



2005 MATE Center/MTS ROV Committee ROV Competition for High School & College Students

www.marinetech.org/rov_competition/index.php



Competition Scenarios & Mission Tasks



RANGER Class “Underwater Olympics”

COMPETITION OVERVIEW

The 2005 ROV competition is divided into two competition classes: **RANGER** and **EXPLORER**. The **RANGER** class is suitable for those who have limited budgets and/or prefer to work with “hardware store” technology; **RANGER** ROVs operate at a maximum of 13 volts, 25 amps. This class is by far the most popular with high school students – but don’t be fooled. **RANGER** mission tasks are equally as challenging as those faced by **EXPLORER** class teams.

In addition to the underwater mission tasks, both classes will be challenged with engineering evaluation interviews, technical reports, and posters displays. The scoring breakdown is as follows:

- Mission – 90 points (max), plus a time bonus
- Engineering & communication – 120 points (max)
 - Engineering evaluation – 80 points (max)
 - Technical reports – 25 points (max)
 - Poster displays – 15 points (max)

Information about **RANGER** class competition scenarios and mission tasks is included in *this* document; the *Engineering & Communication* document contains information about the interview, report, and display requirements. Task specifications, including information about mission “props,” are included in the *Mission Task Specifications* document.

UNDERWATER OLYMPICS

The **RANGER** class underwater competition consists of three “Olympic” events. Each event has a different theme that relates to how ROVs are used in the real world.

RANGER class teams will get two attempts, or “heats,” at each event. The better of the two scores will be used to determine the top winner of each event and will be added to the engineering and communication score to determine the total, overall score for the competition. In the case of a tie, the second (lower) score will be used to determine the winner of a particular event.

Each event is worth 30 points with the possibility of a time bonus score. The time allotted to complete each event (i.e., the mission performance period) is just 5 minutes, plus 5 minutes to set up your system and 5 minutes to demobilize your equipment and exit the control shack. Your team will receive 0.1 points for every second under 5 minutes remaining.

Event #1 – Cap an oil well in the Gulf of Mexico.

An oil platform in the Gulf of Mexico's Green Canyon lease block #272 no longer produces enough oil to make it economically feasible to continue drilling operations. The plan is to decommission the platform and turn it into an artificial reef.

Before removing the top of the platform and converting the base into an artificial reef habitat, the oil well must be capped. The first step in this process is to shut down the oil pipeline leading to shore – in other words, to turn off the flow of oil.

Your task is to:

- **Descend to the base of the oil platform.**
- **Turn a valve to stop the oil from flowing.**
- **Return to the surface.**

The valve will be mounted between two members of the oil platform. It will have handle that will be oriented horizontally and require a one-quarter turn to shut off the flow. An arrow will indicate the direction in which to push the valve. Water will stop flowing from the “oil well” when the valve is successfully turned.

Scoring – 30 points + time bonus:

- 5 points – Vehicle operating (props turning) under its own power
- 5 points – Descend to and physical touch the valve
- 20 points – Successful mission (the oil stops flowing from the top of the oil platform)

- Time bonus – 0.1 point for every second under 5 minutes remaining
Your mission performance period ends when your ROV has turned off the valve, returned to the surface, and physically touched the edge of the pool in front of the control shack. Time bonus points will be awarded upon completion of these mission requirements.

Diving Deeper:

On-line resources for learning more about the oil and gas industry

- Oil and gas industry – www.oilandgasonline.com/content/homepage/default.asp and www.offshore-technology.com/
Oil and Gas Online and Offshore Technology provide information about companies, products and services, and the latest industry news. These sites also contain job postings, training opportunities, and other resources for working professionals.
- The drilling process – <http://science.howstuffworks.com/oil-drilling.htm>

This “how stuff works” site describes the drilling process – from exploration and discovery to extraction and production.

- Rigs-to-Reefs – www.gomr.mms.gov/homepg/regulate/environ/rigs-to-reefs/information.html

The Minerals Management Service (MMS) is the federal agency that manages the U.S. natural gas, oil, and other mineral resources on the outer continental shelf. MMS’ Rigs-to-Reefs policy supports and encourages the reuse of oil and gas structures for offshore artificial reefs.

Competition sponsors that support the oil and gas industry

- Oceaneering International – www.oceaneering.com
- Perry Slingsby Systems – www.perryslingsbysystems.com
- Stolt Offshore – www.stoltoffshore.com
- Sonsub Incorporated – www.sonsub.com
- Phoenix International – www.phnx-international.com
- SeaCon Brantner – www.seaconbrantner.com
- Impulse – www.impulse-ent.com

OceanCareers.com – Find it. Learn it. Earn it.

The MATE Center’s OceanCareers.com web site contains information about wellhead pumpers, oil and gas roustabouts, geological data technicians, petroleum engineers, and many more careers that help to provide heat, light, and mobility to the masses!

Event #2 – Repair a damaged fiber optic cable connection to re-establish a communications link.

A subsea telecommunications company just learned that a fiber optic cable providing high speed, high bandwidth communication to several offshore oil platforms in the Gulf of Mexico is damaged. The damaged cable is interrupting voice, data, and video communications between several platforms and their base operations on shore.

An initial survey of the damage shows that the cable is severed where it joins to an undersea junction box. Re-establishing the connection involves laying a new piece of cable and inserting its endpoint – also known as a communications probe – into an open port on the junction box.

Your task is to:

- **Transport the fiber optic cable and communications probe from the surface to the undersea junction box.**
- **Insert the communications probe into the open port on the junction box to re-establish the communication link to the surface.**
- **Return to the surface.**

The junction box will be resting on a platform, and the open port will be located on the top, horizontal, flat surface of the box. The fiber optic cable and attached communications probe will be long enough to reach the box, and the probe will be small

enough to fit inside the port. The probe will be a small, vertical cylinder and the cable will be attached to one end. A PVC ring will also be secured to this end. A strobe light flashing topside will indicate a successful connection.

Scoring – 30 points + time bonus:

- 5 points – Vehicle operating (props turning) under its own power
- 5 points – Deliver and physically touch the cable and communications probe to the junction box
- 20 points – Successful connection (a strobe light flashes topside)

- Time bonus – 0.1 point for every second under 5 minutes remaining
Your mission performance period ends when your ROV has made a successful connection, returned to the surface, and physically touched the edge of the pool in front of the control shack. Time bonus points will be awarded upon completion of these mission requirements.

Diving Deeper:

On-line resources for learning more about the offshore telecommunications industry

- Gulf Fiber Corporation – www.gulffibercorp.com/index.html
Gulf FiberNet™ is a project that is working to connect the offshore industry through a system of fiber optic cables that spans the heart of offshore operations in the Gulf of Mexico.
- ODI Advanced Technology Systems – www.odi.com
ODI manufactures subsea electrical and fiber-optic interconnect systems that are used worldwide for offshore oil and gas, defense, oceanographic, and research applications.
- DiveWeb Subsea Telecomm Channel – www.diveweb.com/telecom/index.shtml
Find the latest subsea telecommunications projects and news here!
- How a fiber optic cable works – www.howstuffworks.com/question402.htm
This “how stuff works” site describes how a fiber optic cable carries a signal.

Competition sponsors that support the offshore telecommunications industry

- Perry Slingsby Systems - www.perryslingsbysystems.com
- Oceaneering International – www.oceaneering.com
- Sonsub Incorporated – www.sonsub.com
- SeaCon Branter – www.seaconbrantner.com
- Impulse – www.impulse-ent.com

OceanCareers.com – Find it. Learn it. Earn it. The MATE Center’s OceanCareers.com web site contains information about ROV technicians, electricians, and other careers that support the offshore telecommunications industry, helping to provide communication connections worldwide – and allowing us to surf the ‘net!

Event #3 – Install a new instrument module on the Hubble space telescope.

The Hubble space telescope was designed to be modular and astronaut (and robot) friendly. This design allows NASA to equip the Hubble with new, state-of-the-art scientific instruments every few years, giving the telescope exciting new capabilities with each servicing mission.

NASA is putting together a mission to install a new instrument module on the telescope. Like most of its space missions, practice “runs” are being conducted in the Sonny Carter Training Facility’s Neutral Buoyancy Lab at NASA’s Johnson Space Center just outside of Houston. The underwater environment mimics the weightless conditions that both astronauts and robots experience in space.

Your task is to:

- **Transport the instrument module from the surface to the telescope secured to a platform in the NBL pool.**
- **Place the module on the designated location on the telescope.**
- **Return to the surface.**

The telescope is just a simulation. The designated location for the module will be on the side, vertical, flat surface of the mock telescope. The module will have a protruding dowel attached to its center. A small loop of line will be attached to top of the dowel. A strobe light flashing topside will indicate a successful insertion.

Scoring – 30 points + time bonus:

- 5 points – Vehicle operating (props turning) under its own power
- 5 points – Deliver and physically touch the instrument module to the telescope
- 20 points – Successful insertion (a strobe light flashes topside)

- Time bonus – 0.1 point for every second under 5 minutes remaining
Your mission performance period ends when your ROV has made a successful insertion, returned to the surface, and physically touched the edge of the pool in front of the control shack. Time bonus points will be awarded upon completion of these mission requirements.

Diving Deeper:

On-line resources for learning more the Hubble space telescope

- The Hubble Project - <http://hubble.nasa.gov>
Launched in 1990, the Hubble orbits 600 kilometers (375 miles) above Earth, working around the clock to unlock the secrets of the universe. Learn more about the telescope and all that it has discovered at the Hubble Project’s web site.
- The Hubble Site - <http://hubblesite.org>
The latest news, a gallery of images, and information about the telescope’s discoveries are among the features found on this site.
- Eye on the Universe – the Hubble Space Telescope – www.thetech.org/exhibits/online/hubble
This San Jose Tech Museum of Innovation web site features the Hubble telescope.

Competition sponsors that support space science and exploration

- NASA – www.nasa.gov
- Sonny Carter Training Facility’s Neutral Buoyancy Lab – www.jsc.nasa.gov/dx/dx12
- Oceaneering International, Oceaneering Space Systems – www.oceaneering.com/adtech/space/adtech_space.htm

OceanCareers.com – Find it. Learn it. Earn it.

Did you know that engineers, electricians, mechanics, and technicians who work in ocean fields can apply their knowledge and skills to working in space? See The MATE Center’s OceanCareers.com web site for information about these careers and the knowledge and skills they require that can be used from the depths of the oceans to the far reaches of outer space.