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Senior Design Day 2022

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CONSTRUCTION ENGINEERING TECHNOLOGY

Senior Design Day 2022

Bowie House Boutique Hotel
TX Discovery Construction

Team Members:

- Jarod Rose
- Juan Calixto
- Hector Velazquez
- Afolabi Badom

External Sponsors/Mentors:

- Logan Harper, Senior Project Manager
- TD Industries

Internal Sponsors/Mentors:

- Dr. Aloysius A. Attah, P.E.

Abstract:

Our project is the Bowie House Boutique Hotel, located at 3716 Camp Bowie Boulevard Fort Worth, TX 76107. Our sponsor TD Industries has been subcontracted by Austin Commercial to perform the mechanical and plumbing scope of the work. TX Discovery Construction's scope of work was narrowed down further to the underground plumbing. Within our scope of work fell the storm, below floor, and grease systems. We have created a report that includes a schedule and budget for the project that is broken down by system, the BIM systems utilized. The report will also include a site layout, logistics, safety plan, quality management ,and risk assessment specific for the project's jobsite. We have also included our recommendations for sustainability and value engineering possibilities.

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Montgomery Ridge II: Solar Design

SUN-T

Team Members:

- Branson Burger
- Marshall Grimm
- David Pacheco
- Robert Wilcox

External Sponsors/Mentors:

- TX-Morrow Construction: Breck Landry

Internal Sponsors/Mentors:

- Dr. Aloysius A. Attah, P.E.
- Dr. Cheng Yu, P.E.
- Dr. Miguel F. Acevedo

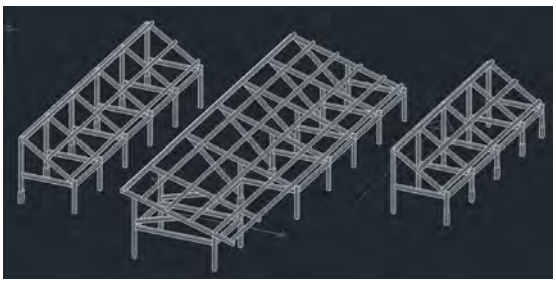
Abstract:

Our group was assigned to design a solar panel layout for a multifamily residential apartment complex and research the feasibility of adding solar power to future construction projects.

The main goals of this project were to design a layout for the current project of Montgomery Ridge II, find overhead reductions for the owner, perform a cost analysis, and finalize an answer for the future additions of solar power to projects.

We have designed a layout that meets the limitations given to us from the sponsor and allows for maximum solar panel placement. Along with this, we worked together with two solar panel contacts in the industry who provided us feedback for our design along with giving us information about costs, scheduling, and power output.

From this information, we were then able to complete the rest of our goals by performing the cost analysis and return on the feasibility of adding solar to future construction projects.



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MEP and Interior Upgrades to Curry Hall

M.A.S CONSTRUCTION

Team Members:

- Luis Ledezma
- Abraham Lara
- Angie Flores
- Eric Lopez

External Sponsors/Mentors:

- Austin Christensen
- Spawglass

Internal Sponsors/Mentors:

- Dr. Aloysius A. Attah, P.E.

Abstract:

Our team has been paired with Spawglass to modernize Curry Hall while still trying to stay true to its historic roots. A lot of the upgrades consist of mechanical upgrades such as new energy efficient air handlers, new sprinklers, installing new windows, new interior upgrades, and electrical upgrades. All these upgrades are meant to keep the building up to date with current building codes and making it more energy efficient along with overall just making the building look and feel more modern.

Much of the scope of work will be done during the summer of 2022 during the break with the demolition of the 1st floor and 2nd floor beginning in March 21st. During this time, 2 restrooms are going to be converted to mechanical rooms in the 2nd floor with 2 new single unit restrooms added to the floor. Along with that, a new sprinkler system, utility work, flooring, ceilings, 6 air handlers, and partitions will be added throughout the building.

The substantial completion is set for January 2023 before the spring semester 2023. The current cost of the project is $5,261,000 with a GMP contract and a CM-at-risk delivery method. This includes a 5% design contingency and 5% construction contingency.

We would like to give a special thanks to all of the UNT professors that help us through this journey, especially Dr.Attah, our sponsor Austin Christensen, and Spawglass for all of the support and guidance.

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Hazel Dallas Apartments

Team Members:

- Derek Brantzeg
- Manuel Vega
- Noor Jebbeh
- Victor Barraza

External Sponsors/Mentors:

CBG Building Company

Tanner Brown

Internal Sponsors/Mentors:

Dr. Aloysius A. Attah, P.E.

Abstract:

Our Project Group has been assigned to the MultiFamily Dallas project which is located at 13100 Noel Rd, Dallas, TX 75240. Receiving notice to proceed march 9th 2021, This 398 unit luxury apartment consists of 5 levels of wood framed housing space consisting of Studios, One and Two bedroom apartments surrounding a precast concrete garage, with a ground floors amenities center. Amenities included are a wellness center including treatment rooms and saunas, fitness centers, open office spaces, a dog park, community pool and three courtyards. The parking garage will have 517 available parking spaces within the six story structure. The units are furnished with high end finishes, quartz countertops, GE appliances and gourmet kitchens.

Hazel Dallas is in accordance with the Dallas Green Building Program by having on site recycling, a storm water management plan and natural water drainage system that incorporates “native vegetation”. Throughout construction, the team plans to recycle waste throughout the process. The complex will also be fit with EnergyStar ceiling fans and thermostats and water conserving water fixtures. Exterior walls are also constructed with more depth in order to facilitate more energy efficient insulation to conserve heat or to stay cool.

Our team is tasked with creating a report based on the aforementioned project that will give a detailed breakdown of logistics, layout, budget, schedule, sustainability, value analysis, risk assessment, safety plan, business plan, and BIM.

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NORTHERN BUILDERS

Vitruvian West Phase III
Northern Builders

Team Members:

- Akhil Nair
- Chidozie Azogu
- Angel Romero
- Sedikiya Alfred

External Sponsors/Mentors:

- DeAnn Hudson
- CBG Building company

Internal Sponsors/Mentors:

- Dr. Aloysius A. Attah, P.E.

Abstract:

Our senior design project is Vitruvian West Phase 3 which is a multifamily residential dwelling. The project is a 405-unit apartment community located on a 3.548 -acre tract, which is part of a larger 13.245-acre tract, located in Addison, Texas. This property is the 3rd addition to the Vitruvian complex and is adjacent to phase I and II, its sister properties. The building consists of a five-story split-level wrap surrounding a seven-story precast parking garage. The square footage of the entire project was 562,979 SF with the residential total being 378,543 SF and the garage total being 184,436 SF. The building consists of 71 efficiency units, 215 one-bedroom units, and 119 two-bedroom units.

Vitruvian West Phase 3 was constructed of cast in place concrete, structural steel, and wood framing. The skin of the building was finished with cast stone, metal panels, fiber cement siding, vinyl windows, and a TPO flat roof system.

Targeting LEED® Silver certification, Vitruvian West Phase III has many sustainable features including electrical vehicle supply equipment (8 car charging stations in total), 140 bicycle parking spaces, and more. Our team was tasked with producing a report that showed the various aspects of the project.

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Avalon at Argyle Phase II

All-Star Development

Team Members:

Luis Romero

Carolyn King

Salvador Zepeda

Cameron Nelson

External Sponsors/Mentors:

McAdams

Internal Sponsors/Mentors:

Dr. Aloysius A. Attah, P.E.

Abstract:

Avalon at Argyle Phase II is the development of the approximately 133-acre master-planned community, including 22 acres of open space. The scope of work includes mass grading, lot grading, transfer of stockpiles, sewer, storm, water, franchise utilities crossing, retaining walls, paving, landscape and hardscape. Avalon PH II is the second phase of this master-planned community containing 130 residential lots and 3 'X' lots. This phase of the development contains an extensive downstream assessment, flood study, LOMR & CLOMR to provide natural drainage as well as sanitary sewer connection into the Trinity River Authority, grading, paving, retaining wall design, water design, franchise utility, hardscape, landscape, TxDOT access onto FM 407 and a roundabout.

We would like to thank the UNT College of Engineering, Dr. Al, and our sponsor McAdams.

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At Home #315 in Denton, TX
DTX Construction

Team Members:

- David Lynch
- Kennis Bench
- Hannah Haber
- Cesar Mendoza

External Sponsors/Mentors:

- Logan Gregory
- Parkway Construction & Associates, LP

Internal Sponsors/Mentors:

- Dr. Aloysius A. Attah, P.E.

Abstract:

DTX Construction has partnered with Parkway Construction on the construction of an At Home retail store. At Home is owned and operated by Hellman & Friedman LLC and serves as a specialty home retail store offering up to 50,000 in home products. The project is in the growing neighborhood of Rayzor Ranch in Denton, TX and consists of a concrete tilt-wall building with a steel framed interior. This retail store covers 88,000 square feet.

The project team was responsible for creating a schedule for the project, and DTX projected a project duration for the At Home Project to be approximately ten months. Along with the schedule DTX created a site logistics plan and addressed sustainability and value engineering for the project. DTX prepared a detailed budget for the project and estimated the cost of construction to be around $7.65 Million. Additionally, DTX Construction conducted a risk assessment on the At Home project and developed a project safety plan to comply with the safety standards set out by the Occupational Safety and Health Administration focusing on the dangers that arise from constructing tilt wall buildings such as rigging, bracing and the use of a crane on the jobsite.

We would like to personally thank Dr. Attah for his continued guidance and Logan Gregory along with the Parkway team for giving us this opportunity.

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NTX DEVELOPMENT SERVICES

Richardson Bike Mart
North Texas Development Group

Team Members:

- Daniel Blaney
- Brittany Diaz Ochoa
- Saroj Pokhrel
- Mohamed Zaatreh

External Sponsors/Mentors:

Chad Salge
The Brandt Companies

Internal Sponsors/Mentors:

Dr. Aloysius A. Attah, P.E.

Abstract:

NTX Construction partnered with The Brandt Companies to build the MEP for Richardson Bike Mart in Frisco. The general contractor who's responsible for building the facility is Frank Dale Construction. The work of this project includes the furnishing of all labor, materials, services, equipment, and appliances required in conjunction with or properly incidental to all work (General Construction, Plumbing, Heating, Ventilating, Air Conditioning, Electrical Work, and Sitework) for construction of a new structure for retail use located at Hollyhock Road in Frisco, Texas. Site work will include excavation, grading, paving for parking and drive lanes, sidewalks, a CMU/brick dumpster and bike wash enclosure, a new fire lane, new parking striping, new parking lot lighting, landscaping and irrigation. This project is a smaller project with a budget of $907,859.00. It includes a new 21,932 gross square foot building for retail use. The building will consist of 13,715 gross square feet of space for Bike Mart and 8,217 gross square feet of lease space for future tenants. Spaces within the Bike Mart portion of the facility will include an open sales floor, a bicycle repair area, a warehouse-shipping/receiving space, fitting rooms, restrooms, and shower rooms, along with office and conference space located within a 2,176 square foot mezzanine. The projected completion date is set for June 15, 2022.

Special Thanks to Chad Salge, Russell Boswell, Chrystelle LeRoux, Aaron Markham and Professor Dr. Attah

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Frito Lay PGCS Warehouse Expansion
Cosmos Construction

Cosmos Construction

Team Members:

Ali Alshayukh
Carlos Brown
Kamal El Houari
Jan Zavala

External Sponsors/Mentors:

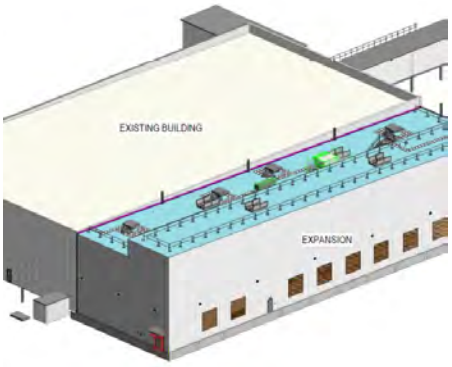
HASKELL

Internal Sponsors/Mentors:

Dr. Aloysius A. Attah, P.E.

Abstract:

Our senior design project is PGCS Warehouse Expansion in Arlington Tx.it was a Design-Build project in alignment with The Haskell Company for PepsiCo. The PGCS project includes 16,957.10 square feet as one building addition expansion to an existing Frito Lay Warehouse. The addition includes A.S.R.S (automated storage and retrieval system) structure, a warehouse, a new filler room, a trucker's office, and restrooms. As a Design-Build project, the following subjects were done by Haskell designing team: Structural Steel, Mechanical, Electrical, Site Utilities, Earthwork, Roofing, Fire Protection, and Loading Dock Equipment scopes. The warehouse is classified under the consumer-packaged goods sector and produces numerous products. This project is divided into multiple phases, but we are tasked to complete the first phase. Phase 1 of the project will include a full Pre-engineered metal building featuring Insulated Metal Panels, 2 overhead loading dock doors, and man doors connecting the existing filler room to the proposed building. The total cost of the project is $7 million. We have finished all earthwork, concrete, Insulated Metal Panels, and roofing. Furthermore, all subcontractors were issued lump sum contracts which included equipment costs, cost of work, and labor costs. Our Cosmos team as a construction consulting firm was responsible to achieve the best results in those areas and develop new technical ideas and strategies for future projects.



Special thanks and appreciation to our Professors at the Department of Mechanical Engineering:
Al Attah, Saman Rashidyan, Cheng Yu, and Zhenhua Huang.

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BEAST Exhaust

Team Members:

- Tyler Witten
- Quadri Olayiwola
- John Hensley
- Christian Thomas

External Sponsors/Mentors:

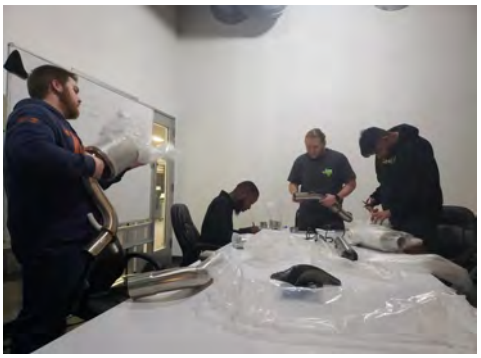
- Terrance Menyweather

Internal Sponsors/Mentors:

- Rick Pierson
- Hassan Qandil
- Onome Disi

Abstract:

The goal of this project is to augment the sound coming from a 4-cylinder engine to the likeness of a lion's roar. We've achieved that via an easy to install glass-pack muffler configuration. The internal technology used to achieve this audible note is a fixed end sound device comprised of two blue spring steel vocal cords with identical geometries to a lion's cords. The thickness/natural frequency of the cord was calculated to match the dominant frequency of our test vehicle at the RPM of the engine at max HP. This creates a roar like reverberation effect within the chamber, and a louder wave at the specific dominant frequency of a lion's roar. In addition, a blue spring steel reed plate with slotted openings reacts to the negative and positive pressure caused by the cords within our sound device chamber.



Beast Exhaust's social cause consist of giving assistance to organizations that help release, heal, rescue, raise, preserve, promote and nurture the well-being of exotic animals such as big cats and wild dogs.

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Forum Energy Technologies
FET – Vibrations Team

Team Members:

- William Caleb Crowe
- Kyle Jaeger
- Ammar Jilani
- Emmanuel Iroulor

External Sponsors/Mentors:

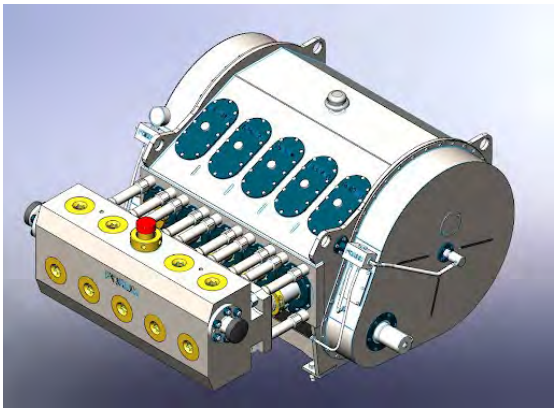
- Forum Energy Technologies
- Garrett Allison
- Saul Dominguez

Internal Sponsors/Mentors:

- Dr. Mark Wasikowski

Abstract:

Our system that we are engineering is made for the sole purpose of vibration analysis and failure prediction. Based on the vibrations the system is detecting from accelerometer sensors, we can run numerical analysis on the amplitude and frequency of these vibrations to determine which parts of the oil pump (power end and fluid end) will need maintenance, replacement and/or show critical failure before signs of wear even begin to arise.



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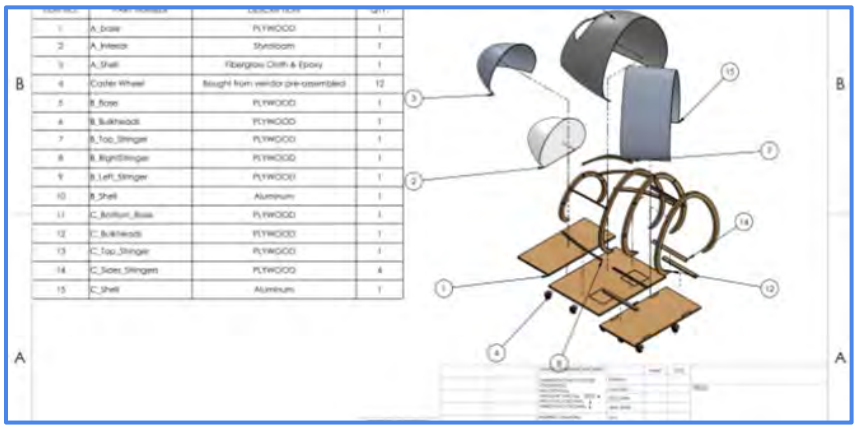
Wright Simulation - Flight Simulator



Team Members:

- Frederique K. Fonka
- Matthew J. Magana
- Maria Avina-Montejano
- Joseph B. Perry

External Sponsors/Mentors:

- Donny Melara - (Helicopter Pilot/Mentor)
- Terry Mauboules - (Plane Pilot/Mentor)

Internal Sponsors/Mentors:

- Mark Wasikowski - (Advisor, Lecturer, Sponsor, Mentor)
- Hassan Qandil - (Lecturer, Mentor)
- Bobby Grimes - (Mentor)
- Robin Shull - (Mentor)
- Omar Cavazos -(Mentor)
- Lee Smith - (Mentor)
- Onome Disi - (Team TA, Mentor)

Abstract:

Our group was tasked with building a flight simulator to mimic the controls and feel of a Boeing 747. We are working on the 4th iteration of the project at UNT. A flight simulator is a scaled-down replica of an airplane that includes the assemblage of equipment and computer software programs necessary to represent the airplane in ground and flight operations. It is a visual system providing an out-of-the-cockpit airplane view while also providing the view and visuals of a helicopter. The flight simulator is designed in compliance with the minimum standards specified by the FAA.

It is designed for maximum reliability and ease of maintenance, and will also offer the highest level of realism and fidelity. These settings allow any person with an interest in practicing their flying skills without the worry of caution, while also allowing them to apply previous settings and knowledge to extract desired data. The goal of this project is to build a realistic environment to simulate flight for academic purposes. The system consists of three sections: the radome, the cockpit, and the storage/third chair. Each section utilizes wood carpentry, bio-composites, and lightweight composites.

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Fried Rice Machine Team

Team Members:

- Luke Borel, Dalton Carlile, Blaise Sherrill, Derrion Thompson

External Sponsors/Mentors:

- Xiaohua Li

Internal Sponsors/Mentors:

- Xiaohua Li

Abstract:

Our sponsor requested that we design a single-task appliance to automate the cooking of fried rice in a commercial/restaurant environment, only requiring the operator to insert the ingredients and set the cook cycle. The design required a combination of convection and conduction heating, along with an automated stirrer and a filter mechanism to collect excess cooking oil. Existing machines currently on the market have some of the features desired but there are none which have every feature.

Rather than fabricate the entire machine from scratch, we selected an existing machine which was closest to the requirements we were given and heavily modified it. The machine we chose has the automated stirrer and conduction heating, but does not have convection heating or an oil filter. Our modifications add convection heating, an oil filter, and a redesign of the stirrer for better mixing.

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Make the Sky Green

Team Members:

Abdulaala Alalqum, Kenan Rodriguez, Marco Sanchez, Robbie Krishnan, Zach Hatfield

External Sponsors/Mentors:

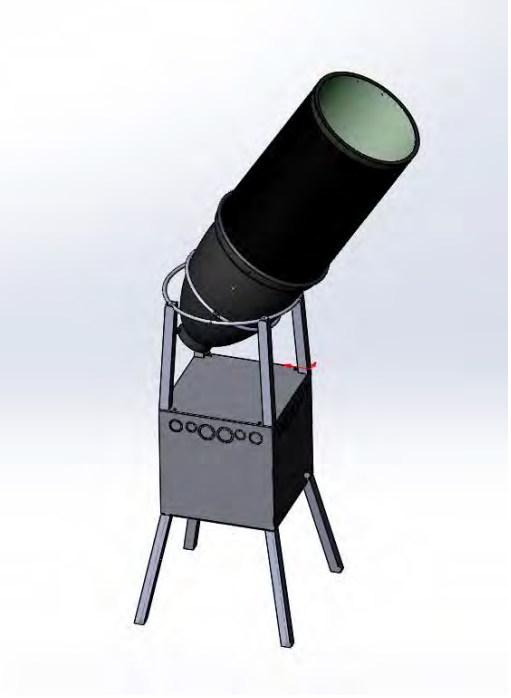
John Alexander

Internal Sponsors/Mentors:

Rick Pierson

Abstract:

As a team, we are designing and building a spotlight battery operated instead of a diesel operated spotlight. Our accomplishment helps the sponsor with the weight of the project, cost, source of energy, and transportation. UNT has rented a diesel operated, heavy weight, and noisy spotlight for campus events for $1500 daily. We designed and built 100,000 lumens spotlight, battery operated, quiet, and portable. The uniqueness of our project is that we provided economical solution by designing a product that costs less and ecological solution that is less harmful to the environment.



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ExoLite

ExoLite

Mechanical Exoskeleton

Team Members:

- Daniel Ramirez
- Lorenzo Gamboa
- Cedric Kenfack Gouanet
- Kojo Agyeman

External Sponsors/Mentors:

- Marcos L. Nevarez, MSgt, USAF

Internal Sponsors/Mentors:

- Dr. Amir Jafari
- Rick Pierson

Abstract:

Many industries strain the bodies of the workers, averaging almost $35,000 in workers compensation paid out per case. We aim to reduce the number of injuries caused and in turn, save people the pain and companies the money.

Our device provides passive lifting assistance for the user's arms, reducing the strain when working overhead or holding weighted items for extended periods. We strived on compacting the design to reduces likelihood of snagging and making it affordable to eventually be viable for private purchase and use.

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HVAC PORTABLE ICE MAKER

FRORE HVAC

Team Members:

- Donald Juarez
- Adam Jasim
- Alex Vargas
- Emmanuel Okhilu
- Omar Hamid

External Sponsors/Mentors:

- Cooper Wood
- Jeff Abbott
- John Houston

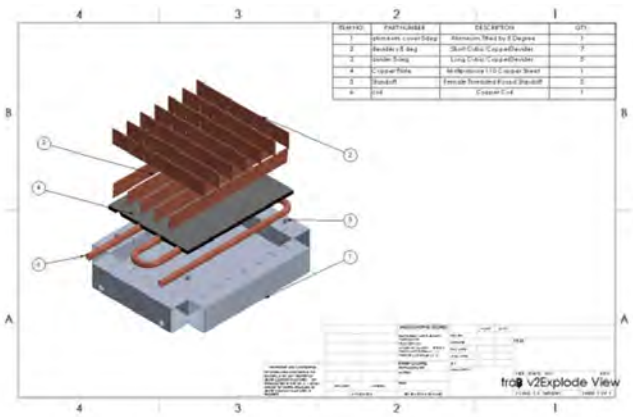
Internal Sponsors/Mentors:

- Dr. Hassan Qandil

Abstract:

Our team was challenged with creating an ice maker to be used indoors and outdoors. We had to redesign the unit from previous semesters and completely change the initial prototype. We installed an insulated frame, restructured the HVAC system and designed the evaporator for the system.

We manufactured the evaporator on our HVAC ice maker. The figure above displays the mold and tray in an exploded view on the left side. The right side displays the tray and components installed and put together in its final form.



Manual operation due to lack of control system support.

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FSAE Paddle Shifters

Team Members:

Reece Ahler
Angel Arvelo
Jorge Celestino
Mikayla Lambert
Cedric Ukabiala

External Sponsors/Mentors:

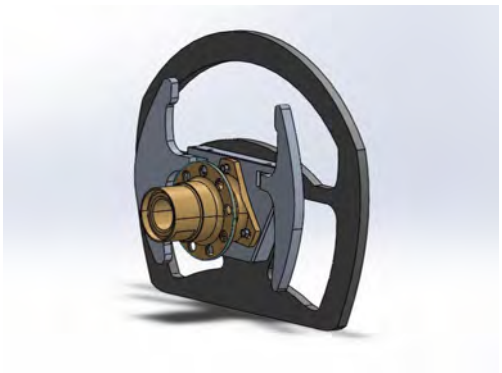
External Sponsors: N/A
External Mentors: N/A

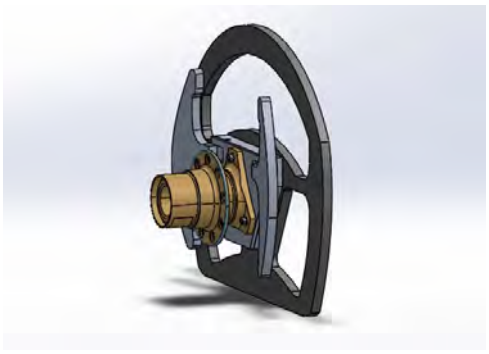
Internal Sponsors/Mentors:

Internal Sponsor: Mechanical and Energy Engineering Department
Mentor: Hector Siller

Abstract:

Mean Green Racing desires to increase their performance in every aspect. In the past, we have shown success in how quick our vehicle is against the competition. We aim to increase the bar of how quick our car can be. Paddle shifters are the next step to having a true racing car and to stand out against the other universities in our engineering knowledge. Paddle shifters will take the place for our hand shifter that is used by the driver. Think of a motorcycle manual shift system and that is what we use for our car. Instead of that, we will be using paddles that real performance cars use (Ex. Ferrari, McLaren, etc.) The driver will shift without having to take his left hand off of the wheel, allowing them to focus more on their driving rather than fumbling for a shift they may have already missed.





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Solar Clamp

Team Solar Clamp

SOLAR SOLUTION

Team Members:

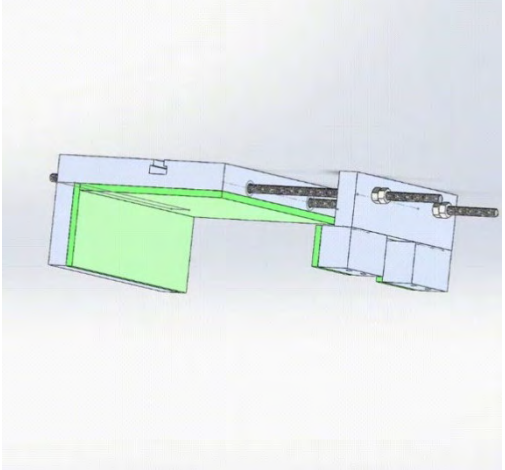
- Emma Ndei
- Alexandra Spinnett
- Jose Vela
- Major Hansen
- Michelle Vargas

External Sponsors/Mentors:

- Solar Solution's

Internal Sponsors/Mentors:

- Richard Pierson
- Dr. Saman Rashidyan



Abstract:

We as a team created a solar clamp for parapet walls in between houses in the Washington DC area. The walls are very old. Drilling into the walls to install solar panels was not reliable. By making an adjustable clamp that can fit on top of the parapet wall we hope that we can take stress off the wall and essentially allowing more customers in the Washington DC area to have an option to use solar energy.

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FlexCure

Team Members:

Jeremy Coates
Christina Vilchez
Adam Munshi
Ethan Courcier

External Sponsors/Mentors:

Adaptive3D

Internal Sponsors/Mentors:

Dr. Yijie "Steven" Jiang
Dr. Hassan Qandil

Abstract:

Traditionally, 3D printed parts are used as prototypes because of their unreliable mechanical properties. Adaptive3D, the leader in elastomeric solutions in the additive manufacturing industry, is looking to shift that paradigm. The company's core technology is a proprietary chemistry that results in market leading elastomeric materials that enable additive manufacturing of flexible parts and products optimized for end use. We have been tasked to build a forced convection, thermal post-curing device for 3D printed lattice structures that applies even heating, reduces cure stresses, and decreases residual odors.

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NASA Student Launch

Team Members:

- Mishal Raza
- Moses Maina
- Kessiah Thompson
- Nicolas Catano
- Cristobal Morfin

External Sponsors/Mentors:

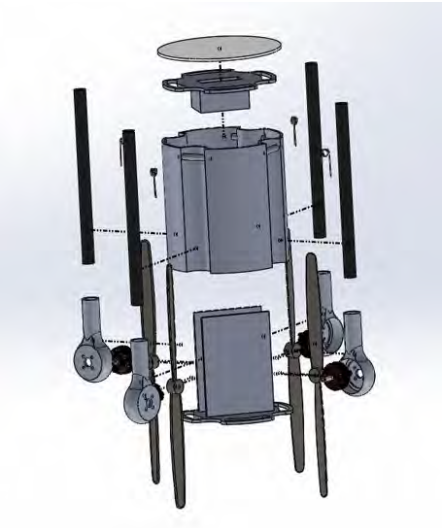
- DFW Boat Specialists

Internal Sponsors/Mentors:

- Mark Wasikowski
- UNT MEEN

Abstract:

The purpose of this project is to design an Unmanned Aerial System (UAS) which is to be utilized as the payload of a rocket competing in the NASA Student Launch Competition. This UAS is designed to be a self-deploying, autonomous, cylindrical quadcopter which is to fly without the use of a Global Positioning System (GPS). Once released, the drone will receive its initial coordinates from the rocket and proceed to follow the falling rocket body using computer vision. The drone's primary mission is to acquire final coordinates of the falling rocket body which is achieved using vector analysis. The final coordinates will be sent to ground control using radio transmission and marked on a pre-gridded image of the landing field. The drone body is fabricated using fiberglass which houses an electronics bay. Attached to the body are four carbon fiber tubes with aluminum motor mounts to hold the motor and propeller assemblies. The arms will pop out from grooves in the body and extend to 90 degrees once jettisoned.



We would like to extend utmost gratitude to UNT MEEN staff members who have offered valuable assistance and guidance to aid in project progress.

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Piezoelectric Occupancy Controller

Team Piezos

Team Members:

- Mathew Brauch
- Eduardo Gutierrez
- John Stavrianopoulos
- Persis Lemma

External Sponsors/Mentors:

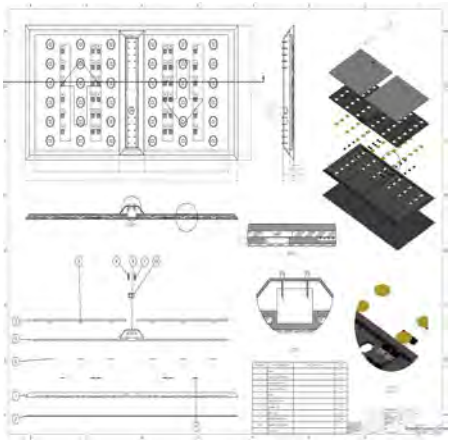
- None

Internal Sponsors/Mentors:

- Dr. Hassan Qandil

Abstract:

This project uses an alternative source of energy to produce electric energy, resulting in clean energy, to meet the power demand of our product. The clean energy source is attained by using a piezoelectric transducer to convert mechanical energy to electrical energy. Piezoelectric transducers can convert mechanical energy from pressure forces and vibrations during activities such as walking and traveling into electrical energy. A device was designed by placing piezoelectric transducers under a floor mat to harvest the energy of a footstep while keeping count of the occupancy of a room. Two mats, one for entering a room and one for exiting a room, communicate to a controller to determine if a person is entering or leaving a room and visually represent maximum occupancy with led lights. The results show that a single piezoelectric transducer can generate 40 volts and 100 microamps when 87.5 lbs are applied. Therefore, this piezoelectric energy harvesting system proves its potential for low power applications while it might not meet the demand of high-power applications.



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D.O.E Solar Decathlon
The Eagles Nest

Team Members:

- Team Leader: Andrew Stewart
- Team Secretary: Tanner Gardner
- Team Member: Ozioma Ozigbo
- Team Member: Noah Ali
- Team Member: Froylan Paredes
- Team Member: Adelyn Johnson
- Team Member: Anne-Mari Ulrich

External Sponsors/Mentors:

- Sal Alhelo Energy EOS
- Fares Sweidan Energy EOS
- Ryan Jensen Gensler
- Sanika Kul Department of Energy

Internal Sponsors/Mentors:

- Weihuan Zhao
- Hassan Qandil
- Bill Hensen

Abstract:

The mission of Eagle's Nest is to reimagine the built environment, keeping sustainability at our forefront and the design of an eagle's nest as our touchstone. Eagle's Nest is a response to the high carbon emissions from residential buildings and the crucial need for on-campus graduate students housing at UNT Discovery Park.

Our project goals include:

Meet the crucial need for on-campus graduate student housing at UNT

Tackle head-on the high carbon footprint of residential buildings by reducing emissions by 50%.

Provide accommodation for UNT graduate students at 20% less than the market average. Immerse students in the cutting-edge renewable energy research at UNT.

Create community among students that encourage innovation, social action, and excitement towards a more sustainable future.

Facilitate relationships between university students and the Denton community through an open and green environment for community gatherings

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Consolar Aqua Pump

Solar Desalination Circulation System

Team Members:

- Austin Gross
- David Chamberlain
- Jonathan Drummond
- Bashar Zuaiter

External Sponsors/Mentors:

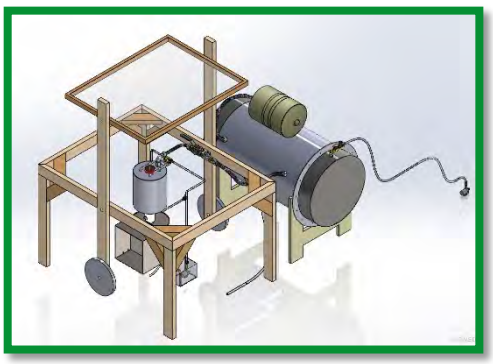
- JD Elkurd (Solar Solutions)

Internal Sponsors/Mentors:

- Dr. Hassan Qandil
- Dr. Weihuan Zhao
- Bridger Planz

Abstract:

In today's age the Earth faces a supply shortage of finite freshwater diminishing exponentially every year as consumer demands increase. Where the Consolar Aqua Pump comes in is it is an element of the Solar Desalination System comprised of a heat exchanger, evaporation chamber, and salt catch collector group projects. The Solar Desalination System is a portable ocean water desalination treatment system that serves to repurpose salt water into clean freshwater completely powered by solar energy. The responsibility of the Consolar Aqua Pump is to direct the flow of salt water and its boiled vapor through tubing and hoses from a source through an evaporation process separating salt and other contaminates providing freshwater. A control circuit, driven by a Raspberry Pi, powers on/off various pumps and actuator valves autonomously by interpreted data collected by flow and temperature sensors throughout the system. Since the system is independent of electricity utilizing solar panels to charge batteries, the project is intended to serve clean water to communities in regions lacking freshwater anywhere there is an abundance of seawater, sunlight and/or insufficient infrastructure globally. This system is easy to setup, operate, and does not require and external power source meaning a net zero energy cost to customers.



Special acknowledgement to Antonio Robledo Garcia and Keon Brown for their volunteer work and contribution in developing the solar tracking and designing the salt catch collect and its steam trap.

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MECHANICAL ENGINEERING TECHNOLOGY

Senior Design Day 2022

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MASTER FLO
The leader in choke technology ™

Anti-Tamper Handwheel

Team Members:

- Eduardo Quintana
- Caleb Stephenson
- Leduar Avelar
- Jowel Malik

External Sponsors/Mentors:

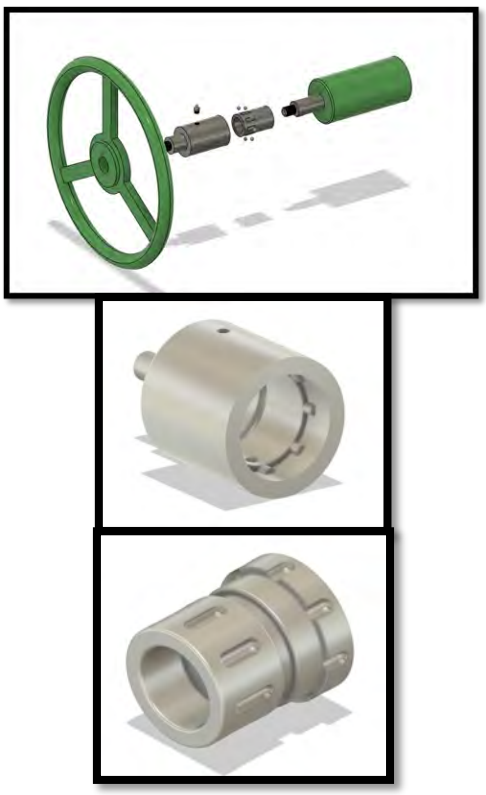
- Jason Wipf
- Bobby Bobeck

Internal Sponsors/Mentors:

- Dr. Seifollah Nasrazadani

Abstract:

Master Flo Inc. was founded in 1979 with a focus on the manufacturing of valves, pipeline, and pipe fittings. The company is constantly adapting to fit the needs of their customers; because of this, our team was appointed to analyze how to improve the protection system of a valve handwheel to prevent the mechanism from any theft or tampering. Handwheels being tampered with have been a major issue in the oil and gas industry for many years and there has been no cost-effective solution to this day. Our team has created a design that is free spinning handwheel when not in use and can be engaged at the user's expense to prevent tampering of any kind. Based on the collection of data that was provided by Master Flo sponsor Mr. Jason Wipf, there has been no cost-effective way of protecting a valves' handwheel from theft or tampering. Our group was set out to create a valve protection system with specific design criteria. The group was asked to create a mechanism that is not expensive, easy to install by engineers and technicians, and doesn't cause any changes to the original design of the handwheel. The final design created will be tested over its safety, functions, stress response, and how easy it is to install or uninstall the handwheel. Our final design was created to be used with numerous different size valves and is meant to be universal. After nine months of designing, planning, and fabricating, our group was able to create a mechanism that can spin freely when not in use and is able to engage with a magnet mechanism when needed. Our group successfully followed the criteria and designed a part that prevented any tampering to the handwheel.



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MASTER FLO™
Excellent Customer Experience | Innovative Flo Solutions

Anti-Cavitation Choke Trim

Team Members:

- Jimmy Weng
- Javier Campos
- Geoffrey Balkcom
- Juan Lira
- David Sanchez

External Sponsors/Mentors:

- Master Flo Valve (USA) Inc.
- Jason Wipf
- Bobby Bobeck

Internal Sponsors/Mentors:

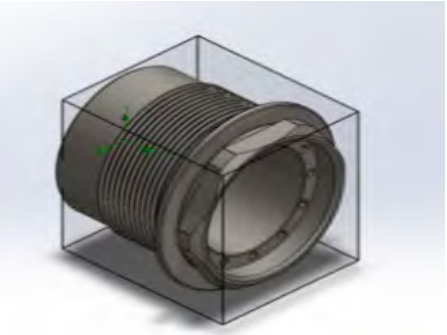
- Dr. Maurizio, Manzo

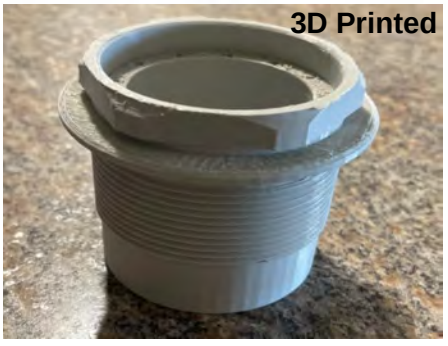
Abstract:

In today's world there are many minor issues that could be solved or reduced with new or improved technology. A common issue that impacts many oil and gas companies is cavitation.

The goal of this project is to reduce the cavitation occurring inside the valve. In our situation, when the fluid is released by the needle and enters and contacts the choke trim, cavitation occurs. The pressure created by collapsing bubbles is the main factor of cavitation and what we want to eliminate.

Our design mitigates pressure inside the valve and has its own direction of flow to reduce cavitation. This design will prolong the life of valves and ultimately save the company time and money.





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Anti-Erosion Choke Trim

Team Members:

- Jesse Slyder
- Adalberto Perez
- Aaron Johnson
- Abdulmohsen Alhammad
- Jarret Theriot

External Sponsors/Mentors:

- Jason Wipf- Master Flo
- Bobby Bobeck- Houston Oilfield Equipment

Internal Sponsors/Mentors:

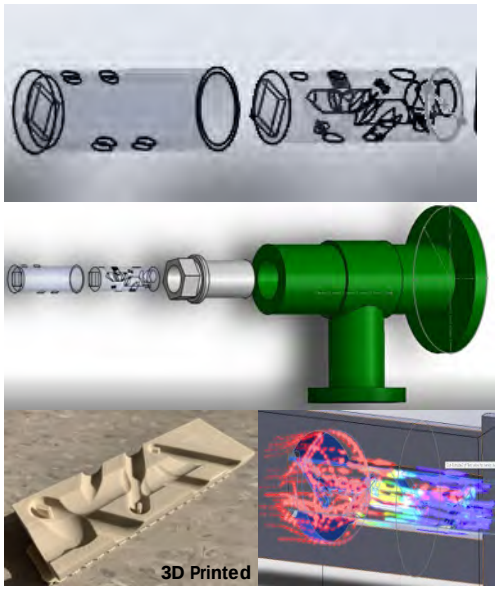
- Leticia Anaya, PhD

Abstract:

Tasked with engineering a choke trim to resist the erosive effects of oil and gas production, the team determined that an unconventional flow path could reduce velocity at the vena-contracta therefore reducing particle impact velocity along the choke trim.

SOLIDWORKS® flow simulation was utilized to model design iterations, resulting in a final design durable enough for usage in the oilfield. The modified valvular conduit, or "Tesla valve," unlike its namesake, has multiple inlet ports not exceeding 60° to reduce erosion. The changing internal flow direction impeded flow from the inlet, causing reduced rates and increased differential pressure across the 4 inch length of the valve insert Team produced.

The Team did not have a control group to compare the design to. The anti-erosion choke trim that comprised the experimental group, was the only sample data that was tested. With this in mind, it is difficult to compare erosion rates of the Team's design to existing designs already in use in the industry.



Special thank you to Omar Cavazos (PhD candidate) and Balmore Giron for their help.

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Low Friction Threading

Team Members:

- Tanner Rubino
- Jacob McAdams
- Justin Crader
- Jacob Sadler
- Guillermo Lara

External Sponsors/Mentors:

- Master Flo Valve Inc.
- Jason Wipf
- Bobby Bobeck

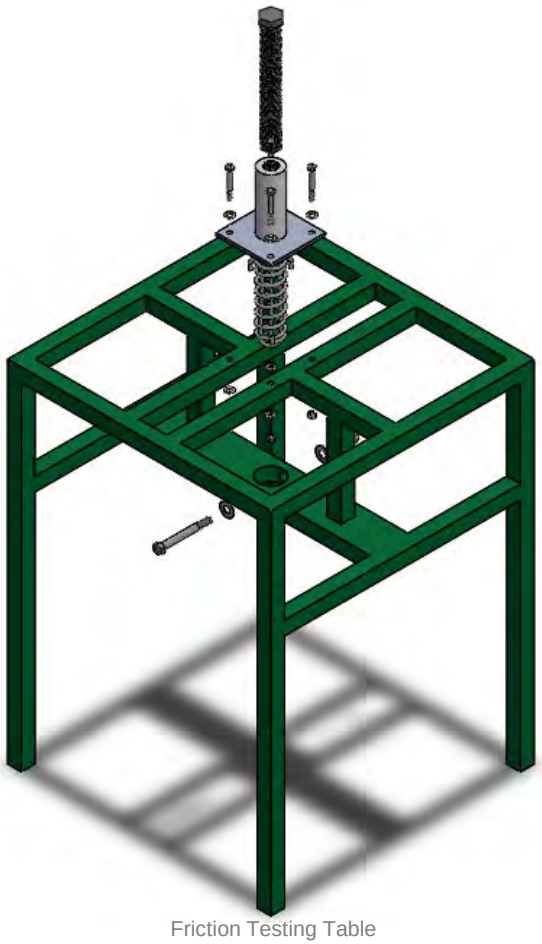
Internal Sponsors/Mentors:

- Dr. Diana Berman

Abstract:

Master Flo Valve Inc. is a global oil and gas flow management company that strives to lower costs and optimize production through reliable products. They specialize in choke valves, control valves, actuation, and automation. Our team has been tasked with finding a way to reduce friction experienced by their valve threads. These valves are under a great amount of pressure, maxing out around 10,000 psi. This pressure is causing the threads on the stem of the valves to experience galling. Galling is a form of cold welding, and when this happens the valve can no longer function until a replacement part is installed. Along with lowering the friction forces we are to produce a solution to prevent galling from occurring.

The solution that has been decided upon is to coat the valve threads with a dry lubricant coating. Graphene, WS_2 (Tungsten disulfide) and MoS_2 (Molybdenum disulfide) are the three coatings being applied. Each of these coatings yield a reduction in friction forces, while also providing a layer of defense between the male and female threads. Since galling is more prone between like metals, the barrier provided by the dry coating will lessen the likelihood of galling taking place. By coating the threads instead of choosing to manufacture new threads out of a different material, we have significantly lowered the cost of implementation.



Friction Testing Table

Special thanks to Jason Sadler, Carlos Hernandez, and Mason-Dallas Inc. for their help and support.

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3-D Printed Molds for Manufacturing of UAV Blades

UAV TECHNOLOGIES
TEAM FIVE

Team Members:

- Sean Evans
- Kevin Garcia
- Gage Jones
- Alex Arellano
- Alonso Rodriguez

External Sponsors/Mentors:

- Army Research Laboratory (ARL)

Internal Sponsors/Mentors:

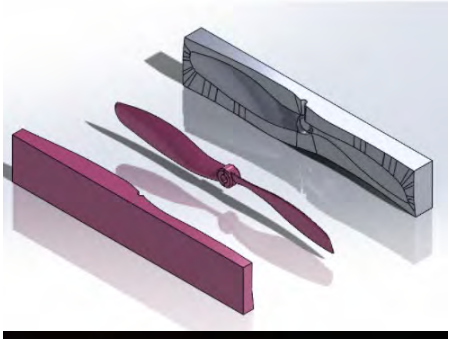
- Dr. Hector Siller
- Cesar Chavez Tolentino (PhD candidate)

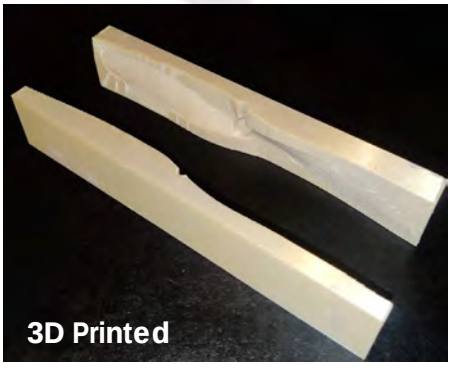
Abstract:

The Army Research Lab (ARL) has tasked us with creating a 3D printed mold in response to a growing demand of drone propellers. The purpose of this project is to create a mold that will be used to make UAV blades in a more cost efficient and timely manner. The UAV blades will be tested using a wind tunnel and aero acoustic chamber. The data from the manufactured UAV blade test will be compared with commercial blades and modified to compete with blades in the market.

The mold has been additively manufactured using a FDM 3D printer. It will be made using a thermoplastic. The blade itself will be made by pouring a mixture of epoxy resin into the mold. The mold is smoothed using PolySmooth to make sure the blade has the right texture.

The goal of this project is to have the blade be able to compete with commercially sold UAV blades in terms of performance and durability. This will allow the Army Research Lab to make their own propellers without having to outsource and is especially needed overseas where materials take time to arrive onsite.





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Laboratory Equipment for Single-Phase Liquid and Two-Phase Immersion Cooling

Team Members:

- Jacob Banda (Team Lead)
- Deisy Yanez
- Seth Angelone
- Conner McEllhiney
- Brian Rodriguez
- Timothy Nga

External Sponsors/Mentors:

- ASHRAE (Sponsor)

Internal Sponsors/Mentors:

- Dr. Bostanci (Advisor)
- Laura Almara (PhD candidate) (Mentor)

Abstract:

With this project we are researching and developing a form of liquid cooling for servers that will operate more efficiently and be more cost effective than that of the standard air-cooled system.

With the single-phase liquid cooling system, the server will have tubes that connect the system's pump, radiator, reservoir, and cold plate together. The cold plate will be a unique design created in house using powdered metal bed fusion in order to maximize heat dispersion from the server's CPU.

With the two-phase immersion cooling system, the server will be completely immersed in a dielectric fluid that will not damage or negatively affect the server. This will take place in a polycarbonate tank sealed with an aluminum lid featuring an attached copper condenser with coolant circulating through it. When the dielectric fluid absorbs heat through boiling and rises as vapor, the condenser will cool the vapor and bring it back to a liquid state ensuring continuation of cooling cycle for the CPU.

UNT TEAM HYDRA

We would like to thank Dr. Siller for his support in the manufacturing process of a custom cold plate design.

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TEES Nuclear Engineering & Science Center
TEXAS A&M ENGINEERING EXPERIMENT STATION
NUCLEAR POWER INSTITUTE

Modular Data Acquisition Training System for Thermal-Fluids Applications

Team Members:

- William Novinski
- Octavio Silva
- Travis Causey
- Tobechi Iheme
- Rodrigo Vivar III

External Sponsors/Mentors:

- Nuclear Power Institute

Internal Sponsors/Mentors:

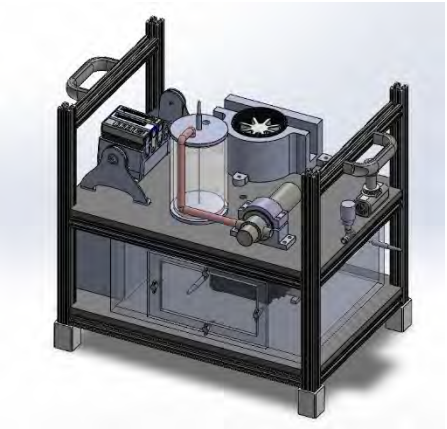
- Dr. Huseyin Bostanci
- Bobby Grimes

Abstract:

The Modular Data Acquisition Training System for Thermal-Fluids application is a lab testing unit that will aid the University of North Texas conduct and facilitate labs for Experimental Thermal Sciences. The project is proposed by Dr. Bostanci and is sponsored by TEES Nuclear Power Institute.

The testing unit is a closed system that pumps heated water through a small radiator that is located inside a controlled air chamber. A fan attached to the radiator forces air through and cools down the heated water and pumps it back to the water tank to be heated. The system encourages students to utilize NI data acquisition modules and LabVIEW software to set up experimental conditions, control heaters, pump, and fan, and collect data via thermocouples, pressure transducers, and flow meters.

The main objective is for this testing unit to aid students understand and practice data acquisition processes through multiple thermal-fluid experiments.



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Cloth Mask Sanitizer

Team Members:

- Naina Thing
- Mohamad Khodr
- Atool Khadka
- Erick Perez
- Judah Thomas

External Sponsors/Mentors:

- Bobby Grimes

Internal Sponsors/Mentors:

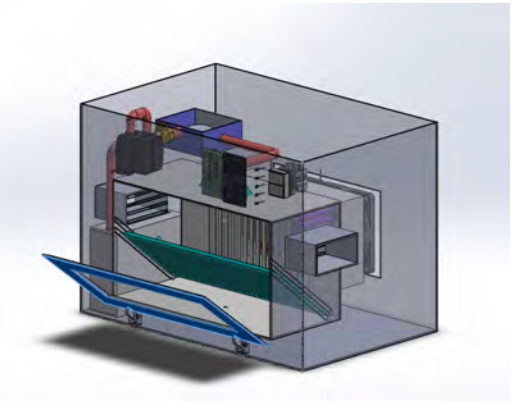
- Dr. Hassan Qandil
- UNT ME Department

Abstract:

The main concept after building this device was the outbreak of Covid-19, when the use of mask uprise. With that there was option of using use-and-throw mask or cloth mask and when masks are used overtime, it can lead to a buildup of dirt and bacteria. This study aims to design and build a device that is time and cost efficient, which kills the active bacteria, and prevent its growth.

To evaluate the necessity of such a device, a brief survey poll was conducted among 37 staff members at Baylor Scott & White in Waxahachie, TX. After the survey, it was determined that the need of this device was not only for Covid-19 cases, but it can also be used for other sanitizing purposes.

The main components of this device are UV-light, steam, and hot air that effectively kills the bacteria ensuring the safety. Based on the components, the device must withstand the temperature changes within it.



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DEVCOM ARMY RESEARCH LABORATORY

UNT Mechanical Engineering Technology
UAV Drive Train

Unmanned Aerial Vehicle (UAV) Drivetrain

Team Members:

- Loren Clary
- Amos Hargrove
- Megan Boudreau
- Trenton Magryta
- Joseph Espinosa

External Sponsors/Mentors:

- Army Research Lab (ARL)

Internal Sponsors/Mentors:

- Dr. Mark Wasikowski
- Bobby Grims

Abstract:

The problem to be solved is when a UAV is flying laterally, roughly half the power is required compared to when the UAV is in a steady state of hovering. The end goal is to find a way to switch between one motor running when moving laterally to two motors running when hovering. This problem is theoretically solved when one motor is turned off midflight so that the other motor is the only one propelling the drive train. The ARL tasked this team with finding the control system to solve this problem of making that switch from two motors to one motor possible. This is a unique solution, because it will increase surveillance flight capabilities for the UAV systems.

The big hurdle in the path to a control system is having a working bench model to utilize while building the program. This involves two motors, a drive shaft, a differential, and a fan to be driven. Previous teams fabricated the fan blades and safety shields while working on getting the components to function properly. Due to a failing of the original motors, new motors had to be purchased and mounted. The image shown is the most recent iteration of the motor mount being fabricated to get the bench fully operational.

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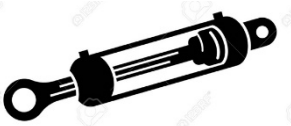


Pneumatically Powered Portable Lifting Device

Team Members:

- Henry Justiniano
- Alberto Ramos
- Mason Mikeska
- Jorge Moreno
- Nathan Shipp

External Sponsors/Mentors:

- Dr. Mitty Plummer

Internal Sponsors/Mentors:

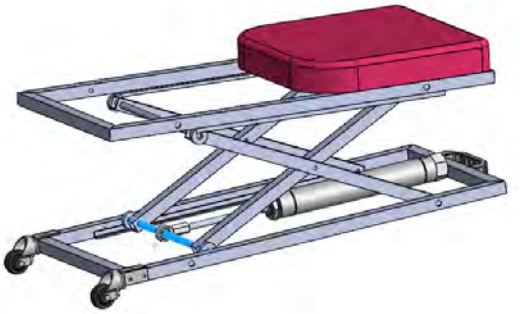
- Dr. Mitty Plummer

Abstract:

The task given to us was to design and manufacture a portable lift using pneumatics as the method to lift 300 lbs vertically 19 inches. This idea started when our sponsor observed an individual struggling while doing garden work around the house and requiring a chair that acts as a lift to assist getting up and down from gardening. Our main goal was to help lift a person, but it will also be able to help lift other items onto higher surfaces.

The requirements for our lift is to be able to lift 300 lbs., lift vertically 19 inches and sit parallel 4 inches to the ground, be 16 inches wide, portable, lightweight, battery powered and operate using pneumatics.

What makes this lift different from the others is that it will use a rechargeable battery, lift with a click of a button, use a pneumatic cylinder to raise the platform, and it will be at an affordable price. Currently, there are many lifts on the market that use hydraulic cylinders and each one is either more than $500 or are operated manually.



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Design Improvements on a Vehicle Extrication Device

Just Action Kareful Extraction (J.A.K.E.) V3

Team Members:

- Ean Robertson
- Nicolas Olivarez
- Heather Clark
- Jett Leach
- Hussain Aun

External Sponsors/Mentors:

- Dr. Todd Dombrowski (CEO of SKII)

Internal Sponsors/Mentors:

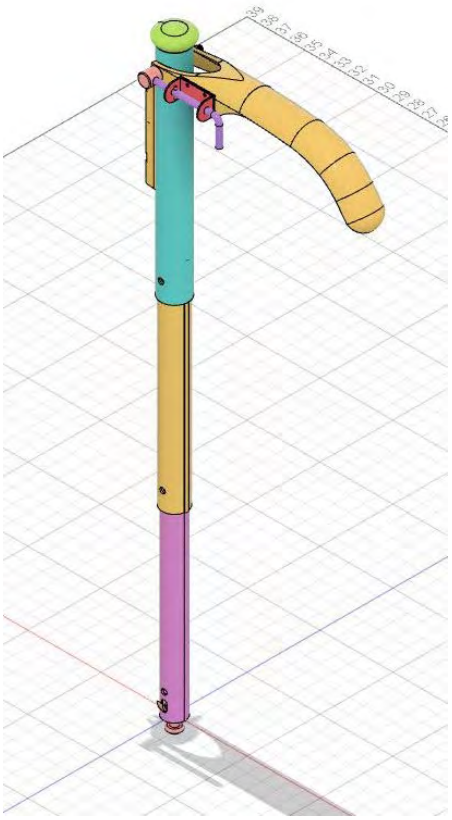
- Dr. Reza Mirshams P.E.

Abstract:

During the month of February in 2021, Texas endured a devastating ice storm. Driving conditions were poor, resulting in a pile-up on I-35 of 130 vehicles. There were around 5 deaths and 36 hospitalizations attributed to this incident. One casualty was not from injuries sustained during impact, but from hypothermia; first responders were not able to retrieve the passenger from the tangled metal in time.

First responders have plenty of tools at their disposal for emergencies such as these but having to switch between them wastes precious time and energy. This proposed multi-functional prototype includes the use of most of these traditional tools, along with added benefits such as a hook for pulling passengers from spaces where arms cannot reach.

The goal is to reduce victim extraction time with a durable, multi-use tool that is still light weight and easily stored in an emergency vehicle.



Acknowledgments:
Dan Cahale for his assistance building prototype V1 & V2
Motus Labs, L.L.C. for access to their CAD/CAM equipment

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///MOTOHIKER///

Motorcycle Carrier

Team Members:

- Michael Gonzales
- Hector Portillo
- Andrew Littlepage
- Deven Patel
- Pearce Polcyn

External Sponsors/Mentors:

- Motohiker

Internal Sponsors/Mentors:

- Dr. Leticia Anaya

Abstract:

The fabrication of a motorcycle carrier that can more safely transport a motorcycle was our main goal. The motorcycle carrier previously had issues with wigging components, torsion during heavy decelerations and high stress concentrators. This new design will be more rigid and will also allow the user to easily mount the motorcycle by an extended ramp with tilt motion that will tilt the carrier towards the loading side. Once the motorcycle is being rolled up the ramp, the carrier will tilt back. The tilt motion is a unique and effective feature that will help the user apply less body force to safely mount the motorcycle. The idea is to use gravity and center of mass to tilt the ramp. When the bike is fully onto the carrier, the new center of gravity rotates the ramp into position. The carrier then is securely pinned into place. The carrier also utilizes secure tie down locations and follows all street legalities. This is a heavy-duty carrier for all adult size motorcycles; as well as a safe and secured travel for the towing vehicle. This product is unique in its design. Most carriers have a ramp to roll up but for our product the whole carrier tilts over for an easier loading option including a ramp extension.

For the guidance and abilities offered, we would like to thank:
Dr. Huseyin Bostanci, Laura Almara (PhD candidate), Rick Pearson, and Bobby Grimes.

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