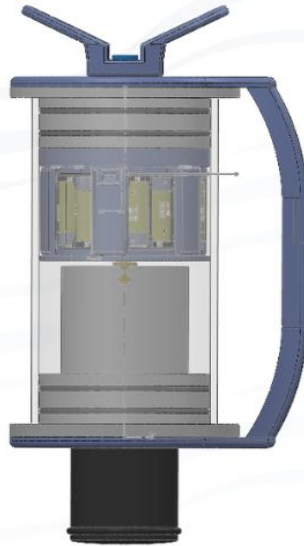


FAST TRITON ROVS

WAVES OVER WINGS

W-O-W



**Under the Supervision of
Eng. Muhammad Mongy**

27' Mohamed Ehab CEO
27' Aly Abelelah ME Head/ CFO
27' Yahia Mohamed COO
27' Mohamed Osama CTO
28' Youssef Hashem SW Head
27' Youssef Waleed Control Head
27' Saged Khaled Vision Head
27' Adham Waheeb GUI Head
27' Jana Ayman SW
27' Salma Sherif Float Head
30' Ziad Gado SW
28' Hadeer Amer SW
27' Abdelrahman Ahmed SW
27' Kenzy Baher SW

28' Menna Ahmed SW
27' Ahmed Mansour SW
30' Mohamed Sherif SW
27' Gamal Elmarangooz SW
28' Aya Yasser SW
27' Nour Walid SW
28' Marwan Mahmoud SW
26' Marwan Hossam SW
29' Zeina Magdy SW
27' Ziad Magdy EC Head
28' Mariam Mohamed EC / Non Tech.
27' Mohamed Sherif EC
27' Seif Alaa EC
27' Seifeldin Waleed EC

28' Amro Tarek ME / Pilot
28' Aleyeldin Bassam ME
28' Sherif Fahmy ME
29' Farida Gouda ME
28' Bassam Hisham ME
28' Youssef Mohamed ME
28' Abdallah Khaled ME
28' Abdelrahman Salama ME
28' Malak Islam Non Tech.
28' Sama Ahmed Non Tech.
26' Logy Magdy Non Tech.
28' Salma Mohamed Non Tech.



Mechanical System

To achieve the goal of maximum precision, a compromise must be done on two aspects: length and buoyancy engine. For length, initially, the float's (acrylic) enclosure tube has been shortened by nearly half that from our last year's, to become 260 mm in its total length rather than 500 mm. Secondly, we have chosen a new technique to adjust the density of the float in order to have a more precise buoyancy engine. Our mechanical team have designed an external piston that has the ability to extend outside the float's structure to increase its volume, or retract inside the body to decrease the volume. The volume adjustability gave the system more accuracy to track the float's density in order to perform the vertical profile. Inside the float, all of its components and PCBs have been designed to be compressed all within one section named the "control section"; such a section includes the custom-made PCBs and the power managing units. Below the control section, there is a battery unit and a 40 kgf/cm motor with a gearbox that is coupled with a lead screw to convert its rotary motion to a linear motion that controls the buoyancy engine's piston. Next, the buoyancy section contains the piston's chamber that is also manufactured with the same piece with the bottom flange, as the piston is made from silicon rubber in-house by our mechanical team, its design has built-in O-rings that seals the water out of the body while extending and retracting. For extra convenience, the float's main body is attached to a handle from above and around the side. Based on those changes, the float's main body length (not including its buoyancy engine) is 347.29mm.

Float CAD is shown in Fig.1. Our end caps pop off as a pressure relief mechanism (both sides of the handle are separable).

Electrical & Communication System

The float control board is powered by a 12V supply, The battery pack consists of 10 Philips AA NiMH cells (1.2V, 2450mAh each) connected in series, providing a total of 12V and 2450mAh capacity. The standard continuous discharge rate for NiMH AA cells is 1C, meaning each cell can safely deliver up to 2.45A continuously. Since the system's full load current demand is 1.69A — well below the 2.45A safe discharge limit — the battery pack safely fulfills the current requirements of the float, as shown in Fig.2. The battery pack drives the motor driver used to run **the DC motor** controlling the piston responsible for adjusting the float's volume. A step-down buck converter regulates the 12V batteries' output into 5V that powers the **Arduino Nano**, the motor encoder, and the **TOF sensor**, ensuring stable operation of the control and feedback components. In addition, the 12V supply is stepped down through a buck converter to 3.3V to power the ESP32 and the pressure sensor. The circuit also includes two resistors configured as a **Voltage Divider**, which scales the system voltage to a safe level so it can be read by the microcontroller's analog input. This divider is also used to allow safe RX/TX communication between the ESP32 and the Arduino Nano so the Nano can receive the signal to start the motor during the mission. Within the system's architecture, the ESP32 acts as the **main controller** responsible for reading the pressure sensor and managing communication. It measures depth using the pressure sensor to monitor the float's underwater position, and processes distance readings from the TOF sensor to determine the **piston position**. Based on this information, the **ESP32 sends commands to the Arduino Nano**, which acts as the secondary controller responsible for motor actuation. The Arduino Nano drives the DC motor through the motor driver, while using **feedback** from the motor encoder to ensure precise movement and accurate piston displacement. The system regulates the piston's position based on the pressure sensor readings to maintain the target depth using a PID controller. After the mission is completed, the ESP32 sends the collected data to a Python program via WIFI that receives the data and plots a graph showing depth versus time. No commands are given to float post deployment.

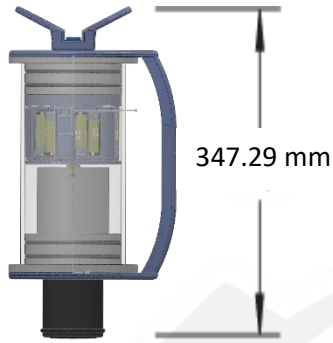


Figure 1: Float CAD



Figure 2: Battery Packs

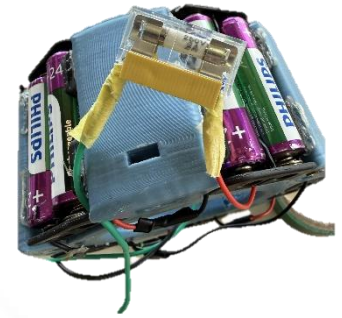


Figure 3: Fuse Image on Battery Pack

Table 1 Compartments of float

1	LED
2	“OK”
3	Pressure Sensor
4	Top Flange
5	O-Rings
6	PCB's
7	PCB holder
8	Battery-pack Holder
9	(intended) Battery-pack
10	Motor
11	Motor Holder
12	Coupler
13	Lead Screw
14	Acrylic Tube
15	Bottom Flange
15.1	Chamber
15.2	Main Bottom Flange
16	Piston Kit
16.1	Piston Skeleton
16.2	Silicon-Rubber Body
17	Float Handle

I	Control Section
II	Buoyancy Section

Table 2 Sections

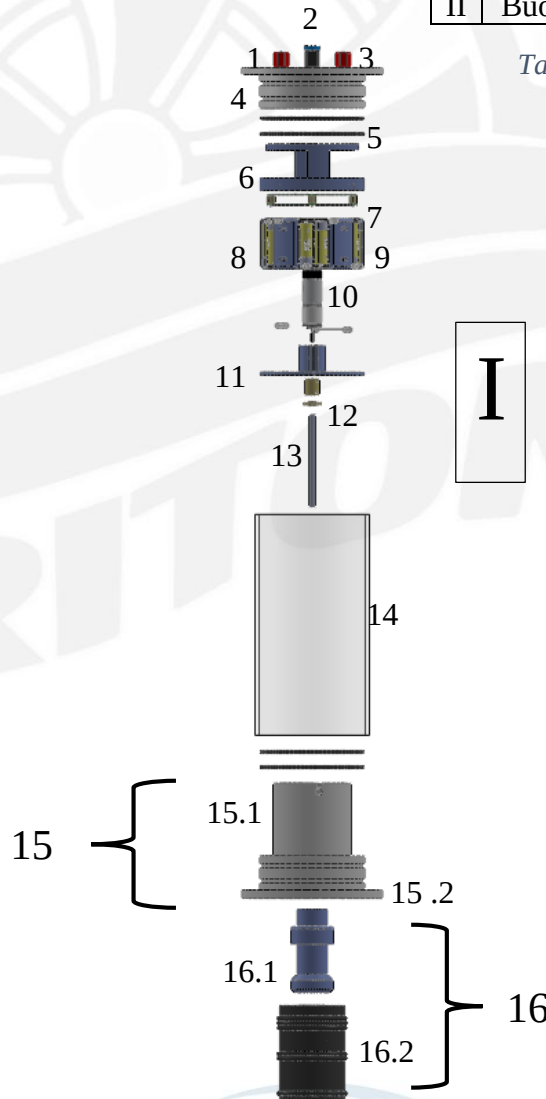
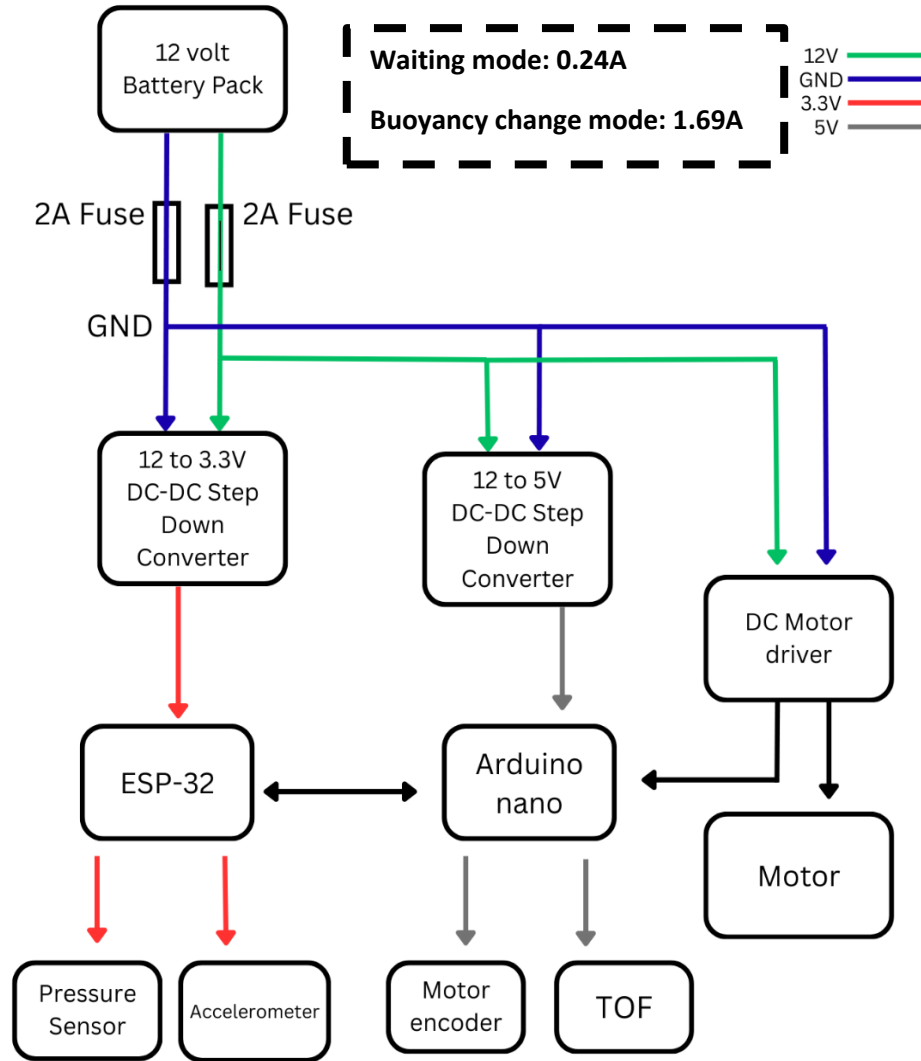




Figure 4: Float SID



Component	Voltage	Current	Power
Arduino Nano	5V	30 mA	150mW
ESP32	3.3V	500 mA	1650mW
DC Motor	12V	1500 mA	18000mW
Accelerometer	3.3V	40 mA	132mW
Pressure Sensor	3.3V	1.25 mA	4.125mW
LED	5V	30 mA	150mW
TOF	5V	40mA	200mW

Description	Value
Total Power Consumption	20286.125mW $\approx$ 20.3 W
Full load ampere	1.69A
Waiting mode	$2886\text{mW} \div 12\text{V} = 0.24\text{A}$
Fuse Calculation	$20.3\text{ W} \div 12\text{ V} = 1.69\text{ A}$
Fuse Used	2 A

Table 3: FLA Table