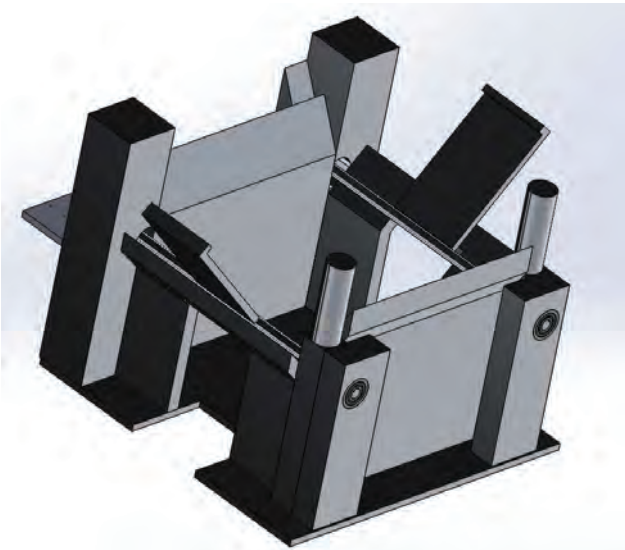
Innovative Robotics

Henry Hodan, Caleb Abood, James Hoff, Aaron Brittain, Mohammed Al Amri

Team Innovative Robotics automated a packaging and assembly process for our sponsor Kuehne & Nagel. The project morphed into two projects during the course of design, automated box folding and envelope packaging. Both of the projects utilized the Universal Robotics UR 10 Cobot combined with a uniquely designed end effector for picking up and moving the materials around.

We designed and manufactured a box folding apparatus that the cobot could place unfolded boxes into. Linear actuators were used to fold the side flaps of the boxes.

We also designed an apparatus that could hold and open a 12" x 9" envelope while the cobot loaded a gift bag into it. A servo motor along with a venturi pump was used to open and close the envelope.



KUEHNE+NAGEL

DPD

Rhae Johnson, Lebarian Stokes, James Franklin

Kuehne+Nagel (K+N) Lewisville is a contract logistics company that currently spends over \$1 million/year on dry ice for medical grade shipping distribution. To help our sponsor reduce operational costs, the DPD team designed and manufactured a machine that can automatically dispense pelletized dry ice at 4 variable quantity levels correlating to transit route length. This development provides a two-fold benefit to K+N, allowing them to upcycle solid dry ice blocks that have dissipated to a weight under the acceptable tolerance and to transition to dry ice pellets after the proof of concept (POC) phase. The initial implementation will provide an estimated savings of \$70,000/year."



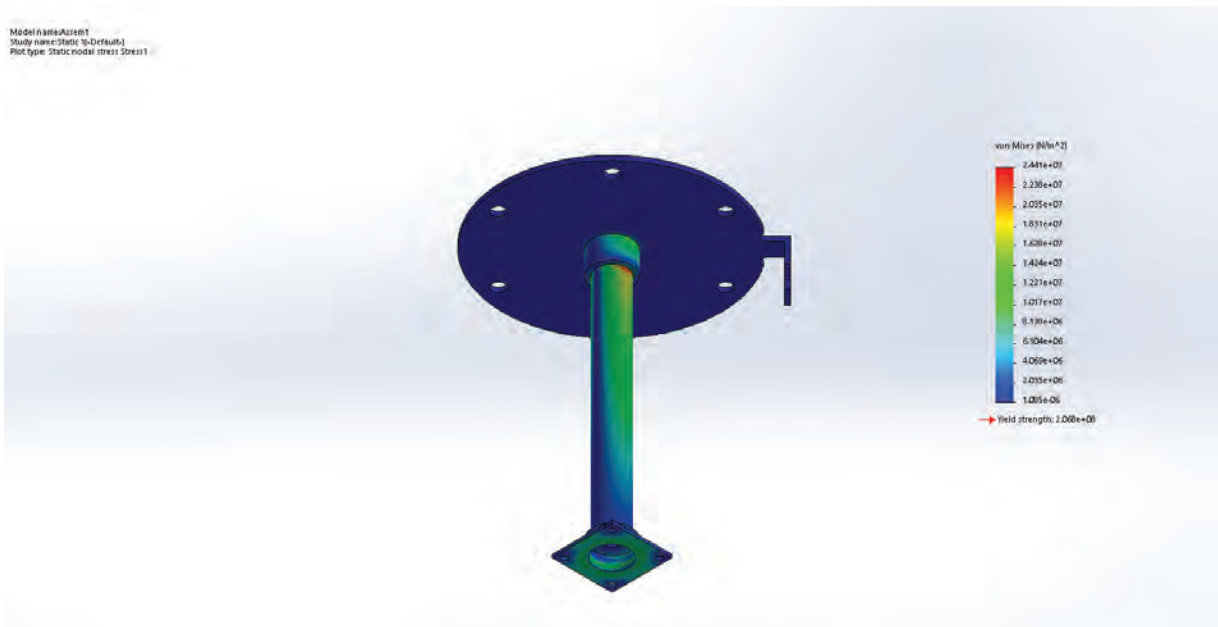
KUEHNE+NAGEL



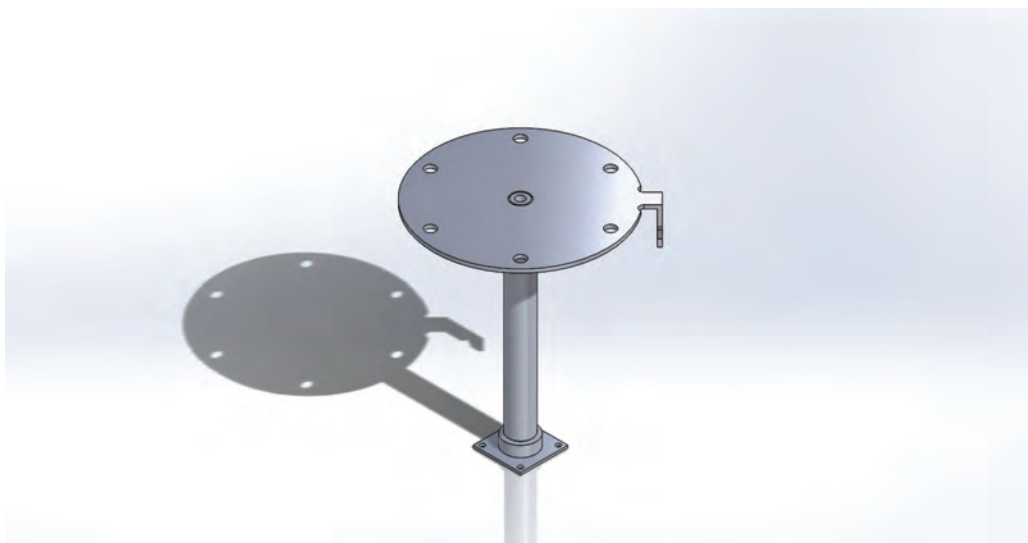
Weed Eater

Omar Aldukhayyil, Nicolas Gonzalez, Stephen Moorer

The aim of this project was to modify the front end of the Cub Cadet ST100 push trimmer for easier use. The team worked together to redesign and manufacture a new shaft, body attachment, and wheel assembly. The design eliminates the grinding of the rotating assembly on the ground and the need to balance the machine on its rear wheels.



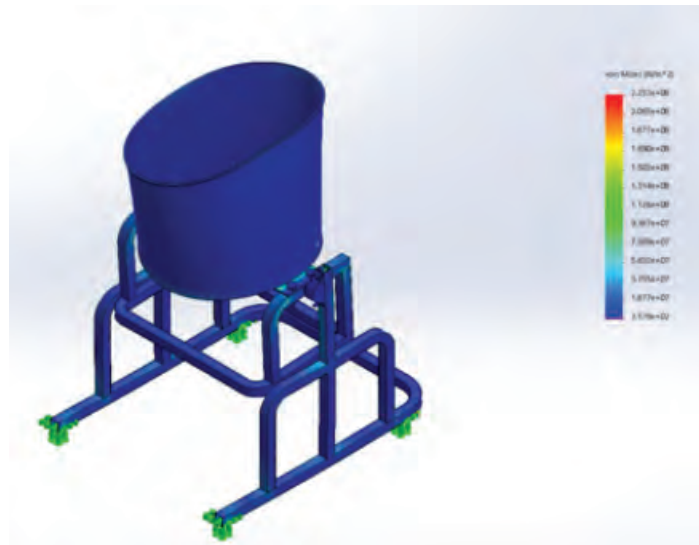
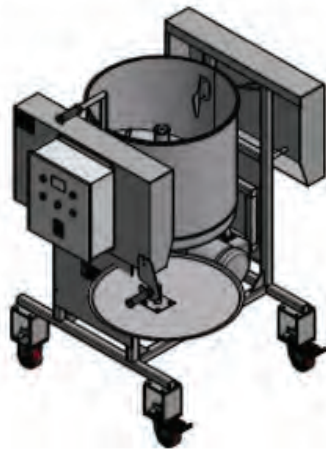
To ensure the design was able to withstand the predicted loads, both stress and frequency analyses were run on the assembly and parts.



MFG

Claire Obiaju, Konstantin Nguyen, Naif Almahti, David Rice

AC Horn Manufacturing has earned a world-class reputation as a manufacturer of snack food processing. Their goal is to provide quality machines built with pride, designed for efficiency and precision. In fact AC Horn's machines have helped fill shelves of the 90% grocery stores with snacks we consume today.



AC HORN MANUFACTURING

H2O

Amy Marie Amaon, Kyle Colombo, Brien Crowder

Clean drinking water is a major concern even in the most developed countries in the world. Something as catastrophic as a hurricane or routine as the Central Texas rainy season can put families at risk of drinking contaminated water. High Quality H2O aims to create a safe, inexpensive, accessible water purification system that also allows for simultaneous storage of more than 10 gallons of clean water for household use. The intent is to create a simple system to be stored in the typical Texan garage right next to other emergency supplies like a generator. One simply has to roll it out, pump any standing water into the system, and flip a switch in order to have safe drinking water for their family within minutes and without extreme amounts of waste that cases of water leave behind.



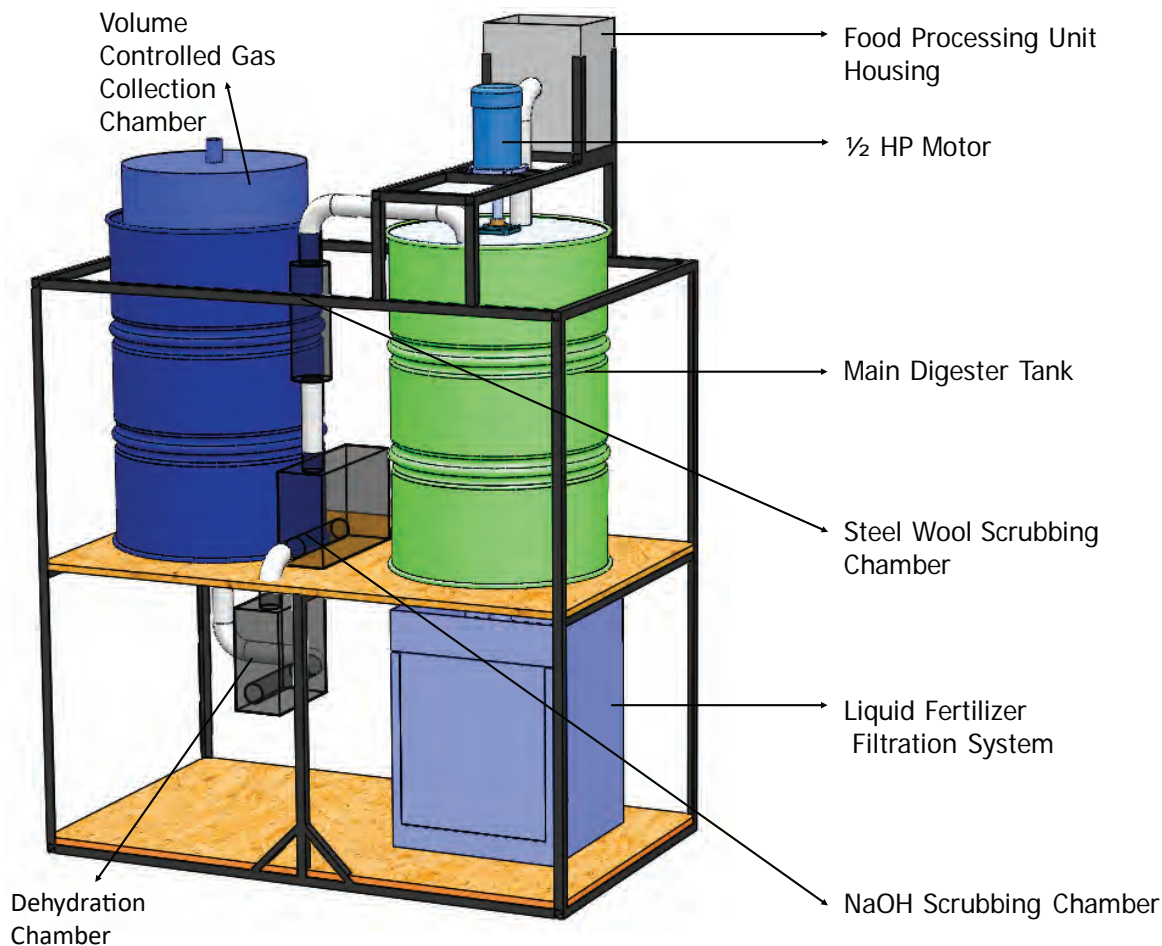
Mean Green Methane Machine

Mazin Alharthi, Bailey Carpenter, Amanuel Eshete, Zachary Hair, Brandon Hogg

The purpose of the Mean Green Methane machine is to convert UNT dining food waste into usable biogas as well as liquid and solid fertilizers. This process would offset the cost of electricity for UNT by further processing the biogas into electricity. Beyond UNT the digester technology can help prevent methane emissions from both rural and metropolitan wastes while generating energy that would otherwise be lost.

From our design experience we concluded that sealing of the digester was the largest concern, both from air entering the system and the smell escaping the system, and shape factor.

Further iterations of design would include welded, corrosion resistant pipes and more robust polymer fittings at input and output locations to minimize odor.



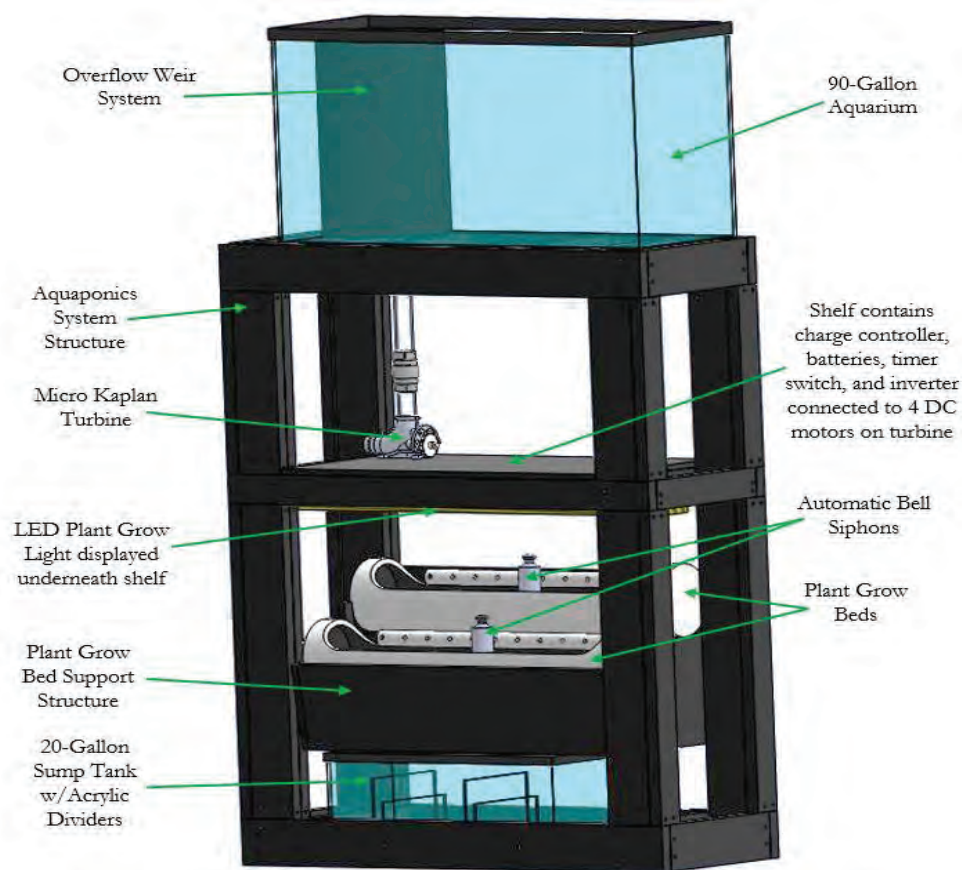
Facilities

Energy Efficient Aquaponics

Sheldon Aminzadeh, Emilio Roman, Jesse Castro, Hanyue Jiang

This project is centered around the fundamental concept of aquaponics which is a sustainable symbiotic system that consists of raising both fish and vegetables. Conventional aquaponics system energy usage in the range from 70% to 92% less than a conventional farm which typically use fuel or petrochemical-intensive fertilizers; therefore, it is our objective to decrease this energy usage even more in our aquaponics system. To achieve this objective, we will be integrating energy efficient applications such as a micro Kaplan turbine, overflow system, LED lighting, automatic bell siphon, and energy efficient materials to increase the overall system energy efficiency. This aquaponics system will be for indoor applications which permits control over various pests, harsh weather conditions, and food to be grown year-round in areas which otherwise might not be able to produce any food crops.

We came together as a team with a desire to design an energy efficient system that integrates both the understanding of mechanical and energy engineering with that of nature and its biological processes. Our inspiration was derived from assisting families with the ability to produce fish and vegetable during anytime of the year. There are many motivations to improve energy efficiency within our aquaponics system. Reducing energy use reduces energy costs and may result in a financial cost saving to consumers.

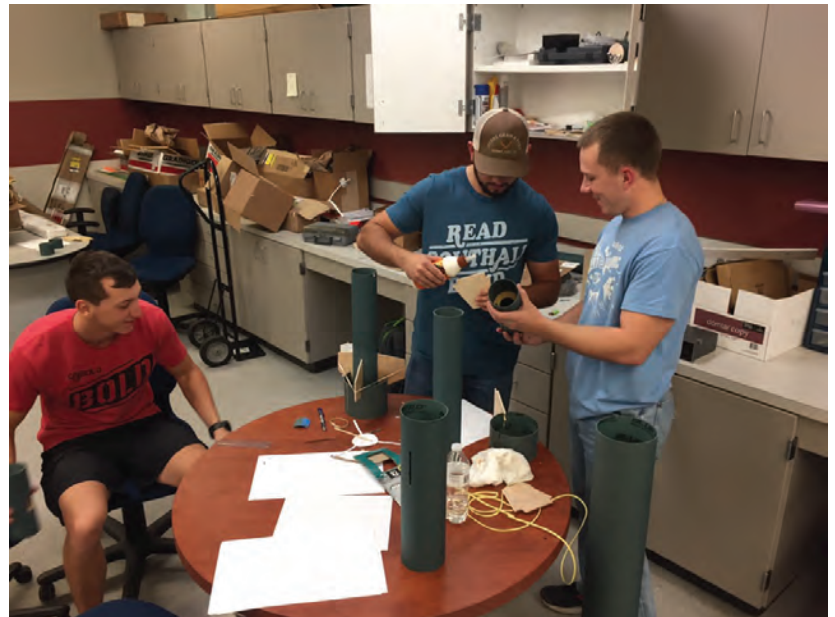


Rocket

Zarek Hogan, Audrey Huneycutt, Jase Hutchens, Jones Jeffcoat



Our project goal was to design a multi stage model rocket that is capable of reaching an altitude of 3000 ft. The rocket must have a total impulse of below 640 N-s and be recovered without any damage. To account for this design goal our rocket will incorporate two stages, a booster and a sustainer. The booster stage motor will be an AeroTech H123 and the sustainer stage motor is an AeroTech I211. These motors should easily propel our rocket to beyond 3000 ft while staying below the max impulse. Our rocket also will incorporate multiple recover systems in order to allow the rocket to land safely and without damage. The booster stage will have a recovery system with a StratoLogger CF which will deploy a 15" parachute once the booster reaches apogee. The sustainer stage will have a recovery system with a MiniTimer 4 and a StratoLogger CF. The Mini Timer 4 will ignite the second stage once the booster stage burns out. The StratoLogger CF will deploy a streamer once the sustainer reaches apogee, once the rocket reaches an altitude of 500 ft the Stratologger CF will also deploy the main parachute, 32", to allow the rocket to land safely. This is our design goal and actions taken for a successful launch. We will launch our rocket on Friday, November 9th.



L.A.C.I. Lightweight Aircraft Cargo Initiative

Kevin Johnson, Aric Guy, Parker Lewis, Thomas Broderick, Michael Silva, Marissa Ortega

The concept is to create a vehicle capable of autonomous transportation and delivery of light payloads in order to expand small markets and support remote operations such as disaster relief and medical aid. Multiple alternative uses could also be implemented with the aircraft, such as surveying, wildlife observations, surveillance, and atmospheric data collection.

The mission profile consists of flying a 2 kg payload within a max range of 50 km. The vehicle can take off and land within 20 m. The wings are detachable for easy disassembly for transportation. The propulsion system is electrically powered and is controlled with an autopilot system.





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