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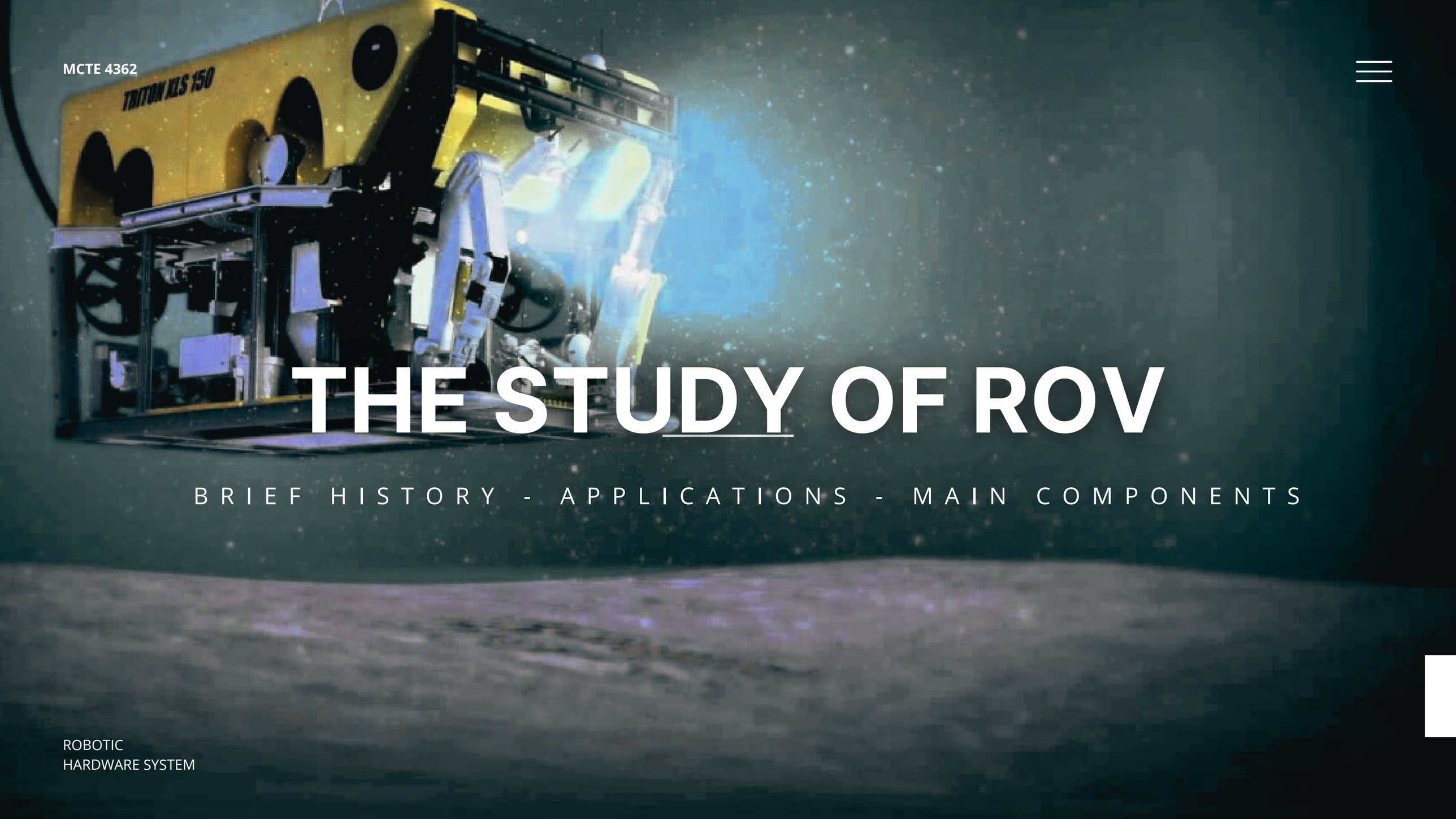



# THE STUDY OF ROV

BRIEF HISTORY - APPLICATIONS - MAIN COMPONENTS

ROBOTIC
HARDWARE SYSTEM


# WHAT IS ROV?

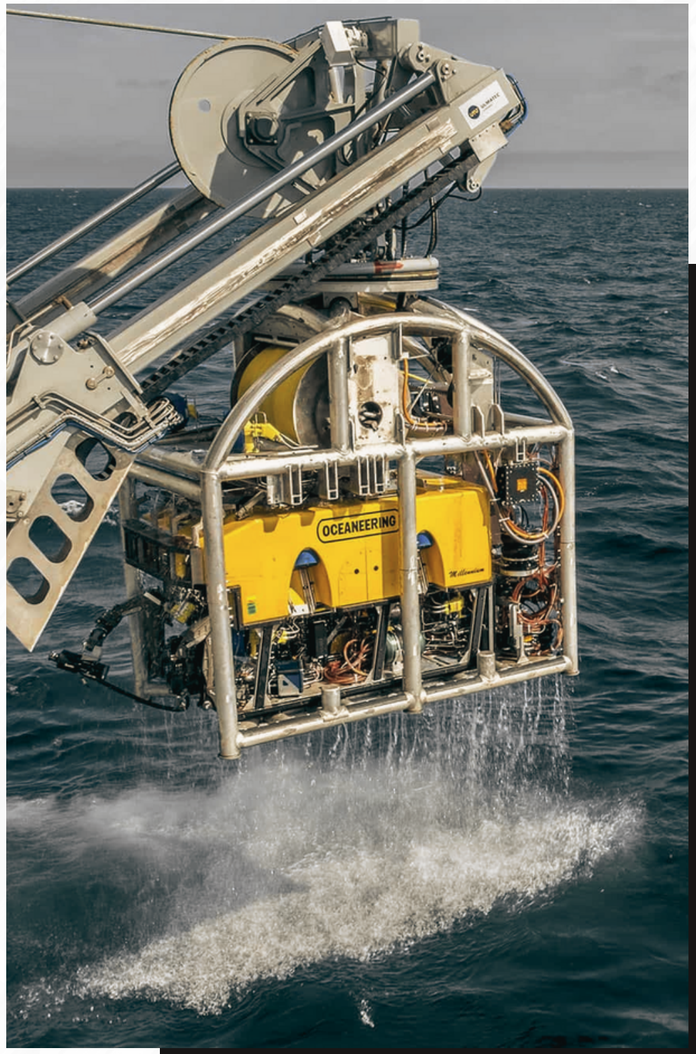
ROV stands for Remotely Operated Vehicle. It is a submersible robot used in underwater operations where it is not feasible or safe for humans to dive. ROVs are controlled by operators on the surface through a tether or a wireless connection, and they are equipped with cameras, lights, sensors, and various tools to perform tasks such as inspection, repair, surveying, and exploration. ROVs are used in a wide range of industries, including oil and gas, marine research, underwater construction, and military applications.

# BRIEF HISTORY OF ROV

The first ROVs were developed in the 1950s and 1960s by the US Navy for military purposes, such as underwater minesweeping and recovery of sunken objects. In the 1970s, the oil and gas industry began to use ROVs for exploration, inspection, and maintenance of offshore oil rigs and pipelines.

During the 1980s and 1990s, ROV technology continued to advance rapidly, with improvements in video cameras, sensors, and control systems. ROVs became smaller, more agile, and more capable, enabling them to perform a wider range of tasks in increasingly challenging environments, such as deep sea exploration and underwater archaeology.

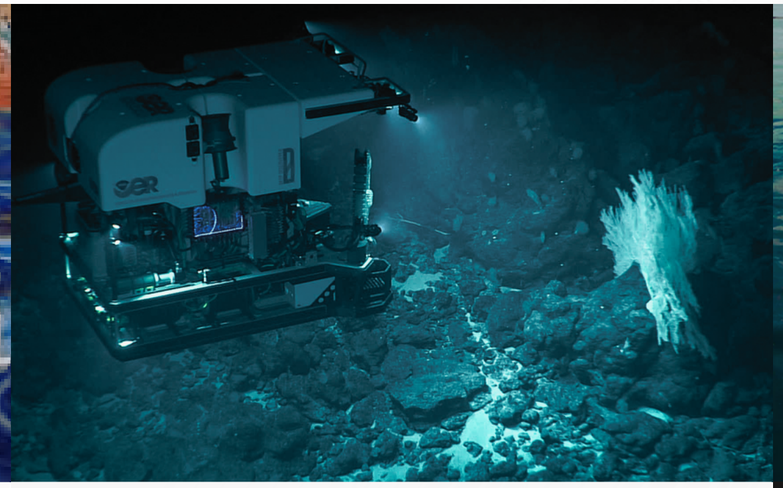
In recent years, the development of autonomous underwater vehicles (AUVs) and hybrid ROVs, which can operate both underwater and on the surface, has expanded the capabilities of underwater robotics even further. Today, ROVs and other underwater robots are used extensively in industries such as oil and gas, marine research, defense, and environmental monitoring.



# APPLICATIONS OF ROV

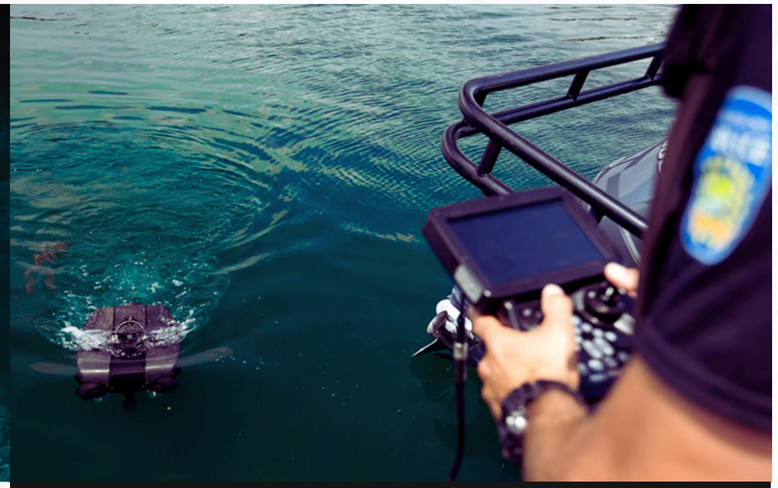
### OIL AND GAS INDUSTRY

ROVs are commonly used in the oil and gas industry for pipeline inspection, underwater maintenance, and repair work.



### MARINE SCIENCE AND EXPLORATION

ROVs are used by marine scientists to explore and study the ocean floor, underwater ecosystems, and marine life.



### SEARCH AND RESCUE

ROVs equipped with cameras and sonar can be used in search and rescue operations to locate and retrieve submerged objects or people.

# APPLICATIONS OF ROV

### MILITARY AND DEFENSE

ROVs are used by military and defense organizations for underwater surveillance, mine detection, and other tasks.

### INFRASTRUCTURE INSPECTION

ROVs can be used to inspect and assess the condition of underwater infrastructure such as bridges, dams, and offshore wind turbines.

### FILM AND MEDIA

ROVs can be used to capture high-quality footage and images of underwater environments for film and media productions.

# MAIN COMPONENTS OF ROV

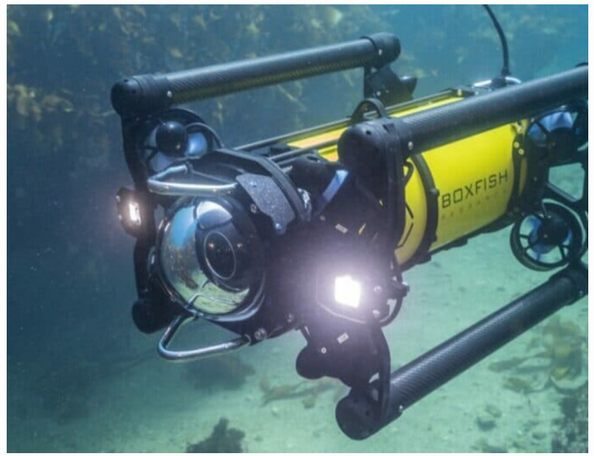
ROBOTIC
HARDWARE SYSTEM

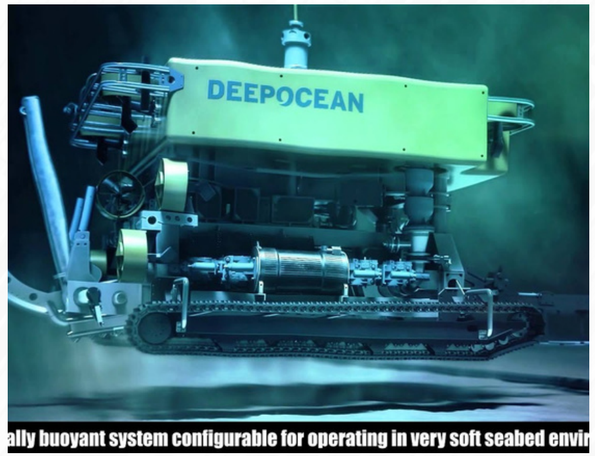


# FRAME

The frame of an ROV is the structure that provides support and protection for the various components of the vehicle. ROV frames are typically constructed from lightweight and corrosion-resistant materials such as aluminum, titanium, or composite materials. The frame consists of several components, including the hull, the ballast system, the propulsion system, and the control system.

The hull is the outermost component of the frame and is responsible for providing protection to the internal components from the harsh underwater environment. The ballast system is used to adjust the buoyancy of the ROV, allowing it to move up and down in the water column. The propulsion system consists of one or more thrusters that provide the vehicle with the ability to move through the water. Finally, the control system includes the hardware and software necessary to operate the ROV from the surface, including the video camera, lights, and other sensors that provide feedback to the operator.




# PROPULSION SYSTEM

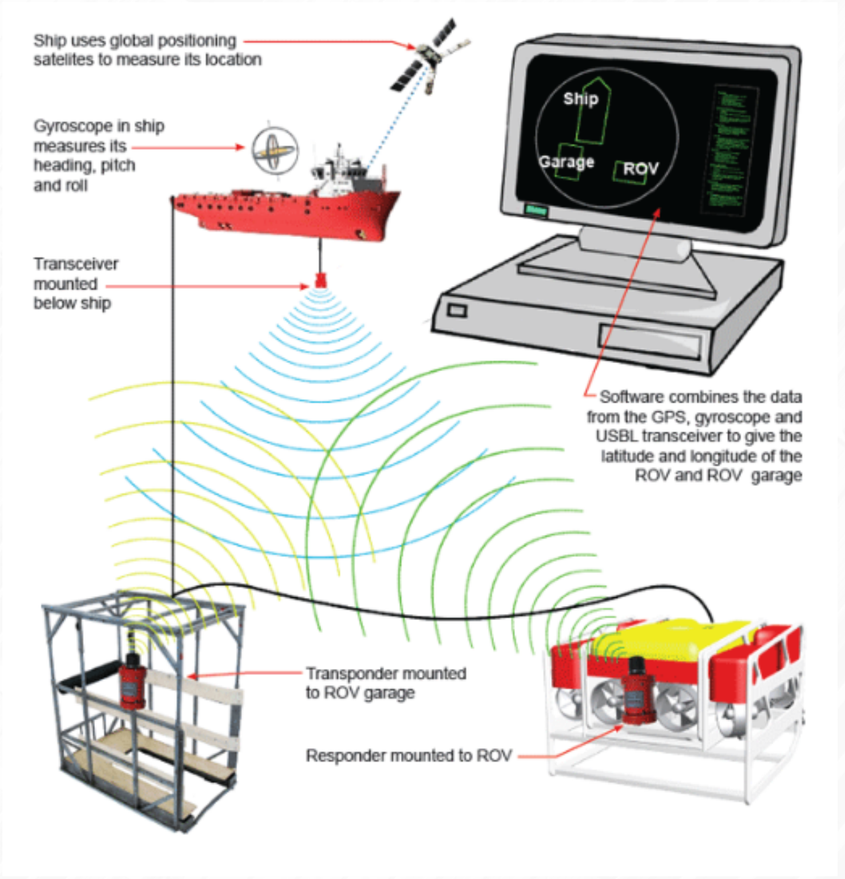
There are several different types of propulsion systems used in ROVs, including thrusters, propellers, and water jets. Thrusters are the most common type of propulsion system used in ROVs. They work by using an electric motor to turn a propeller, which creates a flow of water that propels the ROV in the desired direction. Thrusters are typically located at the front and rear of the ROV, and they can be controlled independently to provide precise movement and maneuverability.

Propellers are another type of propulsion system used in ROVs. They work by rotating a set of blades that create a flow of water that propels the vehicle forward or backward. Propellers are typically located at the rear of the ROV and are powered by an electric motor. Water jets are less common in ROVs, but they are sometimes used in specialized applications. Water jets work by drawing water in through an intake and then forcing it out through a nozzle, creating a jet of water that propels the ROV forward. Water jets are typically used in applications where high maneuverability is required, such as in search and rescue operations.

# NAVIGATION & CONTROL SYSTEM

The navigation system typically includes a suite of sensors that allow the ROV to determine its position and orientation relative to a reference point, typically the surface vessel or a known location on the seafloor. These sensors can include depth sensors, compasses, gyroscopes, accelerometers, and sonar systems. The data from these sensors is processed and used by the control system to guide the ROV to its desired location.

The communication system allows the operator to control the ROV and receive feedback from the vehicle while it is underwater. This system can include both wired and wireless communication systems, with the most common being a tethered connection to the surface vessel. The tether carries power, video, and data signals between the ROV and the surface. The data transmission can be both unidirectional or bidirectional. Additionally, wireless communication systems, such as acoustic modems or satellite links, can be used in some applications where a tethered connection is not possible or desirable.



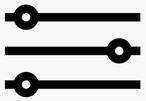
# DATA COLLECTION OF ROV

The data collected by ROVs can provide valuable insights into the underwater environment and inform a variety of scientific and engineering applications, including marine biology, oceanography, and underwater resource exploration depending on the mission given.

# DATA TYPE COLLECTED

- **Imaging and video**: ROVs are typically equipped with cameras that allow for visual inspection of underwater structures, marine life, and other features of interest. High-resolution video and still images can be collected for later analysis.
- **Sonar**: Sonar systems can be used to generate images of the seafloor, map underwater topography, and detect objects and structures that may not be visible with cameras.
- **Environmental sensors**: ROVs can be equipped with a variety of environmental sensors to measure parameters such as temperature, salinity, dissolved oxygen, and pH. These data can be used to study the physical and chemical properties of the water column and the impacts of human activity on the marine environment.
- **Sampling and collection tools**: Some ROVs are equipped with sampling and collection tools that allow for the collection of sediment, rock, water, or biological specimens for later analysis in the laboratory.
- **Navigation data**: ROVs can collect data on their position, speed, and orientation during the mission, which is critical for tracking the vehicle's path and ensuring accurate data collection.

# DATA TRANSMISSION



## Tethered Connection

The most common method of data transmission in ROVs is a tethered connection to the surface vessel. The tether carries power, video, and data signals between the ROV and the surface. The data transmission can be both unidirectional or bidirectional. This method is preferred for applications that require high bandwidth and real-time data transmission.

## Wireless Commucnication

In some applications where a tethered connection is not possible or desirable, wireless communication systems, such as acoustic modems or satellite links, can be used. These methods are typically slower and have lower bandwidth than tethered connections but can be useful in situations where a tether is not practical.

## Data Storage

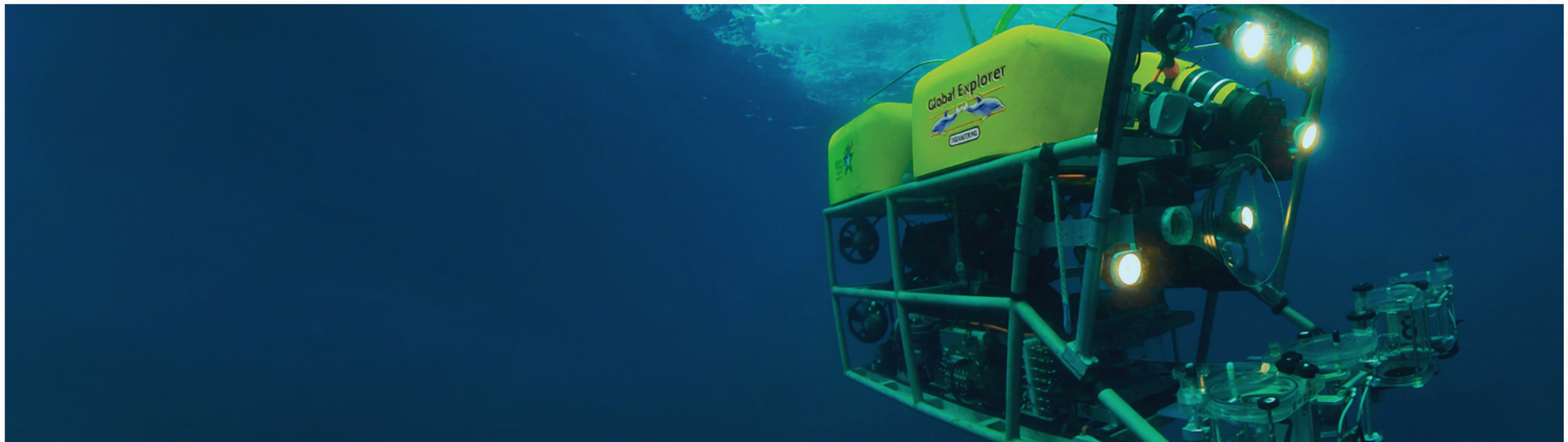
Some ROVs are equipped with onboard data storage systems that allow for data to be recorded and saved onboard the vehicle. This data can be retrieved after the mission is completed.

# POWER MANAGEMENT

An ROV must have efficient power management in order to function properly. Operators may make sure the ROV has enough battery life to carry out its mission safely and effectively by keeping an eye on power usage and putting power-saving measures in place.

# THANK YOU

"To find the pearls in life's ocean, you have to venture out far past the shore." – Unknown




ROBOTIC
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