Multi-Project!

# TOMCAT ROV and Mobile Operation Center

Multi-Discipline!

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## OBJECTIVE

The objective of the TOMCAT Remotely Operated Vehicle (ROV) is to assist in underwater archeological missions featuring wide range of maneuverability, live feed at the surface, and a claw able to cut cable or rope in assistance to a diver or large crawler vehicle.

## DESIGN CRITERIA

The TOMCAT was designed to have improvements in the following parameters:

- Aesthetics
- Communication
- Internal wiring

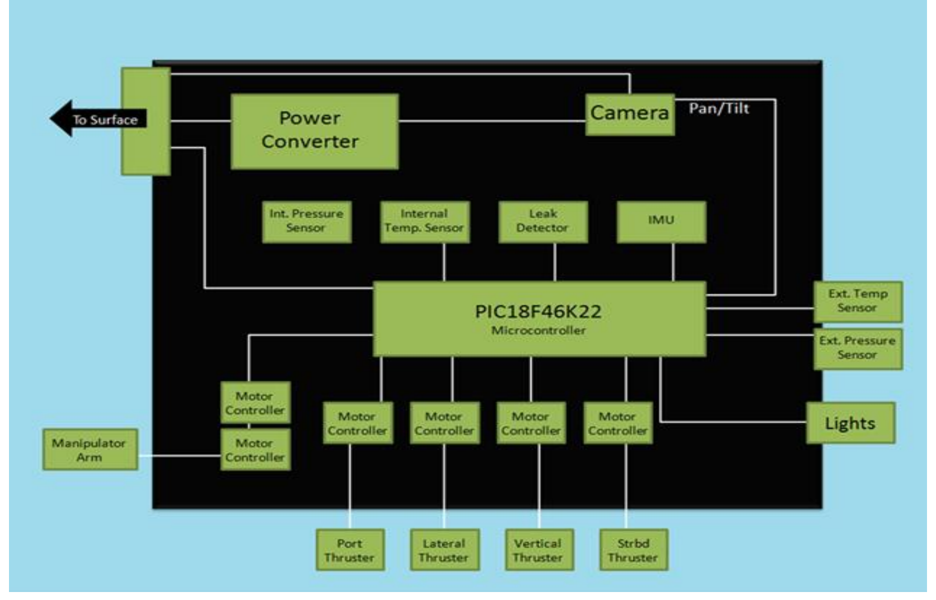
## SYSTEM DESIGN: MECHANICAL


The body of the TOMCAT was sandblasted and repainted using an epoxy-based paint after a self-etching primer was applied. This new coat will keep the ROV from corrosive damage in long missions. Mounting plates were made for the thrusters to secure to the frame and reduce the risk of malfunction during deployment. The TOMCAT frame was also given I-bolts as lift points for easy deployment during a mission.

The buoyancy "hat" of the ROV was cut to reduce the uplift in order to make the TOMCAT neutrally buoyant.

The internal pressure chamber was reorganized with professional circuit boards in order to optimize space and was successfully tested to 300 ft. deep.

## SYSTEM DESIGN: ELECTRICAL




**Vehicle:**

The PIC inside the TOMCAT reads the information sent from the surface to control each aspect of the vehicle. It communicates with 4 motor drivers, controlling the speed and direction of each brushless DC motor. There is one lateral thruster, one vertical thruster, and two forward thrusters. The PIC also controls the motors for the pan and tilt functions of the camera, a relay to turn the lights on or off, and another 2 motor drivers that control the claw rotation and grip.

There is a display in the stern of the vehicle providing the voltage and current that has reached the vehicle and consisting of multiple LEDS. The LEDs indicate if the vehicle is receiving power and communications, and if a thruster is supposed to be moving and its direction. There is a pressure sensor, temperature sensor, and leak detector that send information to the PIC to then communicate with the surface. A circuit breaker and fuses are installed in the hull of the vehicle to protect its circuitry.


**Surface:**

To power the TOMCAT and surface box, a cable connected to a 110 V AC power supply is plugged into the side of the control box. Here the cable splits, directly powering the video monitor and 12 V DC power converter and running through two relays. One relay is used to alert the pilot of any leaks or overheating and the other goes to the vehicle and is used to shut off power instantly in an emergency. The alert system consists of a warning light and an alarm. The monitor displays video feed, as well as, various information about the vehicle's condition including depth and internal temperature. The current and voltage going to the vehicle are displayed on an LCD screen in the surface box. Connected to the surface box, is the control box containing multiple joysticks and switches to control the lights, thrusters, camera pan and tilt, and claw actions. The information about the positions of everything on the control box are sent to a PIC microcontroller in the surface box. The PIC the converts this information to a serial string and sends it a PIC in the vehicle.

## COMMAND CENTER


The purpose of the Mobile Command Center is to have a safe, comfortable and secluded area to operate the Crawler and TOMCAT. The command center was outfitted with windows, easy access door, air-conditioning, and worktable. This allows for versatility of the trailer and adaptation to any environment. The trailer is also equipped with lift points to be able to transfer it to any ship deck.

The Command Center was successfully deployed on a research vessel during the summer and kept occupants cool and dry during operation of the vehicles. Both surface boxes were able to be set up in the trailer along with monitors for the cameras during deployments underwater.

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