GRAND CANYON UNIVERSITY

ENGINEERING

GCU College of Science, Engineering and Technology

ENGINEERING CAPSTONE SHOWCASE

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GCU

STRATEGIC EMPLOYER INITIATIVES & INTERNSHIPS

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1. ACCEL: Assistive Technologies

Summer Barrymore, Adam Morley and Ryan Reed, Biomedical Engineering | Adriana Sweeney, Electrical Engineering | Professor David Kwartowitz

The main objective of the Assistive Technologies project is to develop a method for a disabled person to interact with and operate various electrical devices such as a kitchen mixer or other small appliances. The technology includes a control device, an interchangeable interface, instructions for connecting the device to an existing piece of equipment and a novel sensory device, controlled using the interface. The assistive device has a straightforward user interface consisting of buttons, dials, sliders or other mechanical controls. It is versatile and can be moved between pieces of equipment to control starting, stopping and speed change. The interface design can be connected to a sensory device that includes lights, sounds or other sensory stimulation, which is controllable by the user or teacher as needed.

2. Ankle Brace

Ryan Denhart, Noah Fox, Thaddaeus Kunce and Stevie Morales, Biomedical Engineering | Professor Emmy Tomforde

The Ankle Brace project focused on an innovative, more efficient ankle brace that allows the brace to be electronically tailored to an athlete's needs. An ankle twist, sprain or tweak are the most common and limiting injuries in sports today. This Automatic Ankle Brace allows for a much more personalized fit for a preventative or rehabilitating ankle. Compared to ankle tape and regular ankle braces, it trumps the competition due to its durability, personalization and effectiveness. The Automatic Ankle Brace provides an increased approval and efficiency rating compared to similar types of ankle management, helping to keep an athlete safely in the game.

3. Assistive Utensils

Kiana De Jesus and Olivia Zamora, Biomedical Engineering | Samantha Siqueiros, Engineering Breanna Van Metter, Mechanical Engineering | Professor Mike De Gregorio

Eating a meal is a menial and routine activity each of us participates in every day. However, this is not an independent task for some suffering from neurodegenerative diseases like Parkinson's disease. Tremor utensils are uniquely designed with an electronically stabilizing handle for people who experience hand tremors, often as a symptom of Parkinson's disease. They provide a more effortless eating experience and make independent eating possible. This Assistive Utensils project optimizes the current tremor utensil designs, including battery life, replaceable attachments, versatility and ease of use.

4. Automated Indoor Greenhouse

Glen Nolan, Mechanical Engineering Technology | Blake Wells and Isaac Wells, Electrical Engineering Technology | Professor Dina Higgins

The Automated Indoor Greenhouse is a wood and glass structure incorporating an ebb and flow hydroponic system to provide nutrients to the plants. The greenhouse uses a grow tray that holds varying pot sizes with growing space large enough to accommodate vine vegetables, leafy vegetables, herbs and small fruit bushes. The programmable, automated system controls lighting, water, temperature and a nutrient solution.

5. Automatic Cell Feeder

Mitchell Hardacre and Nicolas Sbragia, Mechanical Engineering | Deisy Valencia and Hana Yazbek, Biomedical Engineering | Professor Cassandra Wright

Cells are living materials that can be combined to make tissues. In some biomedical research, cells are from some form of living donor and are then grown in vitro into novel tissues to help better understand tissue growth factors. When growing cells in vitro, it is essential that the cells receive the nutrients to keep them alive and promote reproduction. This nutrition can be provided to the cells via the media in which the cells are

being held. Traditionally, the cells are fed every 24-48 hours, depending on the specifics of the cells and the experiments being carried out. Typically, the mix provided to the cells contains a media such as Minimum Essential Medium (MEM), some form of serum such as Fetal Bovine Serum (FBS) and possibly some other add-ins such as antibiotics buffers, etc. This mix must be provided to the cells at a set temperature and must be sterile. If media is going to be cycled through the system, the pH must be monitored to determine when a total replacement is needed. This project aims to develop a system that delivers nutrients to cells growing in vitro. The system creates a media which can mix MEM, FBS and a third liquid in correct proportions to provide an appropriate media and heats or cools to the users' specifications. The system maintains the sterility of the solution and is easy to clean using standard disinfectants. All parts that contact the media are inert and replaceable.

6. Auto-Tensioning Child Safety Seat (Front-Facing)

Daniel Armas and Nathanial Wright, Mechanical Engineering | Katina McLaughlin and Matthew Tomovich, Biomedical Engineering | Professor Jennifer Peterson

Automobile child safety seats (car seats) are mandated for use and regulated by each state accordingly. However, while designed with safety as the primary concern, these seats are usually bulky and can be challenging to secure. These seats are either forward-facing or rear-facing based on the height and weight of the child. Ensuring that the connections are tightened correctly is paramount in the operation of this device. Further, many children sustain injury and death from being left in a hot car during the summer months. The Thunder Seat is a child's car seat that automatically tensions the connection to the vehicle. The seat itself automatically tensions and releases the child's harness. Additionally, a weight and temperature sensor are integrated into the design to ensure the child is not too hot or left behind. All these functions are controlled and monitored by an application on a smartphone. Finally, a mechanical safety release is implemented if power is lost.

7. Auto-Tensioning Child Safety Seat (Rear-Facing)

Alonso Carazo, Engineering with an Emphasis in Robotics | Job Potts and David Ybarra, Mechanical Engineering | Judit Vargas, Biomedical Engineering | Professor Craig Price

Automobile child safety seats (car seats) are mandated for use and regulated by each state accordingly. However, while designed with safety as the primary concern, these seats are usually bulky and can be challenging to secure. These seats are either forward-facing or rear-facing based on the height and weight of the child. Ensuring that the connections are tightened correctly is paramount in the operation of this device. Further, many children sustain injury and death from being left in a hot car during the summer months. The Thunder Seat is a child's car seat that automatically tensions the connection to the vehicle. Further, the seat itself automatically tensions and releases the child's harness. Additionally, a weight and temperature sensor are integrated into the design to ensure the child is not too hot or left behind. All these functions are controlled and monitored by an application on a smartphone. Finally, a mechanical safety release is implemented if power is lost.

8. AwareHouse

Nik Ash, Ed John Fernandes, Connor Hansen and Steve Irving, Mechanical Engineering Technology | Professor Dina Higgins

AwareHouse is an after-market forklift sensor system designed to improve the safety and practicality of driving a forklift in a warehouse environment. The added sensors alert the driver to collision hazards and running data on fork height and tilt conditions.

9. Axon Enterprise: Biological Simulant Target

Cole Ford, Kayleigh Hreha, Elise Peck and Jessica Stewart, Biomedical Engineering | Charles Miskines, Mechanical Engineering | Professor Kevin Williams

When Axon Enterprise, Inc. develops a new Conducted Energy Weapon (CEW), or TASER, it is subjected to extensive medical, efficacy and environmental testing. This proofing is done by an arduous and expensive engineering testing process whereby thousands of TASER darts are fired at a target. Thus, the targets must withstand the rigors of the testing regimen. The issue with this practice is that the targets were designed with durability in mind and did not necessarily represent the humanoid target. The objective of the Biological Simulant Target project is to research materials to better simulate the human form as a target; that proves as durable and cost-effective as the current standard practice today.

10. Benchmark Electronics: Warehouse Based Modifiable Robotics Chassis

Jacob Crittenden and Caleb Rye, Electrical Engineering | Tyler Luzar and Trang Pham, Mechanical Engineering | Professor Jeff LaBelle

The Warehouse Based Modifiable Robotics Chassis project focuses on creating a modifiable robotics chassis designed for traversing warehouse environments and carrying a specified load. Specifically, the robot platform has a fixed design base with an adjustable upper module that allows easy interchanging of components for different application areas such as automation and transportation of materials.

11. Bionic Hand

Daniel Angulo, Mechanical Engineering | Jonathan Rosas-Sanchez and Alyson Schwartz, Biomedical Engineering | Alyson Schwartz, Biomedical Engineering | Philip Varkey, Electrical Engineering | Professor Kyle Jones

The goal of the Bionic Hand project is to design and model a bionic prosthetic hand that acts as a sustainable base for additional project phases, and that replicates the basic muscle movement used to open and close a biological hand. This replicated movement allows an amputee to regain the ability to perform simple daily tasks with a functioning prosthetic limb. The bionic hand receives its input from a generated function or is controlled by an external controlling mechanism and is designed to provide a slim profile that optimizes the weight and comfort of a human hand.

12. Child Seat Load Indicator

Hugo Fischer, Jessica Padilla and Landon Rast, Mechanical Engineering | Taylor Latinis, Electrical Engineering | Professor Craig Price

Parents are instructed to replace an automotive booster seat/child seat/infant carrier if it has ever been involved in a collision. The amount of load regarding “involved” is not defined. This can be costly if a child seat is replaced when it does not need to be, or the replacement would not be covered as part of an insurance claim. The Child Seat Load Indicator project develops a method to create an indicator on the child seat such that it would show if it has been in a collision at a level where it should be replaced.

13. Decoy Control

Project Team 1

Juan Carlos Estrella, Jacob Hatfield and Carly Schwulst, Mechanical Engineering | Jacqueline Jacobson, Engineering with an Emphasis in Robotics | Armando Yanez, Electrical Engineering | Professor Luciano Albuquerque

Project Team 2
Jaylen Douglas, Ben Musser and Will Savannah, Mechanical Engineering | David Wieck, Electrical Engineering | Professor Greg Bullock

The Decoy Control product is designed to assist waterfowl hunters with obtaining more shooting opportunities by maintaining constant realistic movement within a decoy spread. Hunters will be able to spend less time focusing on keeping the motion in their spread and more time with their eyes in the sky. With this product, up to three separate decoy spreads can be electronically managed through the push of a remote, all while maintaining the perfect landing zone, so the ducks know right where to go. This hands-free design provides the convenience of keeping hunters' hands out of the water and reduces the amount of motion required for hunters in the blind. There are numerous products on the market that target realistic duck behaviors. However, nothing on the market is designed to maintain realistic motion in all floating decoys at the push of a button.

14. Design Tu Consulting: Apiary Field Workstation

Roberto Casas, Daniel Conrad, Christian Janke and William Moore, Mechanical Engineering | Professor Emmy Tomforde

The objective of the Apiary Field Workstation project is to design an outdoors mobile beehive inspection work cart. The product includes customer requirements for overall size, stabilization, storage, durability, electronic recording equipment, brood box isolation screens and integration of a motorized lift with a manual articulated lifting arm with dynamically adjustable clamps.

15. Direct Controlled Engine

Ezekiel Kormos, Engineering | Gabriel McGlothan, Mechanical Engineering | Professor Greg Bullock

Engine performance and efficiency are negatively impacted by utilizing some of the energy of the engine's output shaft (crankshaft) to drive critical components of the engine. One of the requirements for an engine to properly function is the timing of the opening and closing of the intake and exhaust valves. Today's engines rely on one or more camshafts to control these valves, which cause parasitic power loss due to friction in the gear train driving the camshaft and at the interface between the cam lobes and valves. A proposed method to reduce or eliminate the parasitic power loss is to replace the function of the camshaft with an alternative method for opening and closing the valves that do not require the engine's crankshaft to drive. The Direct Controlled Engine project aims to develop, fabricate and test directly controlled engine valves as a proof of concept (such as by a solenoid or compressed air, etc.) on a one-cylinder off-highway vehicle engine. The project requires a method to open/close the valves controlled by an electronic signal; retrofit these valves on an existing engine, develop an engine controller to control the valves and ignition using several sensors, program the engine controller and test the performance of the engine.

16. Elbow Brace

Daniel Kuhner and Lindsey Riley, Biomedical Engineering | Josiah White, Mechanical Engineering | Professor Mike De Gregorio and Professor Kyle Staggs

The Elbow Brace is meant to make a more efficient, effective, durable and customizable elbow brace capable of quickly treating a wide variety of elbow injuries. This product covers these aspects by having a two-part system: a compression sleeve and a hinged brace. The compression sleeve has a strong compressive force through its neoprene composition and is light and sleek for everyday use. It is comfortable, washable and durable. The compression sleeve is compatible and easy to use with the hinged elbow brace. The hinged brace is light, comfortable and durable for everyday use. It can be used on its own or with the compression sleeve. The hinged elbow brace consists of a locking mechanism that allows the user to lock the elbow into place at a specific angle. Both devices are intended to be compatible with both arms by simply changing the orientation of the brace.

17. Endotracheal Tube (ET) Holder

Jazmine Gomez, Karen Melissa Martinez, Jesse Nava and Itzel Vallejo, Biomedical Engineering | Professor Kyle Jones

Ventilators are essential for hospital patients undergoing sickness, injury or sedation for an operation. Their primary purpose is to provide oxygen-rich air into the lungs to assist with breathing. Although this medical equipment is very beneficial in maintaining the patient's health, it can also cause common complications such as ventilator-associated pneumonia, also known as VAP. This condition occurs when bacteria enter the body through the airway and infect the alveoli in the lungs. One of the reasons why someone might contract VAP lies within the design of most Endotracheal Tube (ET) holders. The ET Tube Holder project aims to modify ventilators to limit the risk of getting VAP while in treatment by designing an ET Tube Holder attachment that improves the use of ventilators and reduces the risk of getting VAP. An additional project objective is to manufacture an ET Tube Holder attachment and bring it to market to be distributed in hospital settings.

18. GCU Biomedical Device Development Labs: Compression Based Robotic Chassis Designs

Kenton Born, Seth Cacanindin and Jared White, Mechanical Engineering | Brandon Hanes, Biomedical Engineering | Professor Jeff LaBelle

The Compression Based Robotic Chassis Designs project focuses on a novel structural design for a robotic chassis that implements interlacing compression fit pieces to achieve high compressive and torsional strength while maintaining low weight and low cost. The specific project includes applying this idea to a robot chassis where weight optimization and load capacity are essential. Additionally, the robot chassis design allows open space within the frame, which allows for easy concealment of electronics and protection for delicate components.

19. GCU Biomedical Device Development Labs: Electrochemical Pressure Sensors

Christine Dubas, Esmeralda Gomez and Naomi Sharpnack, Biomedical Engineering | Ashley Fuller, Mechanical Engineering | Joe Lopez, Electrical Engineering | Professor Jeff LaBelle

The goal of the Electrochemical Pressure Sensors project is to create a novel pressure sensor using electrochemistry to detect changes in resistance. By integrating multiple sensors into a grid, the exact location in which pressure is applied to an object's surface can be measured. Electrochemical measurements of pressure not only allow for direction pressure to be measured but also shear force and torsion. By using electrochemistry, the grid can be scaled from a small and precise sensor pad to spanning an entire parking lot. The reproducibility, ability to isolate exact locations and little to no degradation over time are a few advantages that electrochemistry offers over current pressure sensing techniques while still being low cost.

20. GCU Biomedical Device Development Labs: High Accuracy Fluid Printer

Noah Alvarez and Grace San Giacomo, Biomedical Engineering | Gabriel Martinez, Engineering with an Emphasis in Robotics | Thomas Rulon, Mechanical Engineering | Professor Jeff LaBelle

The High Accuracy Fluid Printer project objective is to design a high accuracy fluid printer with a fluid dispensing apparatus that dispenses precise amounts of fluid on large batches of substrates. This helps to remove potential human error and creates more repeatability between samples, reducing variance between fluid dispersion. This machine helps create a controlled environment for increased reproducibility of substrate treatments.

21. GCU Biomedical Device Development Labs: Press-to-Fit Modular Crane Assembly Platform

Manuel Espinoza, Hector Palazuelos and Marcos Mull, Mechanical Engineering | Josue Danny Orozco, Electrical Engineering | Professor Jeff LaBelle

The goal of the Press-to-fit Modular Crane Assembly Platform project is to create a novel way of designing the load-bearing structure of industrial cranes using a press-to-fit design. Integrating a press-to-fit design into a cranes structure creates a faster assembly process while also reducing overall crane weight and cost without sacrificing strength. Specifically, the boom arm itself can be replaced with the press-to-fit system to provide a more efficient alternative solution regarding transportation, assembly and cost.

22. Human Hand Mimicry Device

Brandon Atkins, Nathan McDaniel, Zachary Steinwachs and Logan Stype, Mechanical Engineering Technology | Professor Dina Higgins

The Human Hand Mimicry Device is a control system designed to manipulate a robotic arm by using an instrumented human arm. The device utilizes the Ultraleap Leap Motion Controller with sensors to capture human arm movement, including the fingers, wrist and elbow. The information captured from the human arm, in turn, controls the robotic arm. The applications for this technology can include tasks such as training doctors and bomb defusal.

23. Low-Cost Reusable Bioreactor

Cameron Bean and Dawson Shamp, Mechanical Engineering | Mario Ibarra and Nathanial Tanaka, Biomedical Engineering | Professor Kyle Staggs

Bioreactors are ubiquitous in research, manufacturing of pharmaceuticals, next-generation biofuels development and even anti-bioterrorism efforts. These bioreactors are often a very high precision stainless steel and glass apparatus with specialized control systems, which are costly to purchase and maintain. A new trend in bioreactors is long overdue, namely the low-cost reusable bioreactor. There is a new market quickly filling with low-cost, single-use bioreactors. This project design uses replaceable bioreactor liners to combine all the benefits of lessons learned from the bioreactor industry with the least drawbacks and nearly instantaneous cleanup.

24. Mechanical Dynamic Tester

Project Team 1

Nathan Kidd, Electrical Engineering | Andrew Lopez, John Strain III and Tyler Townley, Mechanical Engineering | Professor Eugene Kong

Project Team 2

Toluwanimi Adamo, Wilson Tran and Sam White, Mechanical Engineering | Jose Torres Gonzalez, Electrical Engineering | Professor Li Tan

Whether mechanical, electrical, thermal or fluidic, all systems undergo energy dissipation in one form or another. In a mechanical system, this energy dissipation is often referred to as damping. However, the damping coefficient can be hard to ascertain without specific equipment. Further, damping is a significant parameter for ensuring that system requirements are met in both the time and frequency domains. The Mechanical Dynamic Tester, Lopenator, is a designed and developed dynamic mechanical tester. The primary function is to provide an impulsive force of known strength to a test object and measure its deformation as a function of time. The system is used to determine the damping coefficient of RC car shocks, golf balls and shims of aluminum. Results were obtained and processed in real-time using MATLAB.

25. Personal Carrying Assistant (PCA)

Adrian Calderon, Miguel Gonzales, Alexis Lopez and Leo Zavala, Mechanical Engineering Technology | Professor Dina Higgins

The PCA is a user-controlled personal carrying assistant. The product is a flat surface on wheels that is capable of controlled transport of consumer goods. The PCA is designed with Mecanum-Wheels to allow for omnidirectional travel. The user can transport items on the PCA, easily maneuvering around household obstacles. All of the PCA's motions are controlled by a wireless Bluetooth remote control with proximity sensors, to prevent the user from driving the product directly into obstacles.

26. Red Mountain Arsenal: Automated Inspection System Cartridge Conveyance

Zachary Heater and Florin Melen, Electrical Engineering | Roxanna Mendoza and Felipe Rocha, Mechanical Engineering | Professor Kevin Williams

A key differentiator for a high-volume, low-margin manufacturer is product quality control. In the manufacture of rifle cartridges, inspection of visual attributes to identify blemishes, assembly errors or component damage is the primary quality control after production. The Automated Inspection System Cartridge Conveyance project's key objective is to design an automated inspection station capable of passing every cartridge exiting a projection line individually past an optical scanner programmed and calibrated to detect blemishes, dents, scratches, misalignments or missing components. The proposed project develops and demonstrates the conveyance system, per the customer's requirements, delivering a cartridge from a conveyor belt exiting a cartridge production line to an imaging area while manipulating the orientation of the cartridge to allow complete inspection.

27. Rocky Canyon Audio Amplifier

Project Team 1

Joshua Adame and Alberto Jimenez, Mechanical Engineering | Justus Kastel, Electrical Engineering | Professor Don Ellis

Project Team 2

Ulises Mirazo, Alec Mooneyham and Joshua Primrose, Electrical Engineering | Professor Luciano Albuquerque

Today, many audio devices are digital. However, many artists of all genres prefer a more unique and smooth sound unique to tube amplifiers. The Rocky Canyon Audio Amplifier simplifies the tube amplifier design, passing the savings to the consumer, allowing more artists to explore the sound of tube amplifiers without breaking the bank. The amplifier simplifies the circuit, reducing the cost to build while maintaining superior sound quality. The amp allows aspiring musicians to attain a tone akin to name-brand amps.

28. Shamrock Foods Company: Case Conveyance Automation

Ian Cleveland, Nathan Sieben, Avery Weishaar and Isaiah Young, Mechanical Engineering | Professor Jennifer Peterson

On a Shamrock Food bottle filling line, cases tend to jam on their way to be palletized due to an inability to adjust conveyor width throughout the case conveyor sections. This causes significant downtime as the case conveyor traverses throughout the plant and is difficult to monitor. Without replacing the entire conveyor line, the Case Conveyance Automation solution approach incorporated a design to create a modular, robust, chainable and automatic case conveyor rail system. This system can adjust rapidly and automatically to different widths based on the size of the case inputted. This system is attachable to existing case conveyors and powered, connected and controlled by an existing electrical conveyor cabinet. The output from a Programmable Logic Controller (PLC) adjusts the position of the rail and the width of the conveyor to allow specific size product cases to be transferred from one location to another.

29. Shamrock Foods Company: Quality Vision Reject System

Kyle Kaufman, Engineering with an Emphasis in Robotics | Vanessa Castillo Ramirez, Electrical Engineering | Jake Thornton and Hannah Van Leeuwen, Mechanical Engineering | Professor David Kwartowitz

At Shamrock Foods Company, specific rejection systems are designed to catch containers with quality defects as they move through the filling equipment. However, there are challenges with identifying and removing quality defective products after the filling sections, including expiration coding, bottle labeling and bottle sleeving. The proposed Quality Vision Reject System solution approach utilizes an automated vision system to detect specific, predetermined quality defects and design and implement a modular rejection system that can be attached to different conveyor frames. This system is washdown rated and mobile enough to be used in different environments with relative ease. The rejection system removes defective products from the conveyor line and holds the product until an operator can correct the issue and run it back through the line.

30. Solar Collector

Juan Colato, Engineering | Zack Doyle, Electrical Engineering | Brayan Martinez, Mechanical Engineering | Jose Sanchez, Engineering with an Emphasis in Robotics | Professor Amr Metwally

Clean energy technologies are extremely prominent in today's culture. A leader in the clean energy game is the solar panel. This Solar Collector project uses existing solar panel technology and changes the shape to increase efficiency. Current solar panels are flat rectangular solar cells with an average efficiency of about 17%. They only take advantage of the first strike of the sun's rays, with the rest bouncing back into the atmosphere. By incorporating an ultra-reflective, cone shape solar panel, the sunrays bounce multiple times in the walls of the panel. This design increases the efficiency while remaining at the same price point as conventional solar panels on the market.

31. Solar Panel Tracking System

Christian Bonilla and Alex Caceres, Electrical Engineering | Gerardo Ortega Sanchez, Mechanical Engineering | Anthony Chevez Solano, Engineering | Professor Michael Awaah

This Solar Panel Tracking System uses sensors to track the sun's position, adjusting the position of the solar panels to optimize power output. What makes this product design state-of-the-art is a bi-directional control sensor that allows automatic full movement of the solar panels. Existing products move in the sun's direction but are only one-directional. There are also directional systems that need to be manually moved by the user. This system is autonomous such that the embedded sensor senses the direction of the sun, moving the panel in varied directions automatically. The solar tracking system allows the users to harvest more energy from the sun reducing the dependency on electrical companies and saving the user money on electricity.

32. STEM Robot

Alyssa Belpedio, Electrical Engineering | Luke Holste and Jacob Sanders, Mechanical Engineering Aidan Mackey, Engineering with an Emphasis in Robotics | Professor ByungCheol (Bruce) Lee

There are currently various robotic do-it-yourself kits on the market for both the STEM education market and the RC hobby enthusiast. The objective of STEM Robot is a module-based, remote-controlled RC car with diverse coding functionality and accessories for augment-ability. The proposed project integrates current existing mechatronic components into a sleek finished product. With little competition in the STEM education market, many products are overpriced for their worth. A key objective of this project is a lower price point, therefore, being a disrupter for the market.

33. Water Drone

Andrew Berthold, Electrical Engineering | Joseph Biehl, Mechanical Engineering | Professor Emmy Tomforde

Clean drinking water is an essential part of life, and as such, it is a vital aspect of survival. Having a clean water supply involves testing the water for different contaminants, including but not limited to e. coli, dissolved solids, pH, dissolved oxygen, temperature and other biological pathogens. To be tested, the samples must be collected upstream from any man-made structure. Sometimes this can prove challenging between different terrains and limited accessibility by humans. This Water Drone system aims to utilize a commercially available drone for sample acquisition of water sources. Using a drone enables sample collection in areas that would otherwise be impossible. It also can aid in the data collection process by automatically recording curtain measurements to save time. This project has broad commercial interests between agricultural and aquatics agencies but also has interest from different government sources as a method for collecting data.