TIGER SHARK TECHNOLOGIES



METTER GA, USA
Metter High School

PRESENTED BY
Piper Dustin-12th
Emily Ortiz-Luna-12th
Jake O'Conner-12th
Angel Galvan-12th
Kelly Monjaraz-12th
Jay Ulmer-12th
Berkley Eubanks-12th
Jase Vining-12th
Brooks Brosh-12th
Kabreyah Clark-12th
Jose Santos-12th
Emery Wiebe-11th
John Pasaye-11th
Kyleigh Souls-10th
Lily O'Conner-10th

MENTORS
Allen Lanier
Dr. Karen Chassereau

AGENDA

Abstract	1
Company Profile	2
Teamwork & Planning	3
Engineering Design Rationale	4-9
Critical Analysis	10
ROV - SID	11
Non - ROV SID and Pneumatics	12
Safety	13
Job Safety and Environmental Analysis	14-16
Budget	17
Conclusion	18
References	19
Reflections	20
Acknowledgements	21

ABSTRACT

For the 2026 competition, Tiger Shark Technologies designed and constructed their newest remotely operated vehicle to compete at the MATE ROV competition. The ROV has been designed with the idea to take on mission tasks that demonstrate the power of offshore wind turbines in powering offshore oil rigs, deploying instrumentation and monitoring the health of cold-water habitats, and operating equipment under the ice.

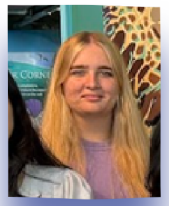






COMPANY PROFILE

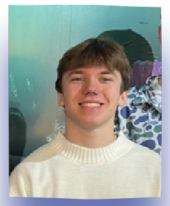
This year the team is made up of returning members and eight new members. Our newest members are willing to help and learn whenever they can. The returning members are determined, highly motivated, and hopeful in the success of the ROV.



Piper Dustin
Chief Executive Officer



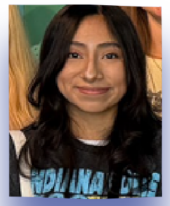
Emily Ortiz-Luna
Chief Quality Officer



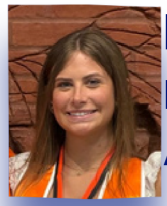
Jake O'Conner
Pilot
Systems Engineer



Jay Ulmer
Electrical Engineer



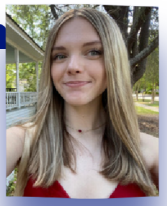
Kelly Monjaraz
Technician



Berkley Eubanks
Marketing Assistant



Angel Galvan
Technician



Kyleigh Souls
Chief Safety Officer



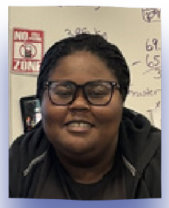
Lily O'Conner
Chief Financial Officer



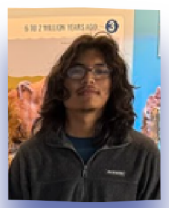
Jase Vining
Design Engineer



Brooks Brosh
Materials Engineer



Kabreyah Clark
Chief Marketing Officer



Jose Santos
Technician



Emery Wiebe
Accountant



John Pasaye
Mechanical Engineer

TEAMWORK & PLANNING

Environmental Education & Team Building

On March 27, 2026, we went to visit the Grays Reef Ocean Discovery Center in Savannah, Georgia. We went to learn more about the ROV that we are building as well as gain more knowledge on the ocean, how Grays Reef was created, and the Grays Reef ecosystem. Mrs. Danielle Oxman was the host of our tour and taught us a considerable amount of information on Grays Reef. We also proceeded to watch a video on the things our ROV needs to perform in the competition and how to efficiently perform in order to hopefully win the competition. She also answered any questions that we had about the competition or other things to the best of her ability. After watching the video on the ROVs, the students were able to walk through the Discovery Center and take a closer look at the models of the reef and posters with information. There were also kinesthetic activities that we could participate in if we wanted to.

Project Schedule

March 11 Vicky Bowen Sponsership For ROV

March 24 Discussing Frame with Jeffers MCCA

March 27 F.T - Grays Reef Ocean Discovery Center

March 30 ROV Cut & Assemble/Begin Float Design

April 3 MES Bake Sale

April 10-20 Spring Break

April 15th Connecting Thrusters/Wiring Electronics

April 21 Assembling Tether

April 28 Power is connected

April 30 Rov touched water/Completed buoyancy

May 2 Competition Day in Savannah



ENGINEERING DESIGN RATIONALE

VEHICLE DESIGN & SYSTEMS APPROACH

When we first started building the frame, one thing we were sure we wanted was mobility and stability in the water. We decided to take inspiration from real marine life and look at the shape of a sea turtle's shell. After modeling a few 3D designs, we came up with the current design of an octagonal base with an arching support structure over the top. For the propellers, we placed four angled on the sides for horizontal movement, and two angled on the top supports for vertical movement. We feel that this frame ensures that everything we need internally inside the ROV can fit securely inside, while also ensuring efficient movement in the water.



Photo of the Completed ROV

INNOVATION



Our team has previously used materials such as PVC pipe to build the frame. This year, however, we moved to HDPE as our primary material. The flexibility of size and angles that HDPE provides allowed us to be less restrictive in our design. We went with Blue Robotics for our motors and electronics. While more costly, the higher quality parts are worth the investment.

Our ROV also has a pneumatic device for its arm. By opening and closing the grabber, Tiki will be able to complete additional tasks.







ENGINEERING DESIGN RATIONALE

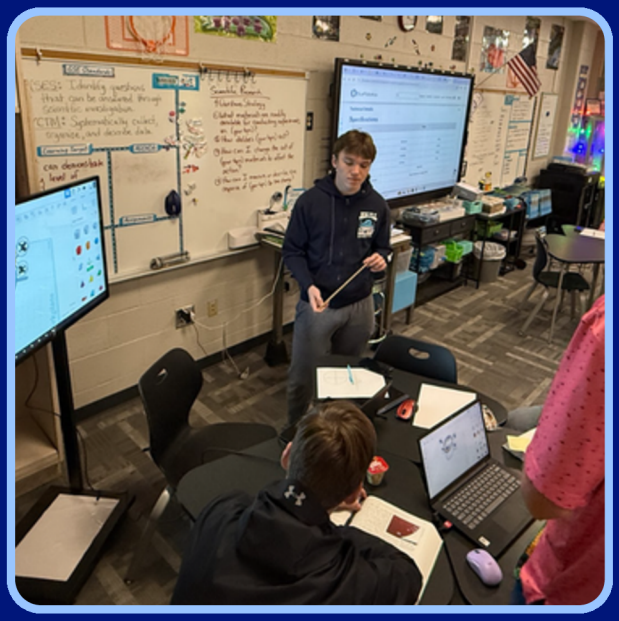
PROBLEM SOLVING

Most elements of our ROV started as an idea with little hard evidence behind it; simply put, each innovation started with someone saying, “this would be a cool addition.” Then, the rest of the team critiques the addition. If the idea is unrealistic, we scrap it. If it has potential, the team makes changes to make it more practical. Finally, the team creates a final version to use for the ROV.





SYSTEMS APPROACH



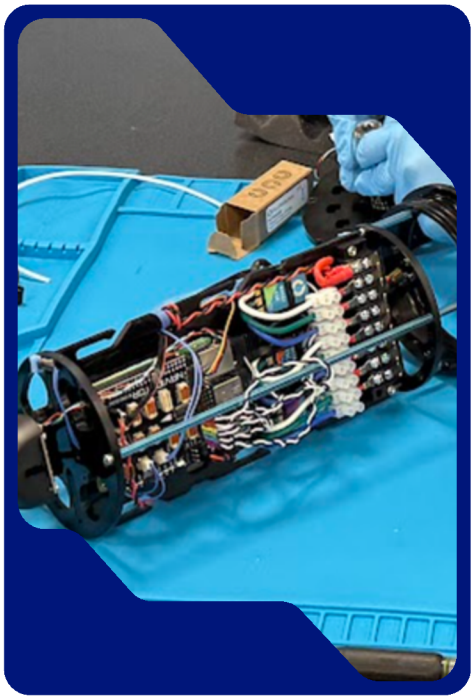
The design on our frame really focuses on our performance and every component was thought of when made. Our thruster placement was one of the first things on our mind when we first thought of our design. Furthermore, we thought of pneumatics and components along with it such as a grabber and all that goes with it. We ensured space with our design for anything extra which was a good idea in the long run as we installed a Blue Robotics technology enclosure. With our design, it ensures there is space for any last minute installs.

VEHICLE STRUCTURE

Most of the ROV budget went towards the thrusters and electronics. Because of this, the other aspects of the ROV were built around these pieces. We had to build a larger frame than we had built before in order to make room for the electronics. While the larger frame increased the total weight, it also allowed more room for attachments.

Since our budget was used primarily for electronics, the other attachments and materials were primarily reused from previous years; Pieces including grabbers and magnets had to be harvested from older ROV's.

Overall, each decision we made when building the ROV had to be counter balanced in another aspect, which provided a unique challenge for the team.



BlueROV2 Electronics Enclosure

VEHICLE SYSTEMS



When choosing materials, lightweight for the frame and components was crucial. For the frame itself, we chose HDPE plastic, which is lightweight and commonly used for its high strength-to-density ratio. It is also less dense than water, which makes it buoyant. This served our purpose for the ROV, because we wanted to be able to add weight to make it neutrally buoyant. We bought several sheets of HDPE, and had the shape of the frame cut out and assembled.

ENGINEERING DESIGN RATIONALE

ELECTRICAL SYSTEM



- Official Blue Robotics Electronics Enclosure used for the ROV.
- Standard Tether from Blue Robotics- Controls sent from computer/XBox Controller
- BlueOS Software
- Power cable in tether runs from the control box via 16 gauge, 6 conductor electrical wire) to the ROV.

TETHER MANAGEMENT SYSTEM

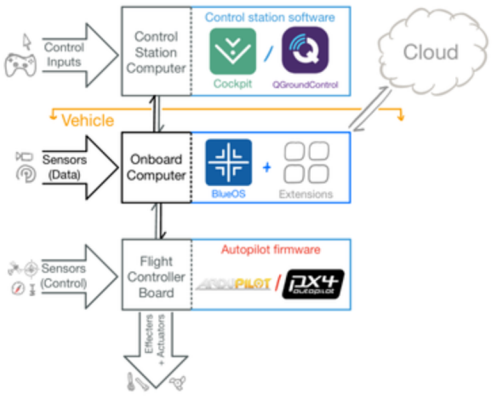


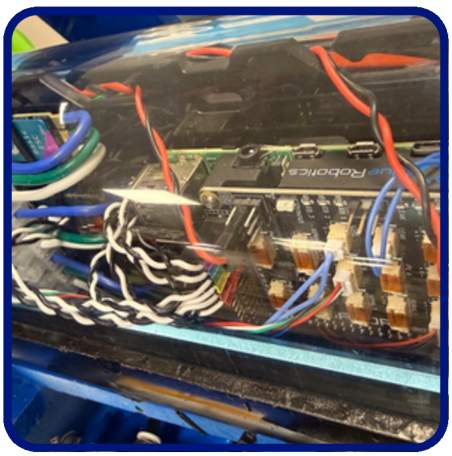
Tether length (50 ft); Blue Robotics Standard ROV ready tether; 16 Gauge/6 Conducter Wires for power; Two pneumatic hoses for linear actuator and grabber. Strain relief is achieved by attaching the tether direction to an eyebolt fixed on the back of the ROV. Zip ties are used to secure the tether in place along with a metal ring clamp. A constricting tether sleeve is used to streamline the hoses and wires and to serve as additional strain relief throughout the tether.

CONTROL SYSTEM

The BlueROV2 electronics enclosure requires the use of BlueOS. Blue OS runs an onboard computer that communicates with an operator at the surface via control station computer. An overview of Blue-OS related software is shown below (from Blue Robotics). The ROV is controlled by an XBox controller that operates through a laptop running the Copilot App.

To improve system and operator performance for the Rov, software platforms like **Blue Robotics Cockpit a control software** use modular designs, AI data synthesis, and hardware-accelerated remote control to dramatically increase efficiency. In addition, to the graphs showing how much amperage is being pulled.





PROPULSION

Thruster Cost - $240 each
Six Thrusters; Due to required voltage, it is most efficient to run no more than two thrusters at the time. Our thrusters are angled as to provide a large range of movement. The design forgoes the ability to strafe to allow for the ROV to rotate on two different axes. Overall, the arrangement strikes a strong balance between speed and flexibility of movement.



Blue Robotics T200 Thruster

BUOYANCY AND BALLAST



Picture of float/ballast

When testing out the buoyancy of Tiki, we saw that the front would float while the back would sink. To help, scoot the on-board electronics back and drilled holes to the back to put pool noodles through. Then we added weight to the front which also helped. Also, there was pool noodles added to the tether so that it wouldn't weigh down the back of the ROV.

PAYLOAD AND TOOLS

A proper camera is necessary for the ROV to navigate the pool. Our camera allows the pilot to identify obstacles, position the ROV for obstacles, and complete visual missions like identifying invasive crab species.

Our ROV was designed with the use of several tools and payloads in mind. We decided to reuse our grabber mechanism from the past year, but purchased a new pneumatic piston. With this, we can complete the missions that require picking up props.

A magnet is included on our ROV in order to pull metal pins. We also included a rope attachment with a carabiner attached to lift the bucket to the surface.



Grabber Attachment

BUILD VS. BUY, NEW VS. USED

New

We were given a generous donation from the Jay Bowen Foundation to purchase six of the T200 thrusters from Blue Robotics. We found that a more complex system was required to operate the ROV with T200 thrusters. With funds that we earned in previous years working the basketball concession stand was used to purchase the full electronics enclosure and tether required to operate the T200 thrusters.



Blue Robotics Equipment Unboxed

The team decided to use HDPE for the frame to allow for more a more streamlined design that did not absorb water or hold air. The pneumatic cylinder that was used last year was large and would throw the ROV off balance with used. This year, we purchased a smaller, rectangular shaped dual rod pneumatic cylinder with a shorter action and less “jolt” when used.

Reused

The grabber for the grabber arm and magnet were reused from last year. Various materials like zip ties, rubber stoppers, and screws were in stock from previous years. Most tools and all power tools were used already available for use. The laptop used to run the ROV program was already on hand.



Attaching the Grabber to the new ROV

CRITICAL ANALYSIS

TESTING & TROUBLE SHOOTING

We tested the vehicle's buoyancy and stability through water trials, evaluating how it performed under operational conditions. During each test, we monitored onboard sensors, amperage levels, and structural integrity in real time to assess overall system performance.

STRATEGIES AND TROUBLESHOOTING

During testing, we encountered two key issues. First, a buoyancy imbalance was identified and corrected by adding weight to the front and attaching foam to the rear, along with cutting holes to adjust displacement. Second, a water leakage issue caused the sensors to get wet, triggering a software alert and a rise in amperage. Jay Ulmer (Pilot) responded immediately by shutting off power to prevent misfires or component damage. We then depressurized the vehicle, safely drained the water, and thoroughly dried all electronics before resuming operation.

PROTOTYPE

Before finalizing our vehicle, we constructed a physical cardboard prototype to evaluate the frame layout, thruster placement, and overall structure. The prototype featured an octagonal hull ring with a cross-frame support, allowing us to test weight distribution with electronics and spatial arrangement of components without committing to final materials.

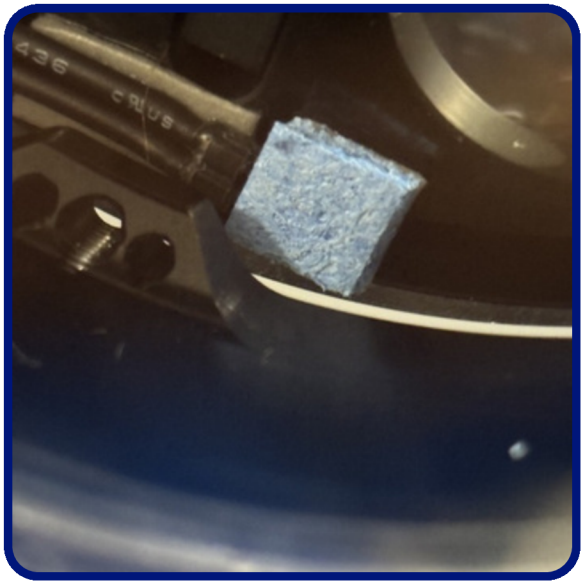


Photo of SOS Leak Sensor



Photo of Prototype

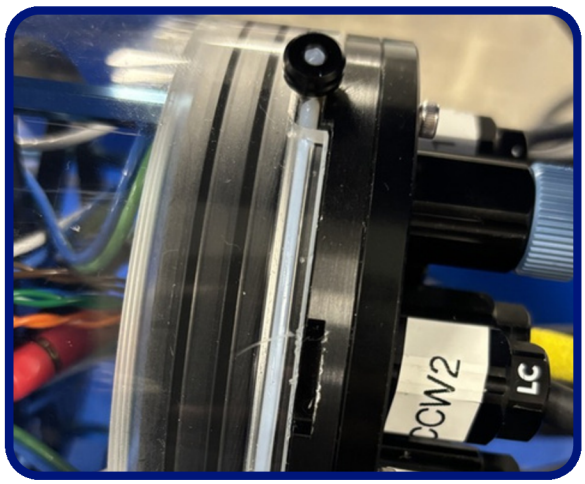


Photo Of Front O Rings

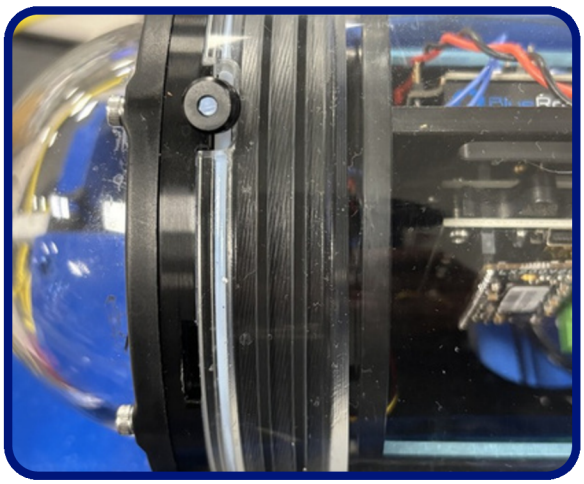
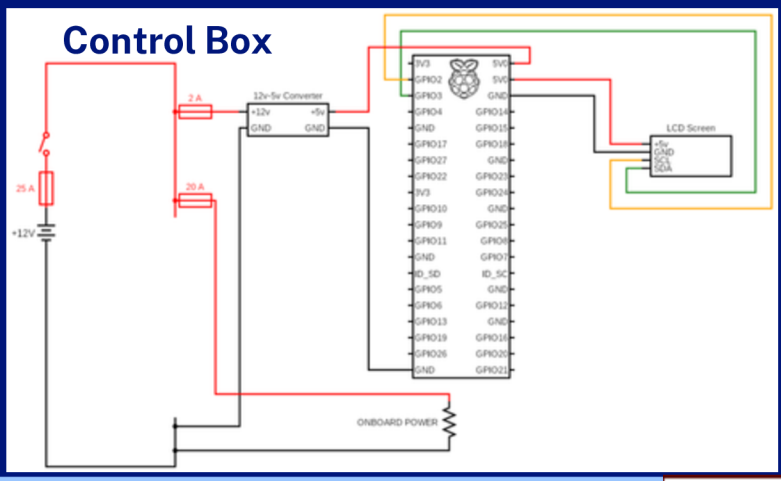


Photo Of Back O Rings

ROV-SYSTEM INTEGRATION DIAGRAM (SID)

The control box supplies power to the ROV and a Raspberry Pi 4B. Onboard power is supplied via an XT-90 connector that runs from the fuse box in the control box. A 12v to 5v converter is used to supply the Raspberry Pi with power, which in turn provides power to an LCD screen. The LCD screen is used to display diagnostics and telemetry data. A data cable is run from the onboard Raspberry Pi to the Topside Interface, and a USB cable transmits data from the Topside Interface to the control box.

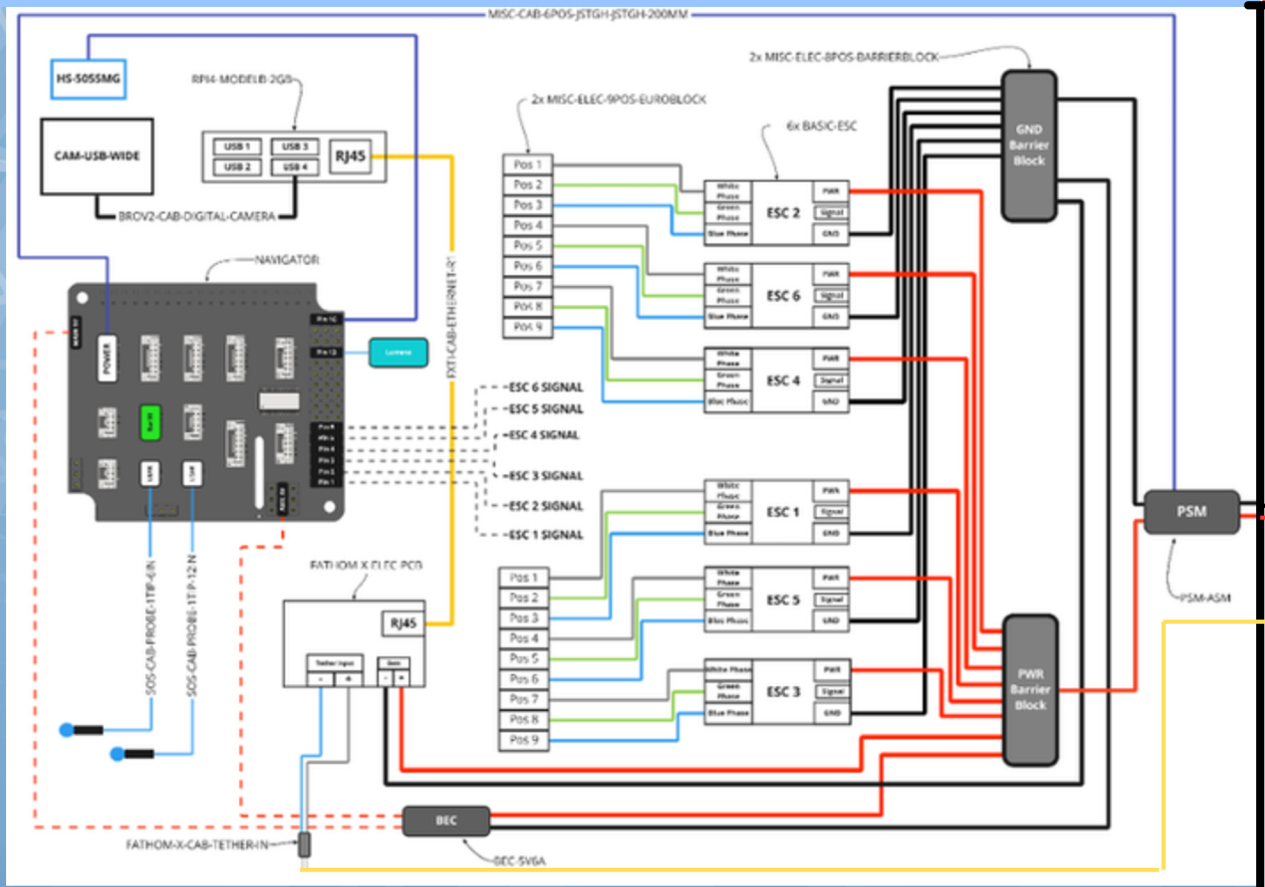


Anderson Power Pole Connectors are used to reduce the risk of electrick shock when connecting the ROV to the power source.

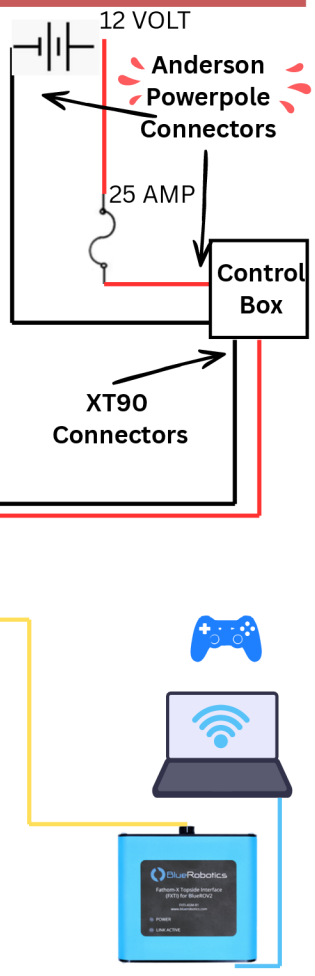


Tiki's central nervous system is controlled by the BlueROV2 Electronics Enclosure from Blue Robotics.

Underwater



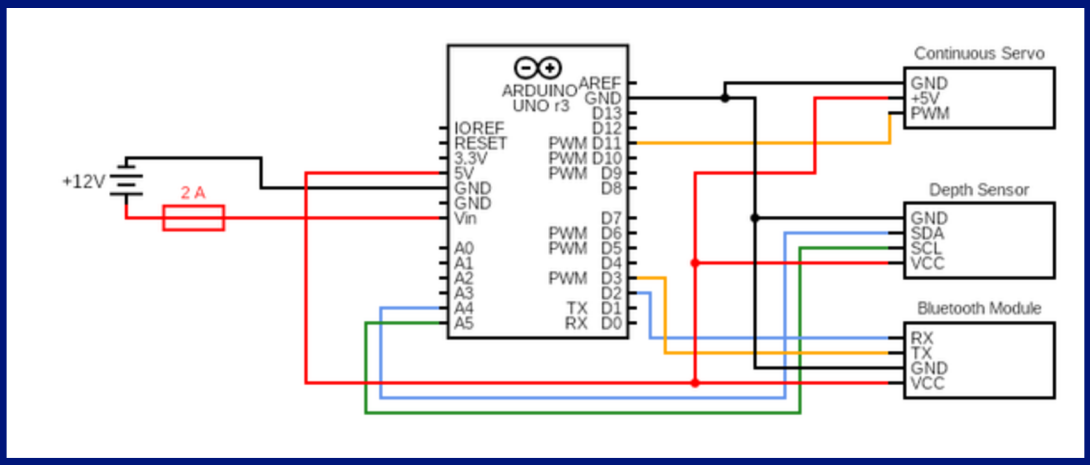
Topside



NON-ROV SID AND PNEUMATICS

Verticle Profile Float SID

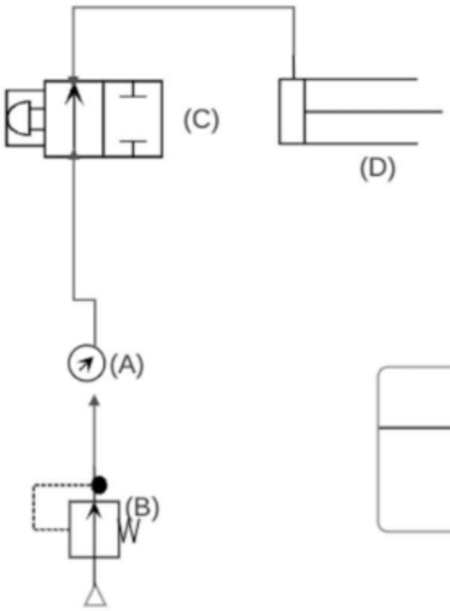
The Vertical Profile Float consists of a linear actuator (piston) connected to a syringe as our buoyancy engine. There is an electronics enclosure fixed at the top of the float. In the enclosure there is an arduino uno R3 running a program for the depth sensor and our bluetooth module. These are attached to a plastic board for easy access in and out of the enclosure. All of which are attached to a switch and battery. Everything is encased in water-tight PVC connectors





Pneumatic SID

A simple grabber is operated through the use of a dual rod pneumatic cylinder.



PRESSURE SOURCE

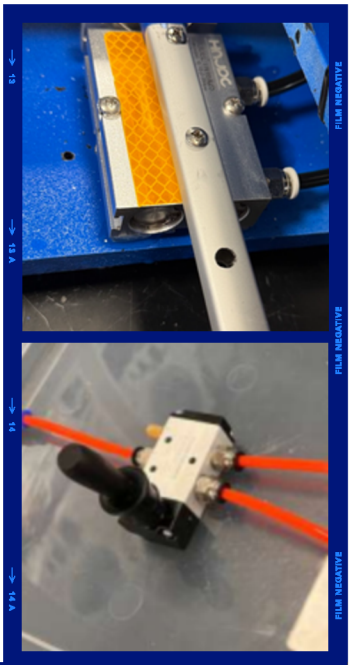
LIST OF COMPONENTS

A - PRESSURE GAUGE
B - PRESSURE REGULATOR
C - FLOW CONTROL VALVE
D - SINGLE ACTING CYLINDER

FLUID POWER QUIZ: PASSED
JAKE O'CONNER
JASE VINING
JOHN PASAYE
BROOKS BROSH

FLUID POWER DIAGRAM

TIGER SHARK TECHNOLOGIES

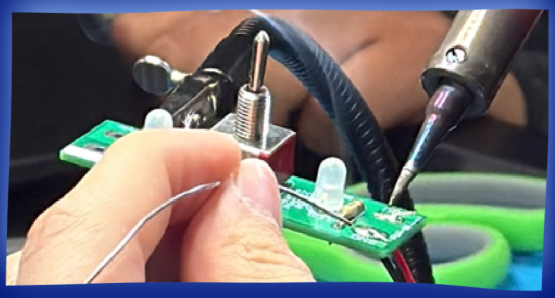




SAFETY

One of our top priorities on the team is making sure that everyone is being safe and efficient. We encourage using safety equipment more than anything else on the team. We follow strict protocols and use proper PPE when cutting, soldering, gluing, drilling, and painting. Clean workspaces, supervision, and teamwork reduce risks. Safety briefings, tool training, and mutual accountability ensure every team member understands and practices safe habits throughout every stage of our build.







Operational Safety

To ensure safe ROV operation, we guard thrusters, file sharp edges, and use water-safe outlets near water. Team members follow dry-hand protocols, secure all wiring, maintain safe distances during testing, and conduct thorough pre-dive checks to prevent injury around the pool, tools, and electrical components.





Safety Procedures

Safety Procedures are to prevent someone from getting hurt. Safety glasses are worn when working on or operating the ROV. Some of the most important safety procedures are the power tools, heating implements, sharp tools and objects, and electrical power devices.

JOB SAFETY AND ENVIRONMENTAL ANALYSIS

Job/Task	Potential Hazards	Safety Practices & Procedures
Power Tools- Drills Motor, Dremel, etc.	External skin injuries from sharp or pointed ends of tools- Flying object (small particles)	• Safety glasses are always used when working with power tools. • Members must have experience and a mentor present.
Heating Implements: Soldering, Hot gun glue, Heat gun, etc.	Skin damage (burns)	• Training with a mentor must be done before working with heat tools. • Safety glasses must be used and hands should remain a proper distance from the heat source.
Electrical Powered Devices	Injuries from shocks or burns from faulty wiring	• Properly soldered wires • Wires for control box are in a sealed container • Safety components such as Anderson connectors and fuse boxes are used
Hand tools, sharp objects, Hammer, Screwdriver, Box cutter, etc.	External skin injuries from sharp or pointed ends of tools- Flying object (small particles)	• Safety glasses are used at all times. • Hands are a safe distance from hazards.

JOB SAFETY AND ENVIRONMENTAL ANALYSIS

Job/Task	Potential Hazards	Safety Practices & Procedures
Transporting ROV	External injuries from heavy or damaged equipment	• Utilize grabbing points to handle the ROV. • ROV is only used when necessary.
Testing the ROV in water	Falling into pool - entanglement with tether or tripping on tether - Electrical Dangers	• All wires are waterproofed. • Only the required tether is enabled. • Only assigned members allowed poolside. • Only mentors allowed in the pool.
Deck Side Setup and Awareness	Slipping on wet floor - Falling into water - Electrical dangers	• Keep deck side clean and dry. • Communicate clearly between members. • Be aware of wet surroundings.
Personal Protective Equipment	External skin injuries - Dropped or flying objects	• Closed-toe, non slip shoes required at all times. • Hair tied back and no loose clothing around equipment • Safety glasses worn.

JOB SAFETY AND ENVIRONMENTAL ANALYSIS

Job/Task	Potential Hazards	Safety Practices & Procedures
Safely Setting up and Breaking Down Power Supply	Burns and injuries from electricity	• Use a checklist for setup and shutdown steps. • Keep electrical gear elevated and dry.
Inspection of ROV Prior to Submerging	External injuries from sharp edges and loose parts - External injuries from motor - Entanglement or tripping from tether	• Conduct pre-dive inspection list • Make sure ROV is Neutrally Buoyant • Verify the thrust guards are secure • Test motor function work well before deploying.
Tether Management	Entanglement or tripping from tether - pulling tether out - Knots in tether	• Assign a dedicated tether handler. • Keep the tether clear of obstacles. • Monitor for tension changes.
Removing ROV from the Water	Electrocution - Damaging ROV or damage from ROV	• Grip the Rov firmly and lifting using legs. • Dry off equipment to avoid slippage. • Inspect the ROV post-retrieval for damage.

BUDGET

The greatest expense in building the ROV was the purchase of six thrusters and the corresponding electronics to control them. This was more than we had anticipated, but in order to operate the T200 motors, we needed the speed controllers, and it was less expensive to go with the full electronics enclosure than to purchase the individual compoents. This purchase was made possible by a generous donation from the Jay Bowen Foundation and with funds from student led fundraisers. HDPE plastic was donated to the team and used for the frame. The pneumatic actuator was a new purchase because we needed something that did not exert so much force on the ROV when used.

Budget			
Company Name: Tiger Shark Technologies			
School: Metter High School			
Income			
Source			
Fundraisers from previous school year; funds caried over			$2,000.00
Bake Sale		Fundraiser	$300.00
Metter Kiwanis Club		For purchase of Sensors and Electronics for Float	$250.00
Candler County Ed Foundation		Registration	$500.00
Jay Bowen Foundation		For purchase of T200 Thrusters and Accessories	$2,500.00
		Total	$5,550.00
Expenses			
Category	**Type**	**Description/Example**	**Budgeted Value**
Electronics	Purchased	BlueROV2 Electronics Enclosure	$2,200.00
		Battery Power Cable	$80.00
		Fathom ROV Tether (ROV Ready)	$260.00
		Fathom-X Tether Interface	$245.00
		Pressure Relief Valve	$32.00
		Bar High-Resolution Depth/Pressure Sensors	$90.00
		T200 Thruster with Penetrator (x6)	$1,440.00
		Xbox Wireless Controller	$70.00
Hardware	Purchased	Wetlink Bulkhead - M10	$17.00
		Wetlink Bulkhead - M14	$22.00
		Wetlink Penetrator Assembly Block	$21.00
		WetLink Penetrator Blank (No Hole)-M10 Thread, P	$580.36
		T200 Mounting Bracket (x6)	$48.00
		PVC Saddle	$15.00
		Dual Rod Pneumatic Cylinder	$16.50
	Re-used	Aluminum/Plastic/Rubber Grabber	$0.00
		Air Compressor and Tank with Pressure Gauge	$0.00
		Pneumatic Hose and Connectors	$0.00
		Total Expenses	$5,136.86
Travel Expenses			
Transportation	Flight	Air Canada (approxmate cost - $1200 per ticket for 10 tickets)	$12,000.00
Transportation	Ground Transport	Minibus Rental - Estimated $150 minimum one way (2 trips)	$300.00
Lodging	Hotel	Six Rooms - Murray Premises Hotel ($1088 per room for 6 nights, 6 rooms)	$6,528.00
		Total Transportation and Lodging (no meals)	**$18,828.00**

Regional Competition:

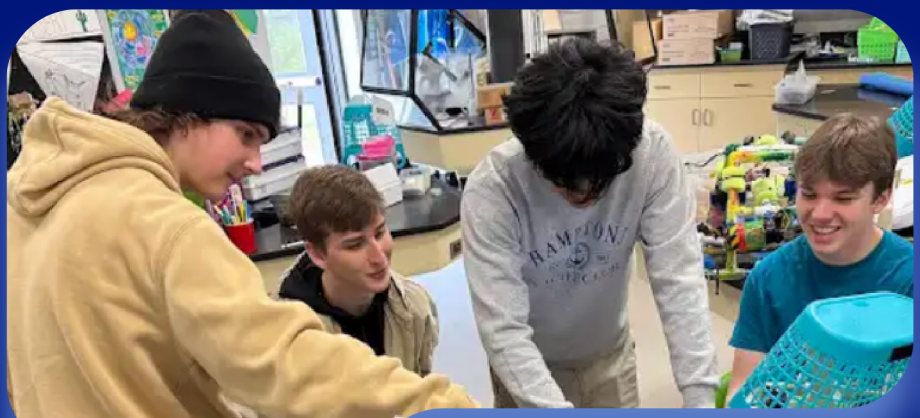
Travel expenses for the regional competition in Savannah include only cost of fuel since our coach drives the bus. This was covered by our school this year.

World Competition:

The cost to travel to St. Johns in Newfoundland & Labrador requires a lot of fundraising. We have started a campaign to raise money through donations and sponsorship from local businesses and community organizations. We have set a fundraising goal of $15,000 from community and business sponsors to cover flights and a portion of the hotel. At the time of this publication (5/21/26), we have collected $3,700 towards our goal.

CONCLUSION

Overall, Tiger Shark Technologies worked hard to design and put together a successful and functioning ROV. The team has developed and used employability skills of critical thinking, safety, and teamwork. Our company took some risks, learned from past mistakes, and thought outside the box for this competition season. With direction from mentors, Tiger Shark Technologies were able to prepare for the 2026 MATE ROV competition.











REFERENCES

- https://bluerobotics.com/learn/bluerov2-assembly/
- https://materovcompetition.org/ranger
- https://20693798.fs1.hubspotusercontent-na1.net/hubfs/20693798/2026/Manuals/2026%20RANGER%20Manual_updated_12_17_Cover.pdf
- Intake Guards for Blue Robotics T100 and T200 Thrusters - https://www.printables.com/model/33509-intake-guards-for-blue-robotics-t100-and-t200-rov-

MATE ROV COMPETITION

GRAY'S REEF SOUTHEAST

REFLECTIONS



Jake O'Conner

Having been in Robotics for the last four years, I've had the chance to grow in both my knowledge of science and my leadership skills. As our program has grown, I've had to work with groups of people with a diverse set of interests and skills. Despite any challenges that we've had to face, I'm glad that I had the opportunity to be part of a great group of people.



Berkley Eubanks

During my time in Robotics over the past few years, finding time to come together and work has become increasingly difficult. Much like the other seniors in Robotics, I have taken quite a few Dual-Enrollment courses and had obligations to many other clubs and sports. However, the time I spend in Robotics hardly feels like work. I get to team up with a wonderful group of people and have fun while we all work to a common goal. To me, Robotics is an outlet for creativity and intelligence that allows me to be productive and enjoy community simulaneously.



Jase Vining

This is the first year that I have been completely involved with robotics, and it has been a fun and challenging experience. Working with the team has allowed me to open up and be more creative when it came to designing and programming. Working on the float for this years competition has been increasingly challenging. Trying to manage the programming and assembly of the float. Attempting to seal everything water-tight and making sure all the electronics work is a fun and difficult experience. All-in-all it has been an amazing experience!

ACKNOWLEDGEMENTS

We would like to show appreciation for the people who have helped us on this year's robotics journey!

We would like to thank **Mr. Blake Jeffers and the construction class at Metter College and Career Academy**. Mr. Jeffers and his class helped in many aspects, from helping advise the ROV design to cutting and helping assemble the final product. He and his class also helped in troubleshooting ideas for construction of the float and various aspects of the ROV. Through the use of their equipment and help we were able to cut large segments of PVC, precisely cut and assemble HDPE material, among other specialty tasks.

Special thanks goes out to **Ms. Danielle Oxman of the Gray's Reef National Marine Sanctuary** for sharing her expertise and knowledge of Gray's Reef and ROV marine technology at the **Gray's Reef Ocean Discovery Center** in Savannah. We learned a lot about the history and conservation of Gray's Reef Marine Sanctuary and explore the center. We also watched the MATE ROV Ranger flythrough video and were given an opportunity to ask questions and discuss ideas for planning our mission tasks.

Gavin Osterloh, a student at Georgia Southern University and former member of the **Whale Tech World Champion MATE ROV Team** came to visit our team. On his visit, Gavin shared a little about his expereince with MATE ROV and took time to speak with team members in small groups to offer guidance and answer questions in the very early stages of designing our ROV. The team shared the cardboard protype of the frame and discussed plans for attaching the payload and electronics enclosure.

There were many individuals who helped with troubleshooting ideas for incorporating the Blue Robotics electronics enclosure and T200 thrusters. This was our first year using this advanced equipment, and finding ways to modify the design to work within the MATE ROV guidelines for Ranger was a challenge. The following people took time to respond to emails and help guide us and our mentors towards ideas to accomplish this task. A few of these people are: **Steven Rayo with Blue Robotics, Matt Gardner MATE ROV Competition Technical Manager, Eben Franks, Scott Haigh, and Danielle Oxman.** Thank you all for helping point us in the right direction.

Special Thanks to Our Sponsors

Candler County Foundation for Public Education

KIWANIS CLUB OF METTER

THE JAY BOWEN FOUNDATION

Special thanks to Mrs. Vicki Bowen and all that you do for the Metter Tigers!

Financial Contributions from these sponsors, our school, and donations from our mentors helped supply us with the equipment necessary to take our design to the next level.