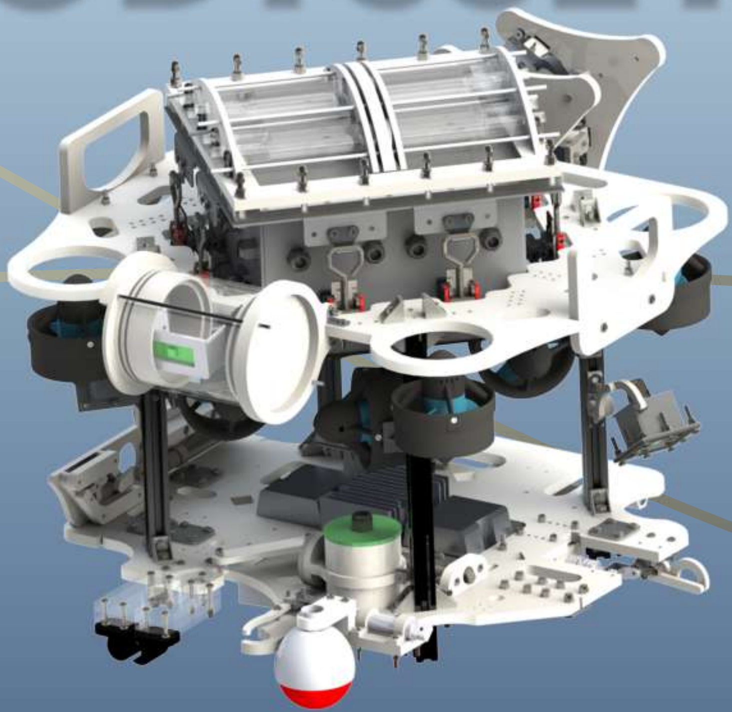
ODYSSEY



COMPANY STAFF

"## : Graduation Year

"25 Amr Khaled Alhagla | | CEO
"28 Mostafa Ahmed Elassar | | CFO
"25 Ahmed Mohamed Khalafallah | | CTO Electrical
"24 Omar Ahmed Yackout | | CTO Mechanical
"26 Hanin Osama Morsy | | Vice CTO Mechanical
"24 Ahmed Sameh El Komy | | Firmware Team Lead
"24 Mahmoud Hamada Yousef | | Hardware Team Lead
"24 Ahmed Mohamed Sakr | | Software Team Lead
"28 Abanoub Hany Zaky | | Mechanical Engineer
"25 Abdelrahman Moataz | | Firmware Engineer
"25 Ahmed Adel Ibrahim | | Mechanical Engineer
"24 Ahmed Hassan Falah | | Firmware Engineer
"25 Ahmed Ibrahim Anan | | Hardware Engineer
"25 Ahmed Mohamed Mamdouh | | Firmware Engineer
"25 Ahmed Mohamed Rizk | | Mechanical Engineer
"25 Hussein Khaled Hussein | | Software Engineer
"26 Ibrahim Mohamed Beshr | | Firmware Engineer
"24 Marwan Ahmed Mostafa | | Hardware Engineer
"27 Mina Emile Roushdy | | Hardware Engineer
"24 Mostafa Ibrahim Hassan | | Software Engineer
"25 Nezar Marwan Zolfackar | | Mechanical Engineer
"27 Omar Essam Fayed | | Hardware Engineer
"27 Peter Tharwat Emeel | | Mechanical Engineer
"27 Phoebe Emile Roushdy | | Hardware Engineer
"25 Salma Ahmed Sherif | | Firmware Engineer
"24 Seif M.Amr Bassiouny | | Firmware Engineer
"26 Yahya Medhat Abdelbarr | | Firmware Engineer
"26 Youssef Tarek Hussein | | Software Engineer
"25 Ziad Amr Ibrahim | | Software Engineer

Mentors

-Abdelhamid Abdallah -Ahmed El Tawil -Ahmed Hindawy -Alaa Arafa -Alaa Shehab -Ayman Adly
-Hagar Mohammed -Hany Hamza -Ibrahim Elshenhapy -Mahmoud Ahmed -Mahmoud Beshr
-Mahmoud El Shenawy -Marawan Ahmed Rabea -Mohamed Ebrahim -Mohannad Mohamed Yehia
-Omar Samy -Perla Hatem -Raghad Aboeleneen -Rozan Magdy -Samanda Tarek

AQUAPHOTON ACADEMY

ALEXANDRIA UNIVERSITY FACULTY OF ENGINEERING

ALEXANDRIA, EGYPT

Non-ROV Devices

ROVS BUILT TO LAST

Non-ROV Devices

1 *Odyssey*'s Vertical Profiling Float

1.1 Mechanical Design

The float, shown in Figure 1, consists of High Density Polyethylene (HDPE) plates that contours four sealed syringes of 60mL, which allows the 70-RPM DC motor with torque 35kg.cm to overcome the water column of 4m pressure. Water is sucked into or pumped out of the syringes depending on the motor's direction that is coupled to a lead screw using a customized coupling. Moreover, to smooth the motion of the pistons, linear bearings were added to two stainless steel rods holding the plates together. As the syringes get filled with water, the float's weight increases and it starts to overcome the buoyancy force and sink to the bottom of the pool. When the desired depth is reached, the motor's rotation is reversed to release the water from the syringes decreasing its weight, allowing the float to rise back to the surface. The enclosure is sealed by two flanges each secured using two radial O-rings. Holding a 4 inch acrylic cylinder that is 630mm in length, separating the mechanical and electrical systems by a third common flange sealed by four radial O-rings. The bottom flange is connected to four AGRO glands responsible for sealing the whole system and the pneumatic cables and the pressure sensor is placed on the top flange.

(a) Assembled View

(b) Exploded View

Figure 1: ***Odyssey***'s Float

The total pressure force of the water 4m pressure head that the float can withstand is 659N, was calculated according to equation 1

$$F_P = \rho \times g \times h \times A \quad (1)$$

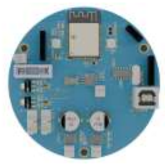
A power lead screw is used to convert the rotational motion to linear motion with the following equation:

$$\left(\frac{Force \times D_m}{2}\right) \times \frac{\pi \times D_m \times f + L}{\pi \times D_m - f \times L}$$

1.2 Electrical Design

• Electrical System

This year's electrical system offers improved integration, which is evident in utilizing a single board module for the performance of four essential functions: power regulation and distribution, as well as signal distribution and control. Contrary to last year's model, which had separate boards for each.



(a) Top-View

(b) Side-view

Figure 2: Float Electrical System

ESP32 is the core of the system, managing signal data including a BMP280 pressure sensor, sealed in a balloon of specific air volume. This measures pressure accurately as the air volume inside the balloon changes with pressure. The float's depth from the pool's surface is measured by the following equation:

$$Depth = 443.3 \times \left(1 - \left(\frac{pressure}{1013.25}\right)^{0.1903}\right)$$

Depth is displayed over time on the GUI through a web server initiated on the ESP32. It is accessed by connecting to the IP adress of the ESP32 through a WLAN. The ESP32 is also connected to two limit switches indicating that the syringes have reached their minimum or maximum limit.

► Float Power Calculations

As shown in Table 1, the maximum power consumed by the float is approximately 36.8688 W, which draws nearly 3 A of current from the 12 V power source. The peak current is then multiplied by a 1.5 factor of safety, resulting in a maximum current of 4.5 A, therefore a 5 A fuse is placed.

Component	Input Voltage	Max Current	Quantity	Consumed Power
ESP32	3.3V	260mA	1	858mW
DC Motor	12V	3A	1	36W
Pressure Sensor	3.3V	1mA	1	3.3mW
RTC	5V	1.5mA	1	7.5mW
Total				36.8688W

Table 1: Power Calculations