



Company spec sheet

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1 COMPANY SPECS

1.1 Company and school, club, or organization name

Universidad de los Andes – Team: ROBOCOL

1.2 Home state and/or country

Bogotá, Colombia

1.3 Distance traveled to the competition

- Bogotá - Denver Colorado distance: 4.975 km
- Denver – Longmont distance: 48.85 km
- Total distance: 5023.85 km

1.4 History of MATE competition participation (new or returning)

The ROBOCOL submarine project began exactly 3 years ago in 2021 with the objective of participating in the MATEROV competition. Due to the COVID-19 pandemic, we were unable to apply initially as we had not made sufficient progress to compete. In 2022, ROBOCOL decided to register for the competition for the first time. However, we did not qualify because we still lacked the necessary tools to fully operate the submarine, including movement and compliance with requirements. In 2023, we resumed work on the submarine at the beginning of the year, implementing subsystems with specific objectives to ensure its proper functioning. This effort reflected in the results we achieved, finally qualifying us for the competition. Today, we are active participants in the MATEROV competition in the pioneers category.

1.5 Company photo and caption with team members names and roles



Figure 1: From the left up: Gabriela Camargo Moreno (Management), Laura Andrea Hurtado Acosta (Vision-task), Juliana Delgadillo Cheyne (co-leader Vision-task), Juan Pablo Santa Arias (co-leader chassis and tank), Juan Diego Pinto (co-leader hardware), Sergio Andrés Oliveros Barbosa (Software), Daniel Alejandro Castillo González (Software), Felipe Andrés Mesa Niño (Software), Daniel Hurtado Jiménez (Vision-task), Hernando José Díaz (Hardware), Gianmarco Javier Rojas Rodriguez (Hardware). From the left down: Maria Alejandra Moreno Bustillo (Vision-task), Andrés Santiago Martínez Hernández (Leader vision), Santiago Usme Martínez (Team captain- leader software), Daniel Eduardo Contreras Rojas (Hardware), Tatiana Pérez Suancha (Software), Valentina Echeverri (Leader chassis and tank), Santiago Ardila (Leader arm), Daniel Alvarez (Team captain), Jorge Luis Lamprea Barragán (Leader hardware).

1.6 Range of grade / college levels represented by team members

Team members		
Team member	Career	Career Level
Gabriela Camargo Moreno	Business Administration	5 semesters
Laura Andrea Hurtado Acosta	Electronic Engineering	3 semesters
Juliana Delgadillo Cheyne	Electronic Engineering	6 semesters
Juan Pablo Santa Arias	Mechanical Engineering	3 semesters
Juan Diego Pinto	Electronic Engineering	2 semesters
Sergio Andrés Oliveros Barbosa	Computer and systems engineering	4 semesters
Daniel Alejandro Castillo González	Electronic Engineering	3 semesters
Felipe Andrés Mesa Niño	Computer and systems engineering	2 semesters
Daniel Hurtado Jiménez	Electronic Engineering	7 semesters
Hernando José Díaz	Electronic Engineering	2 semesters
Gianmarco Javier Rojas Rodriguez	Electronic Engineering	2 semesters
Maria Alejandra Moreno Bustillo	Electronic Engineering	6 semesters
Andrés Santiago Martinez Hernández	Biomedical Engineering	7 semesters
Santiago Usme Martínez	Electronic Engineering and Mechanical Engineering	6 semesters
Daniel Eduardo Contreras Rojas	Electronic Engineering	6 semesters
Tatiana Pérez Suanca	Electronic Engineering	2 semesters
Valentina Echeverri	Electronic Engineering	5 semesters
Santiago Ardila	Mechanical Engineering	6 semesters
Daniel Alvarez	Electronic Engineering and Mechanical Engineering	7 semesters
Jorge Luis Lamprea Baragán	Electronic Engineering and Mechanical Engineering	6 semesters

2 ROV SPECS

2.1 Total cost

Total cost			
Item	Cost per unit	Qty	Total
Chassis and tank			
Acrylic	264 USD	1	264 USD
Aluminum	110 USD	1	110 USD
Penetrators	85.80 USD	1	85.80 USD
3D printed pieces	33 USD	1	33 USD
DATA wire 100m	400 USD	1	400 USD
Power cord 50m	184.80 USD	1	184.80 USD
screws	22 USD	1	22 USD
O-rings	22 USD	1	22 USD
Floater			
aluminum rods	3.96 USD	6	23.76 USD
aluminum-cylinder Ø150mm*250mm	146.08 USD	1	146.08 USD
Filament PLA	17.60 USD	3	52.80 USD
ESP-32	9.46 USD	1	9.46 USD
PVC 4"*1m	3.94 USD	1	3.94 USD
Hardware			
ESC	36 USD	6	216 USD
Engines	200 USD	6	1200 USD
Anderson conector	5 USD	15	75 USD
PCB	134.14 USD	2	268.28 USD
Leak Sensor	3 USD	5	15 USD
DHT22	9 USD	3	27 USD
IMU	7.59 USD	1	7.59 USD
Shipping	230 USD	1	230 USD
pressure sensor	1.39 USD	1	1.39 USD
Consumables			
Wires	11 USD	1	11 USD
Screws and nuts	22 USD	1	22 USD
3D printing filament	110 USD	1	110 USD
Conectors	50 USD	1	50 USD
Tin	11.22 USD	1	11.22 USD
Heat shrinkable	0.59 USD	20	11.88 USD
Tie ups	1.10 USD	20	22 USD
Manufacturing			
Manufacturing	1000 USD	1	1000 USD
TOTAL			
-	-	-	4771.19 USD

It is important to note that we have had the support of the Mechanical Engineering department since the creation of the project in 2020, with the department covering the large majority of our manufacturing costs as well as provided extensive access to laboratories and machinery to manufacture and print most of the submarine. Additionally, the department of Electrical and Electronic Engineering have provided us with spaces to work and 1000 USD. The remaining costs have been obtained thanks to our sponsors; we have had the opportunity to work along a printed circuit company (Microcircuitos) and a software company (Ekumen).

2.2 Size and weight measurements

2.2.1 Total weight



Figure 2: Total weight: 14.5 kg considering the wire. Adding the weight of the electronic part, the submarine weighs 15 kg

2.2.2 Size measurement



Figure 3: Submarine height: 30 cm

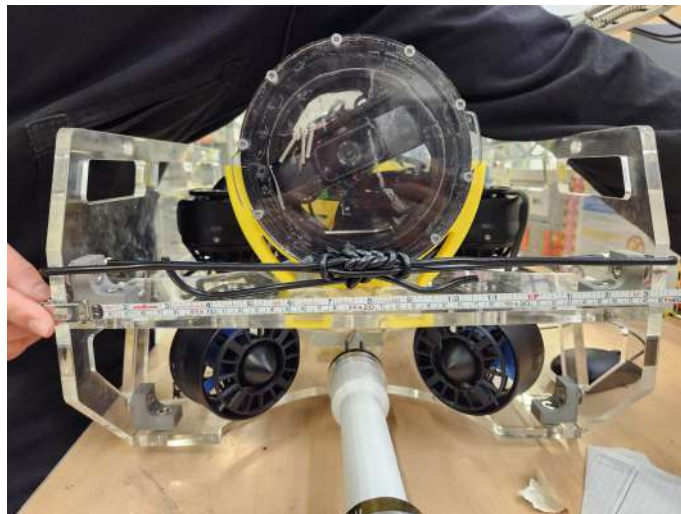


Figure 4: Width of the submarine: 39.3 cm



Figure 5: Depth of the submarine: 45 cm

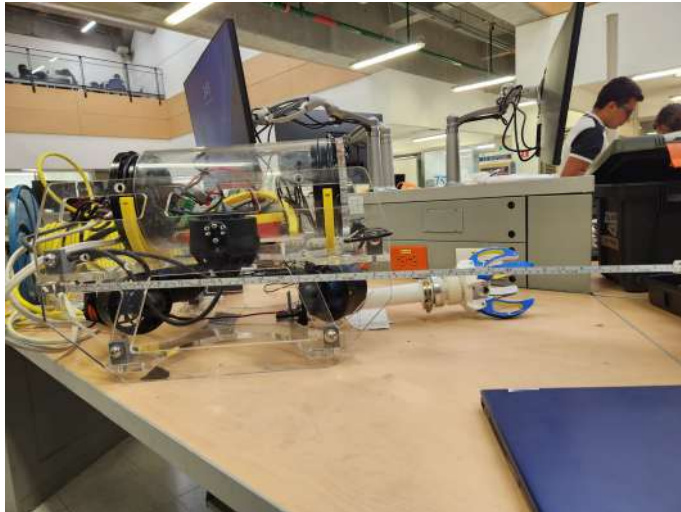


Figure 6: Total depth size considering the arm: 65 cm

2.3 Total students-hours to design and build

Total hours per subsystem			
Subsystem	Amount of people	Tasks	spent hours
Chassis and tank	3	Maintenance on the tank and design various components	400
Arm	2	Design and manufacturing of the robotic arms of the submarine	160
Hardware	6	Design and organize the electronics of the submarine	450
Vision	3	Algorithms to solve the tasks	120
Software	5	Control algorithms, main communications, sensor data management and interface	360
Management	2	Event organization, Sponsor search and management, Team logistics	600
Creative direction	2	Recordings, advertising	200

2.4 Safety features

The submarine was, is and will be always designed having in mind the protection of the world around of it since one of it's main purposes is exploring and taking care of nature. This is why the submarine has safety features which let's it accomplish it's purposes without damaging people, nature or itself:

2.4.1 Thruster grid protection and ubication

The submarine has grid protection installed in all 6 of it's thrusters so there's no possibility for an unaware person, by any chance, to get hurt by the thruster blade when it is moving. Thrusters are strategically ubicated se the chassis covers their main action faces. In case of impact, the chassis will probably receive it mainly.

2.4.2 Chassis, round edges

The submarine was designed with round edges chassis so it may no represent any posible cut in our team members' skin or similar. This may protect the submarine structure.

2.4.3 Fuse

The submarine has a fuse which protects the robot from high currents and possible short circuit.

2.4.4 Bumpers

In a future, the ROV may have elastic bumpers for protecting itself and its surrounds un a better way if impact occurs.

For specific safety features check Company safety review document for more detailed information.

2.5 Special features

Our submarine is a project carried out by a group of university students who, applying the knowledge they have acquired throughout their career, have managed to carry out a functional submarine, a submarine that has the main colors of the place where it was born: Universidad de los Andes in Bogotá, Colombia. Black and yellow are the main theme colors of our team!

To reduce costs, the submarine has the ability to solve the tasks only with the use of the captures of the cameras that it has installed, which helps to avoid having to buy more elements such as additional sensors.

2.6 Photo of the vehicle

