CREATIVE PRESENTATION TEMPLATE

ROBOTIC HARDWARE SYSTEMS

ROV

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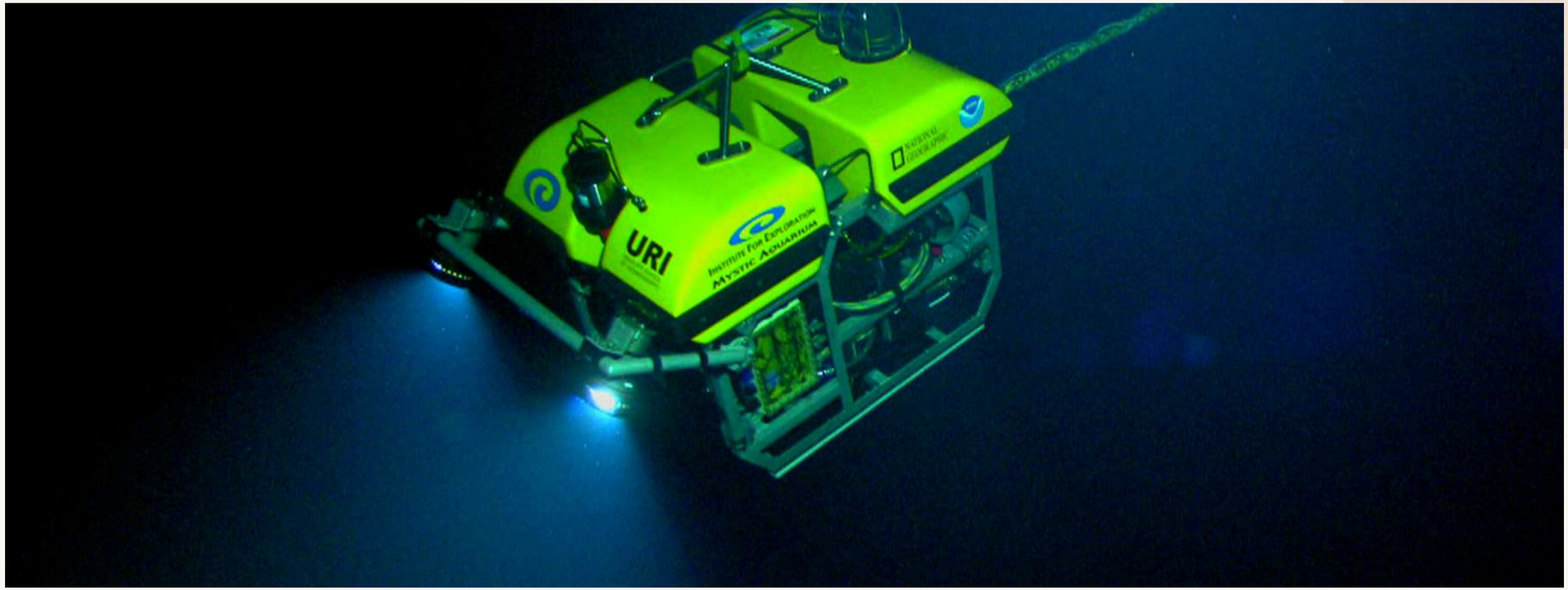
CONTENTS

1. INTRODUCTION

ROV

- Remotely Controlled Vehicle (ROV) - An unmanned underwater robot that is connected to a ship by a network of cables.
- The wires enable remote vehicle navigation by transmitting command and control signals between the operator and the ROV.
- A video camera, lights, sonar equipment, and an articulating arm might be found on a ROV.
- The articulating arm is utilised for raising lifting hooks onto larger things, cutting lines, and recovering small objects.
- Part of what makes ROVs so attractive is their ability to do jobs that are simply too dangerous or physically impossible for humans to do on their own

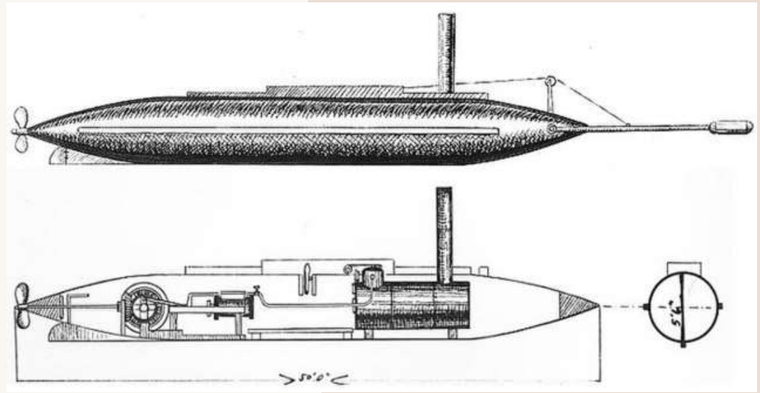
2. HISTORY & APPLICATION



HISTORY

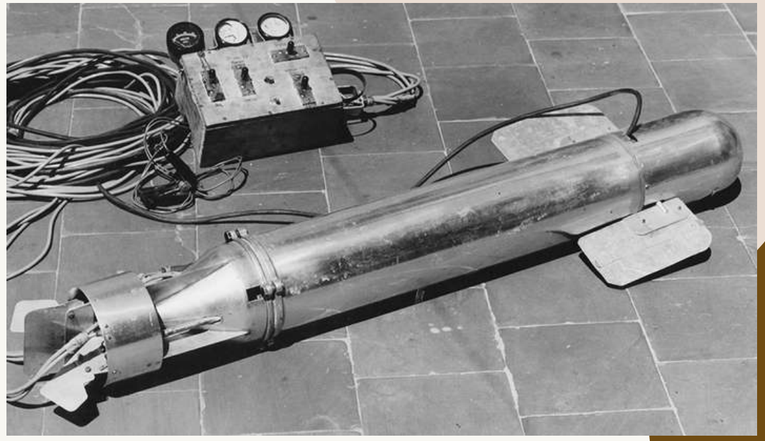
1.1864 -

- LUPPIS-WHITEHEAD AUTOMOBILE, AUSTRIA, DEVELOPED THE PROGRAMMED UNDERWATER VEHICLE (PUV)
- NAMED TORPEDO.



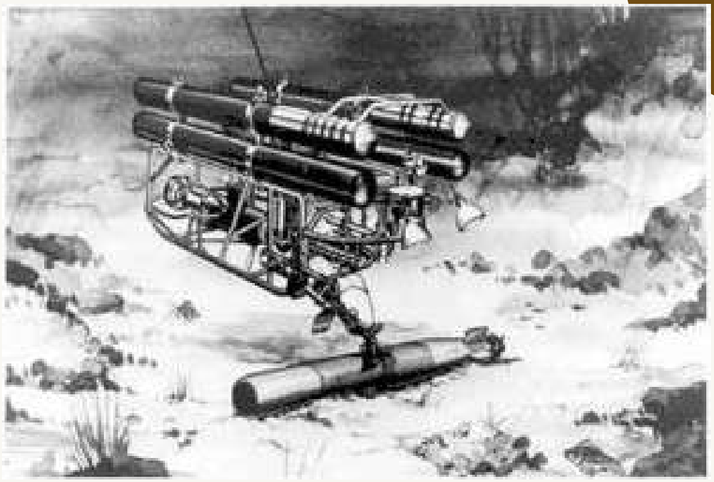
2.1953 -

- THE FIRST MODERN ROV WAS DEVELOPED BY DIMITRI REBIKOFF
- NAME POODLE.
- AS OPPOSED TO PUV, POODLE WAS A TETHERED ROV.



3.1960 -

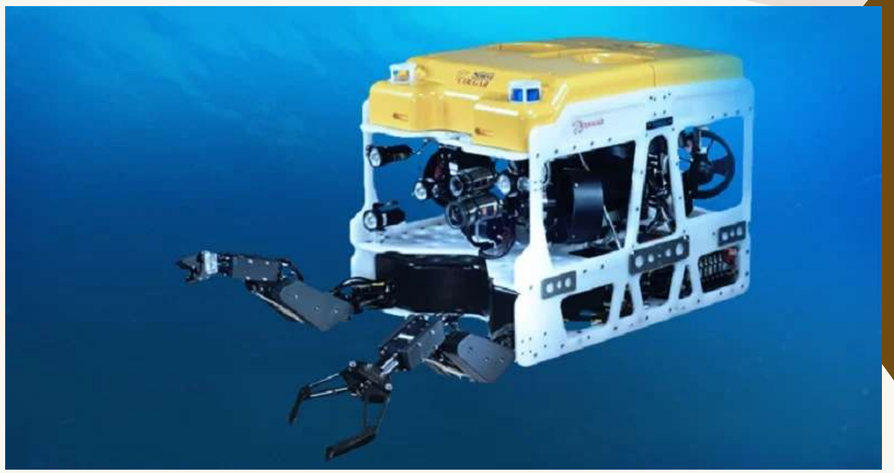
- US NAVY DEVELOPED AN INTEREST FOR DEEP SEA EXPLORATION
- U.S. USE IT AS NATIONAL DEFENSE AND UNDERWATER EQUIPMENT RECOVERY



HISTORY

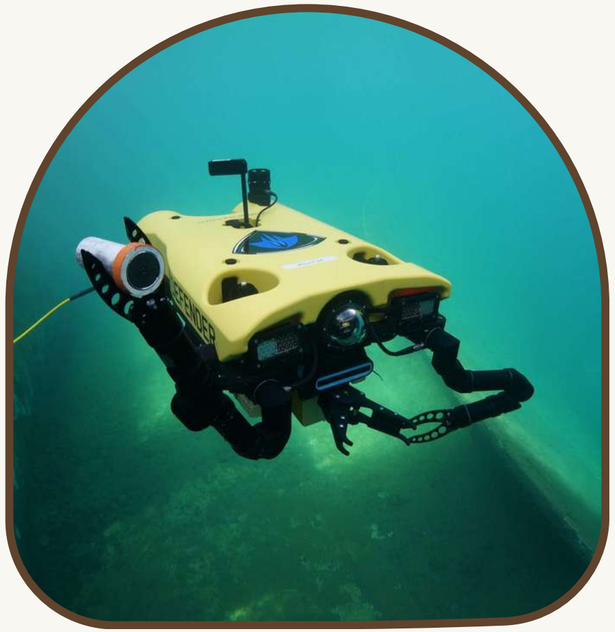
4. 1980 - ROV TECHNOLOGY HAD BEEN ADAPTED AND WAS IN USE IN THE OIL AND GAS INDUSTRIES.

5. NOWADAYS, INVENTION AND INNOVATION OF ROV TECHNOLOGY, THEY HAVE INFILTRATED MANY MORE INDUSTRIES BEYOND MILITARY SEARCH AND RESCUE.



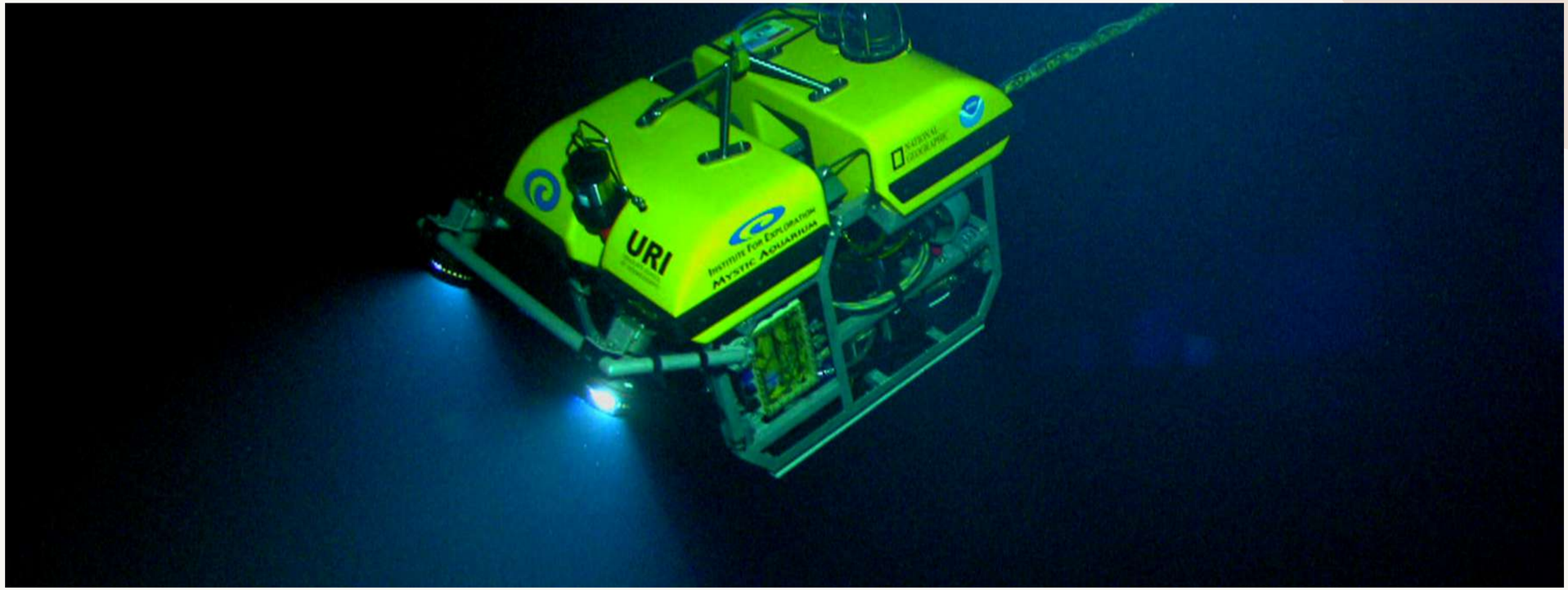
APPLICATIONS

- DAM AND WATER-TANK INSPECTIONS
- EXPLORATION AND COMMERCIAL APPLICATIONS
- MARINE CONSTRUCTION
- MILITARY AND LAW ENFORCEMENT
- UNDERWATER RESEARCH



- AQUACULTURE
- DROWNING-VICTIM RECOVERY
- EVIDENCE RECOVERY FOR PIPELINE MAINTENANCE
- SHIPPING

3. MAIN COMPONENTS



MAIN COMPONENTS

A) HULL DESIGN

B) PROPULSION SYSTEM

C) NAVIGATION SYSTEM

D) DATA COLLECTION

E) DATA TRANSMISSION

F) POWER MANAGEMENT

A)HULL DESIGN

Cylinder :

- Simple and popular hull design for small ROVs.
- The cylindrical shape makes it easy to control and maneuver in water.

Torpedo :

- More streamlined hull design that is often used for larger ROVs.
- The torpedo shape reduces drag and helps the ROV move more efficiently through the water.

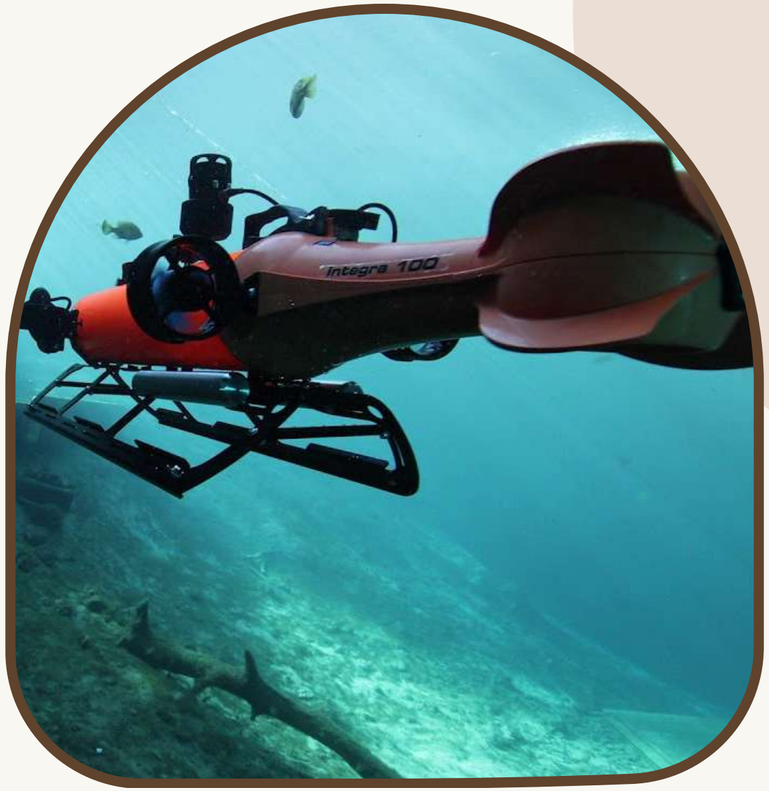
Box :

- Simple rectangular or square-shaped hull design that is often used for larger ROVs.
- Provides more internal space for equipment and sensors.

A)HULL DESIGN

Multi-hull :

- Consists of two or more hulls connected by a frame.
- Provides more stability and maneuverability.



Hybrid:

- Combines different hull shapes and features.
- Eg : cylindrical body with streamlined fins or wings
- Optimizing performance for a specific mission.

B) PROPULSION SYSTEM

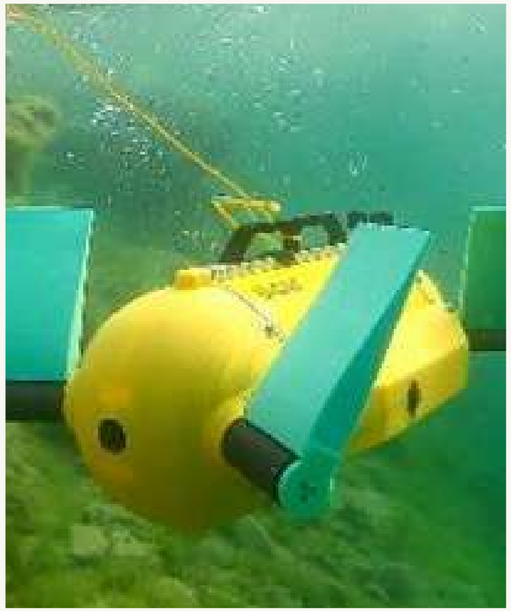
>>> THRUSTERS

- Common method of ROV propulsion.
- It work by pushing water out in one direction
- Most ROVs have at least four thrusters, one at each corner of the vehicle.

CRAWLERS <<<

- Some ROVs are equipped with wheels or tracks
- Allow them to crawl along the seafloor.
- Useful for ROVs that need to operate in rough terrain or on steep inclines.

B) PROPULSION SYSTEM



>>> FLIPPERS

- Use flippers, similar to those used by marine animals like dolphins and whales.
- Flippers work by pushing water in one direction, which propels the ROV in the opposite direction.

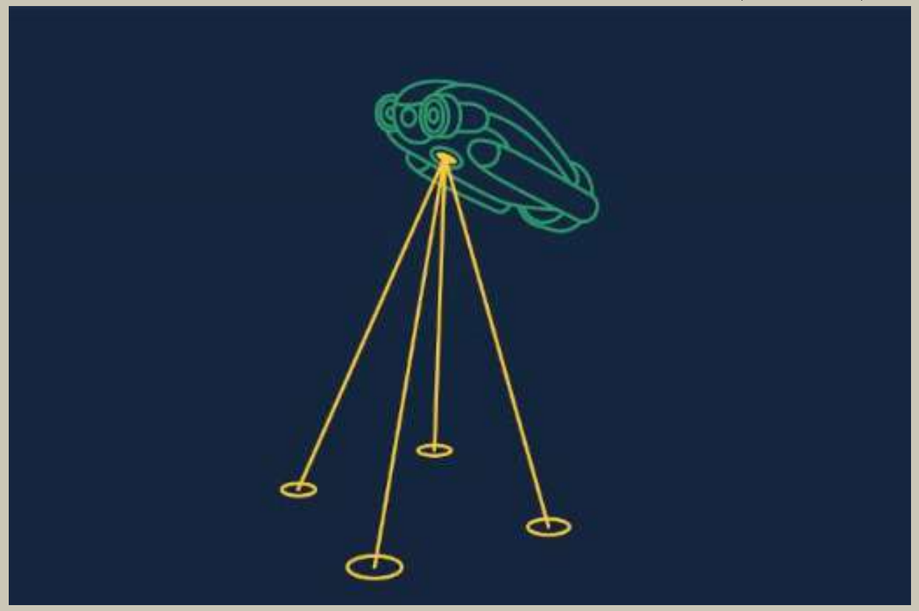
JET PROPULSION <<<

- Work by using a high-pressure jet of water to propel the ROV.
- Useful for ROVs that need to move quickly and maneuver in tight spaces.

C) NAVIGATION SYSTEM & CONTROLLER

• NAVIGATION SYSTEM

DOPPLER VELOCITY LOG (DVL)

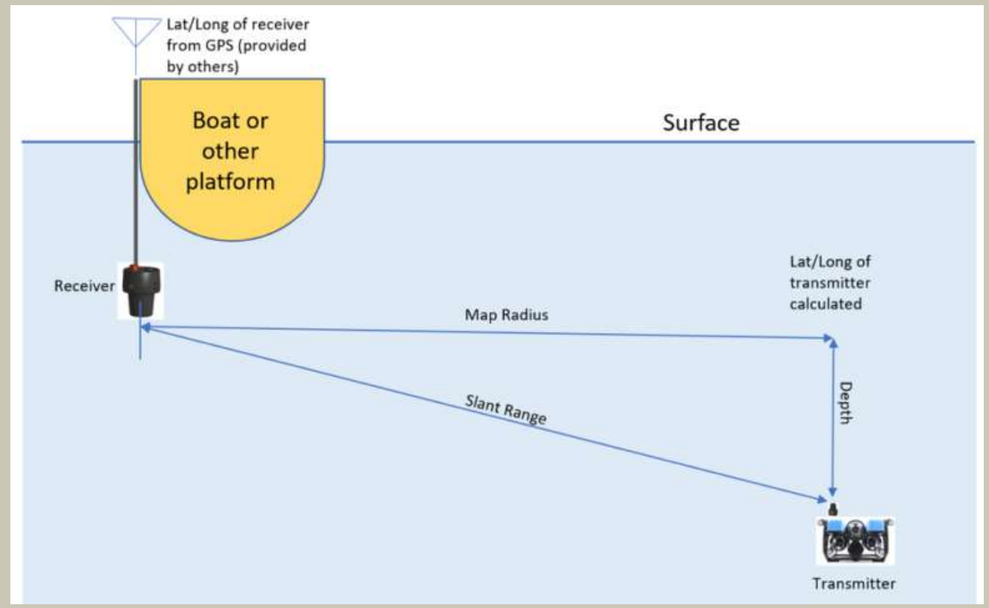


1. SOUND WAVE SENT
ACOUSTIC NARROW BEAM WAVE IS SENT FROM EACH OF THE FOUR TRANSDUCERS.

2. SOUND WAVE ECHO
THE SOUND WAVE WILL BOUNCE OFF THE BOTTOM AND THE TRANSDUCERS WILL RECEIVE THE ECHO.

3. MEASUREMENTS PERFORMED
THE DVL COMPUTER MEASURES THE RECEIVED ECHO AND THE IMU

USBL POSITIONING SYSTEMS



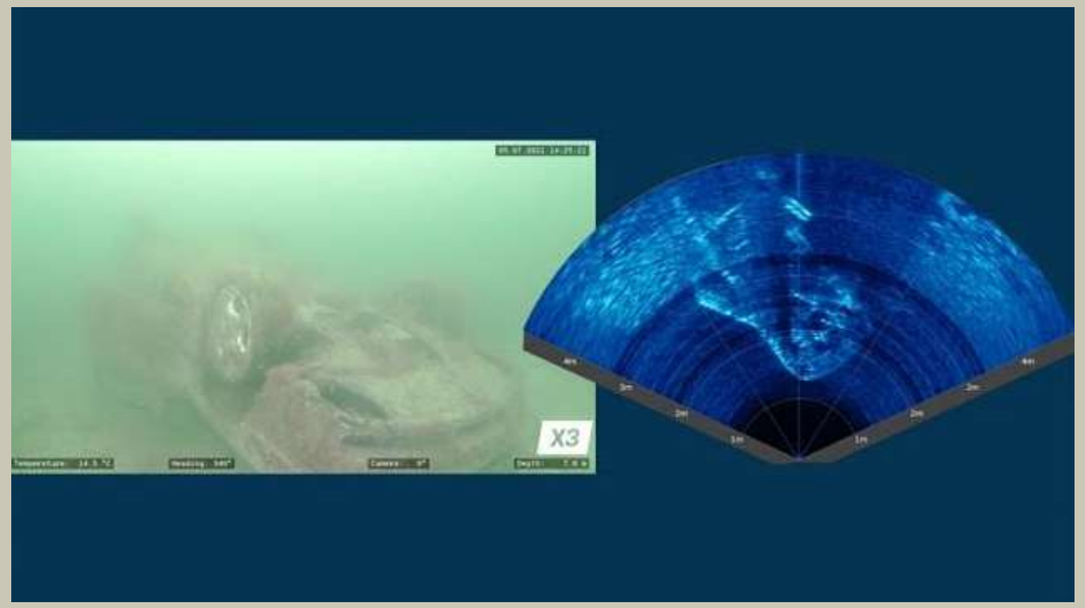
1.USBL CALCULATING TIME OF FLIGHT, RANGE AND BEARING ARE CALCULATED BY

2.ACOUSTIC PULSE IS TRANSMITTED FROM A TRANCIEVER ON THE VEHICLE AND THEN RECIEVED BY A RECEIVER ON THE SURFACE.

C) NAVIGATION SYSTEM & CONTROLLER

• NAVIGATION SYSTEM

MULTIBEAM IMAGING SONAR



THE HIGH FREQUENCY MULTIBEAM CAN EVEN INSPECT SMALL STRUCTURES WITH AN IMPRESSIVE MILLIMETER

HUNDREDS OF BEAMS OF SOUND ARE FIRED OFF SIMULTANEOUSLY TO GIVE REAL-TIME VIDEO WITHOUT NEEDING TO USE THE CAMERA.

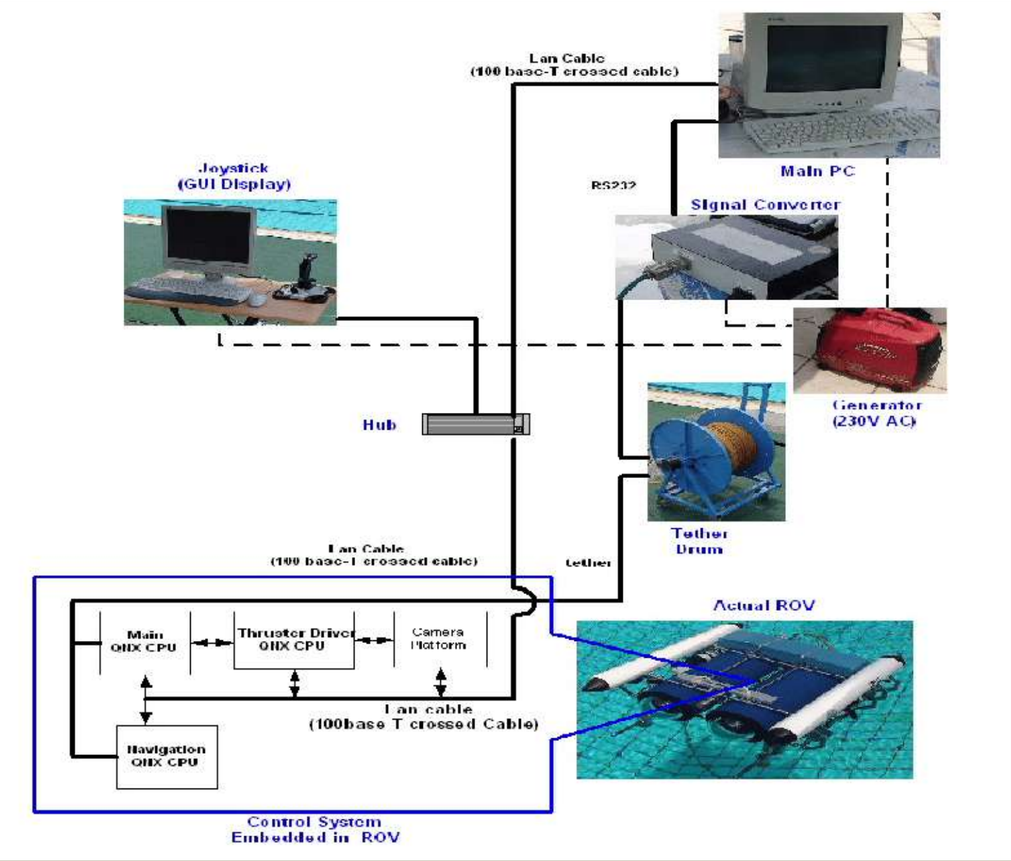
RECOGNIZING UNDERWATER LANDMARKS, OR IT CAN BE USED TO SEARCH FOR LOST OBJECTS ON THE SEAFLOOR.

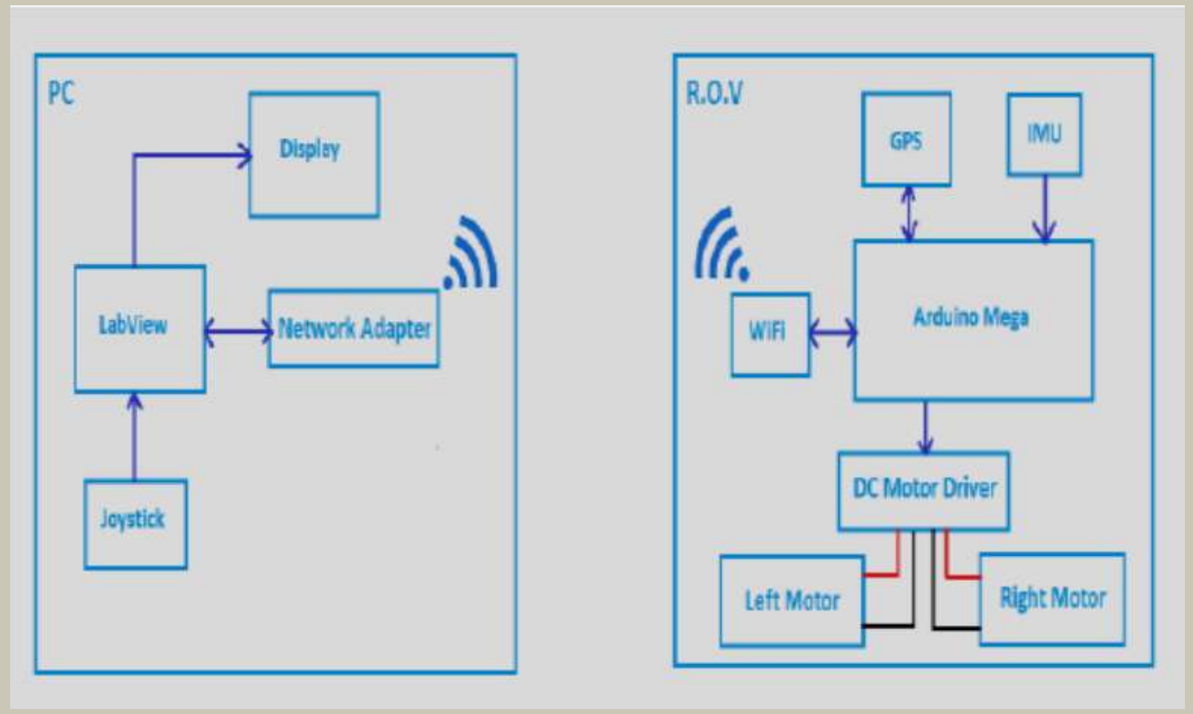
DEPTH SENSOR

- FINELY TUNED PRESSURE SENSORS CAN IDENTIFY THE ROVS DEPTH BELOW THE SURFACE.
- THIS ALLOWS FOR NAVIGATION AND AUTONOMOUS DEPTH CONTROL.

C) NAVIGATION SYSTEM & CONTROLLER

• CONTROL SYSTEM





- THE CONTROL SYSTEM CONTROLS THE DIFFERENT FUNCTIONS OF THE ROV, FROM CONTROLLING THE PROPULSION SYSTEM TO SWITCHING OF THE LIGHT(S) AND VIDEO CAMERA(S) .

- CONTROL STATIONS VARY FROM LARGE CONTAINERS, WITH THEIR SPACIOUS ENCLOSED WORKING AREA FOR WORK CLASS SYSTEMS, TO SIMPLE PC GAMING JOYSTICKS WITH PHDS WITH WILL BE CONDUCTED OUTSIDE THE WATER

D) DATA COLLECTION

MOST OF THE ROV CONTAINS RASPBERRY PI COMPUTER THAT COONNECTS TO VARIOUS SENSORS, INPUT AND OUTPUTS. SENSORS CAN BE ADDED/EXPANDED ACCORDING TO THE USER NEEDS.

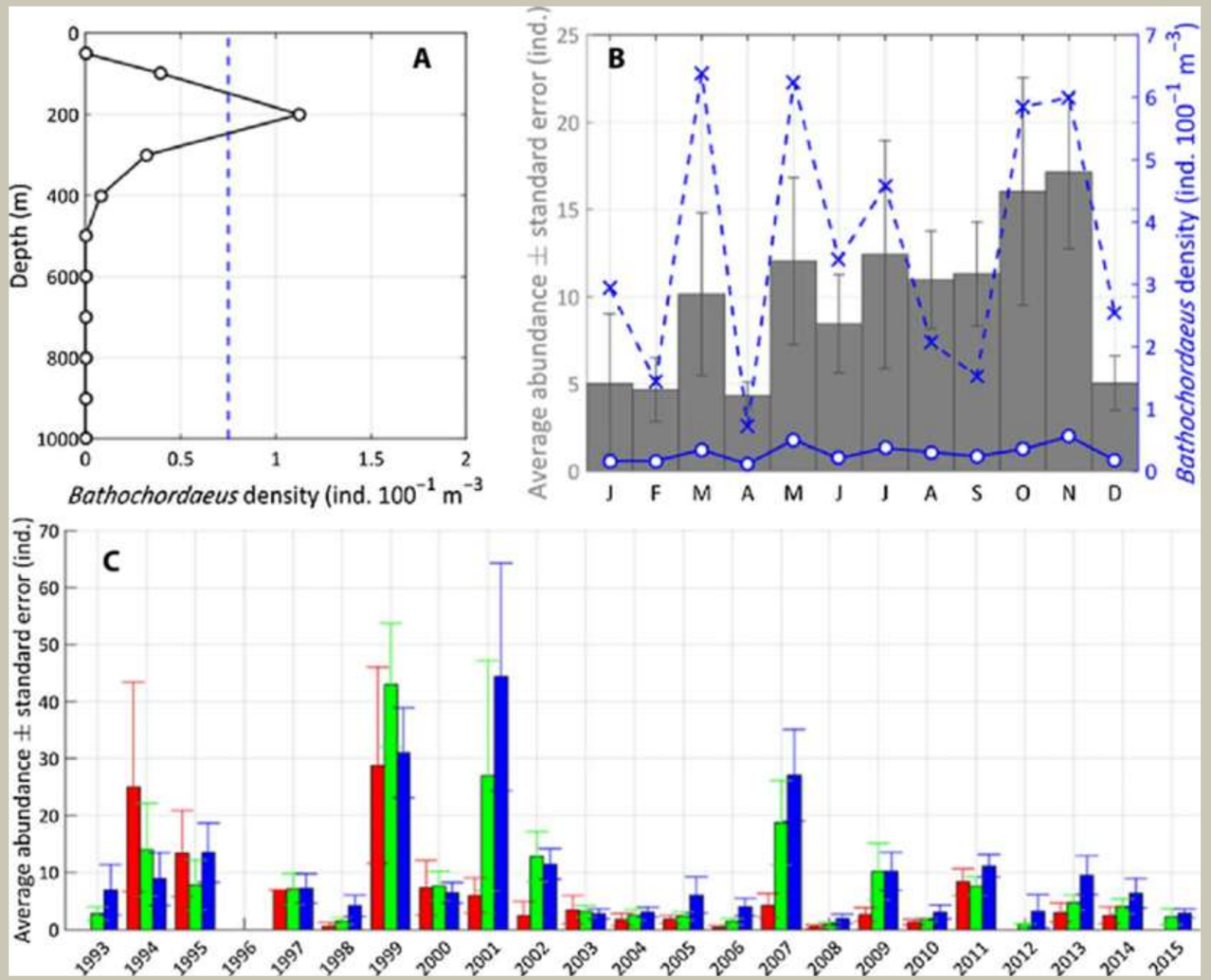
THE SENSORS ARE:

- BAR 30 PRESSURE/DEPTH & TEMPERATURE SENSOR
- 1080P HD CAMERA
- 3-DOF GYROSCOPE
- 3-DOF ACCELEROMETER
- 3-DOF MAGNETOMETER
- INTERNAL BAROMETER
- CURRENT & VOLTAGE SENSING
- LEAK DETECTION
- 2D IMAGING SONARS.
- 3D IMAGING SONARS.
- DOPPLER VELOCITY LOGS (DVL)
- ENVIRONMENTAL.
- INERTIAL NAVIGATION SYSTEMS (INS)
- MULTIBEAM ECHOSOUNDERS.
- MULTIPLEXERS

D) DATA COLLECTION

ALL SENSORS WILL SEND REAL-TIME SURVEILLANCE TO SCIENTISTS ABOARD THE SURFACE VESSEL.

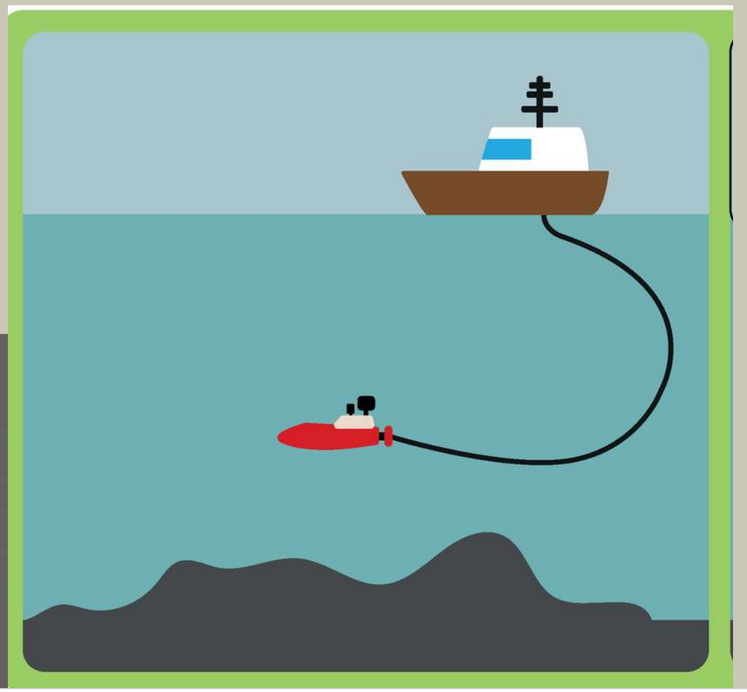
WATER DEPTH DATA »»



«« **WATER DENSITY DATA**

D) DATA TRANSMISSION

THERE ARE TWO COMMON WAYS IN TRANSMITING DATA FROM ROV TO THE USER WHICH ARE :



1.WIRED COMMUNICATION

- THIS INVOLVES THE USE OF FIBER OPTIC CABLES TO TRANSMIT DATA BETWEEN THE ROV AND THE SURFACE CONTROL SYSTEM.
- FIBER OPTIC CABLES CAN TRANSMIT LARGE AMOUNTS OF DATA AT HIGH SPEEDS AND ARE OFTEN USED IN APPLICATIONS WHERE HIGH-RESOLUTION VIDEO OR DATA IS REQUIRED.

EG : OPTICAL COMMUNICATION

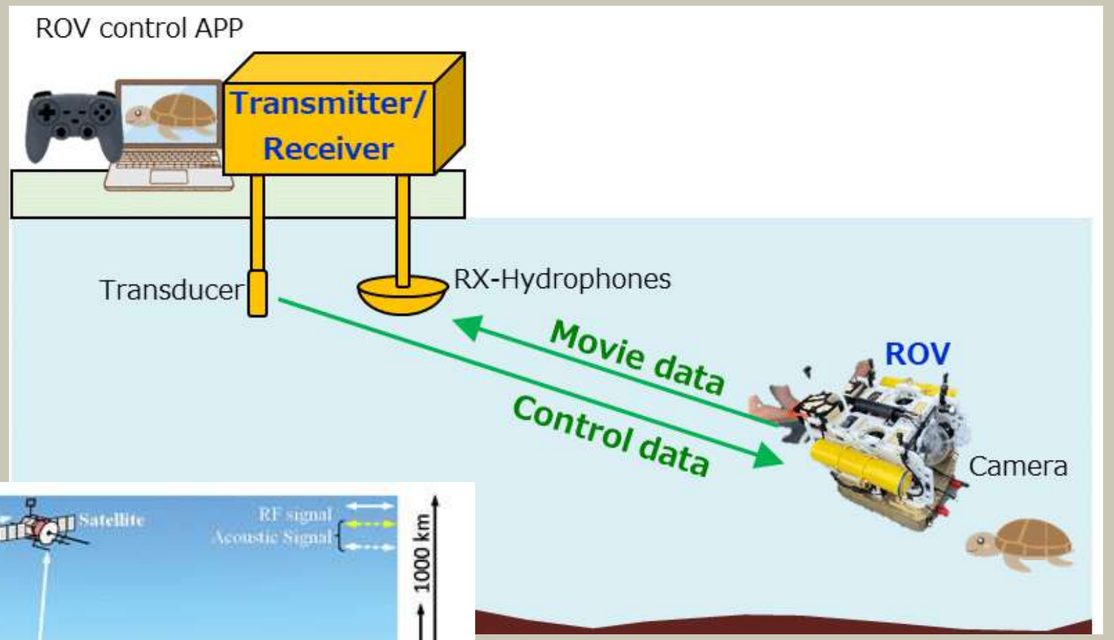
D) DATA TRANSMISSION

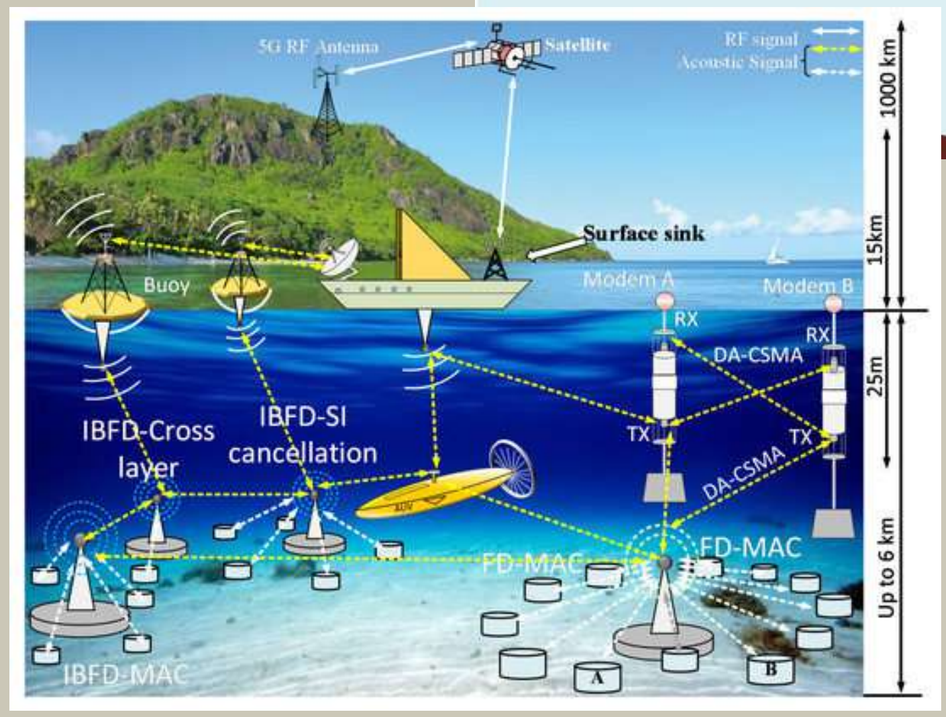
2.WIRLESS COMMUNICATION

- TECHNOLOGIES SUCH AS RADIO, SATELLITE, OR CELLULAR NETWORKS ARE USED TO TRANSMIT DATA BETWEEN THE ROV AND THE SURFACE CONTROL SYSTEM.

- THIS TYPE OF COMMUNICATION IS OFTEN USED WHEN THE ROV IS OPERATING AT A GREAT DISTANCE FROM THE SURFACE CONTROL SYSTEM.

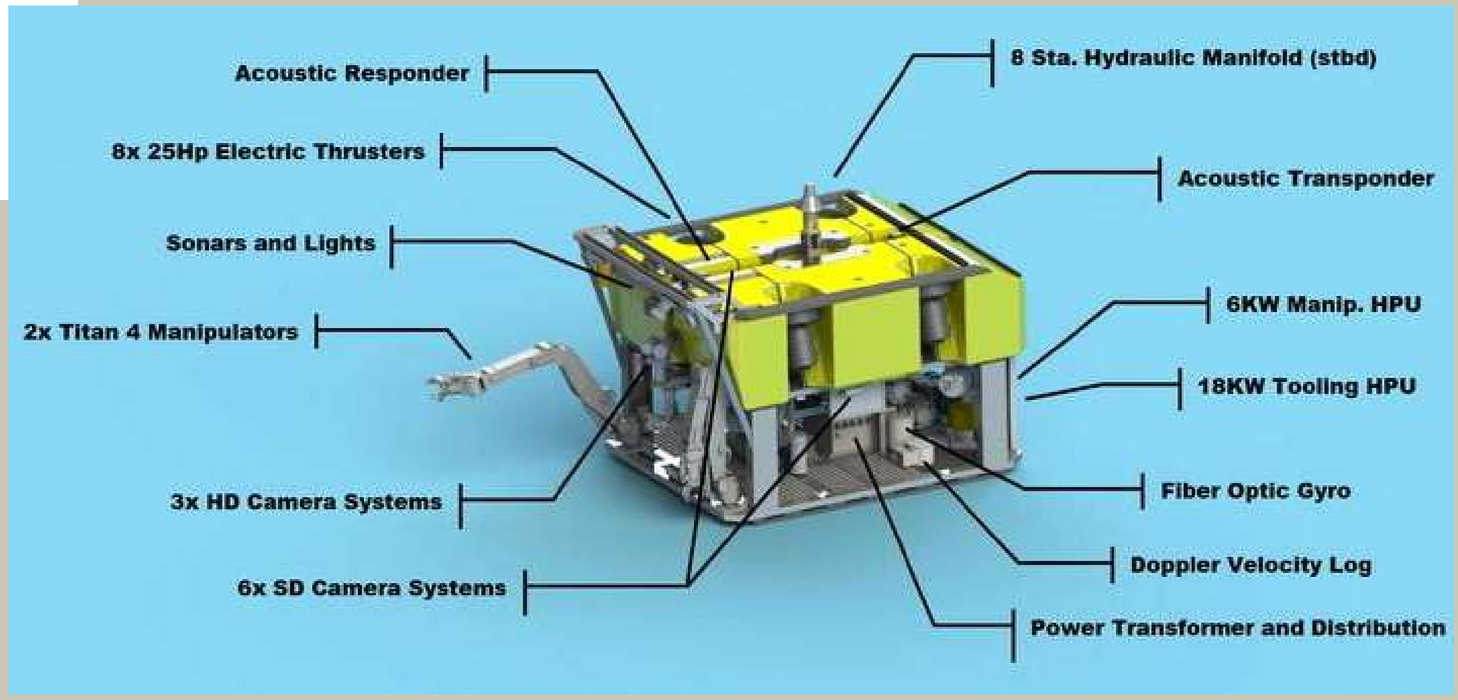
EG : ACOUSTIC COMMUNICATION (USING WAVE AS DATA TRANSMISSION)





E) POWER MANAGEMENT

BATTERY, PAYLOAD, ENDURANCE, SPEED..



E) POWER MANAGEMENT

THESE ARE THE COMMON POWER SUPPLY THAT WERE USED IN MANY ROV NOWADAYS :

LITHIUM-ION BATTERY (14.8V , 18AH)

IT IS STORED IN THE BOTTOM CYLINDER OF THE BODY THAT COULD LAST FOR 2 HOURS UNDERWATER

BLUEFIN 1.5 KWH SUBSEA BATTERY

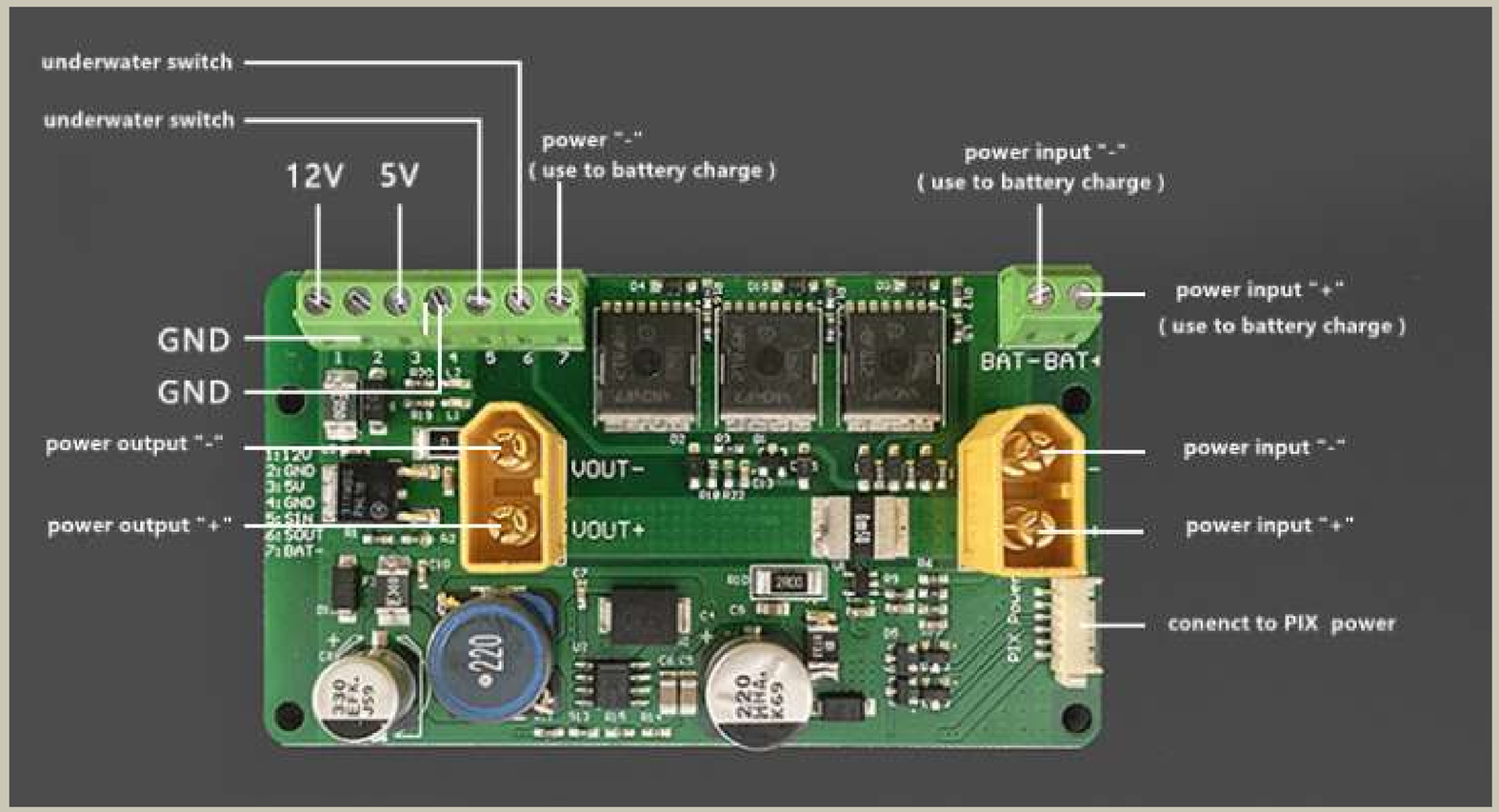
PRESSURE-TOLERANT LITHIUM-POLYMER BATTERY THAT PROVIDES A RELIABLE, HIGH-ENERGY DENSITY POWER SOLUTION FOR UNDERWATER SYSTEMS.

COULD LAST WITHIN 6 HOURS OF FULL CHARGE

E) POWER MANAGEMENT

OPENROV POWER MANAGEMENT BOARD

- THIS IS AN INTEGRATED POWER MANAGEMENT BOARD.XT60
- INTERFACE POWER, WHICH CAN DIRECT INPUT AND OUTPUT. WHEN THE POWER PASSES THROUGH THE ISOLATION AREA, IT CAN TRANSFER TO 5V AND 12 OUTPUT TERMINALS.
- THE 90A AMMETER INTERFACE, WHICH CAN DIRECTLY LINK TO THE PIX OR OTHER MASTER CONTROL AFTER ACT IN CONCERT WITH OUR UNDERWATER SWITCH.



E) POWER MANAGEMENT