MATE ROV Competition: Challenging students to develop technical and 21st century workplace skills

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Associate Director & Competition Coordinator, MATE Center

Chair, Marine Technology Society (MTS) – Monterey Bay section

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MATE COMPETITION PHILOSOPHY

The MATE ROV competition is about **student learning**.

It is designed to be an educational and inspirational event for **students** that challenges them to apply the physics, math, electronics, and engineering skills they are learning in the classroom to solving practical problems from the marine workplace.

Mentors (teachers, parents) are expected to limit their input to educational and inspirational roles and encouraged to focus on benefits to the **students** from the learning process and not simply “winning” the competition.

BACKGROUND

Partnering with the MTS ROV Committee to…

– **Address shortage of skilled individuals to support the marine industry**

- Reach more students & get them interested in the industry
- Help students develop the skills to support marine activities

– **Provide a venue for industry to become involved with education**

- Funds – to support student participation
- Industry mentors – complement & expand students' & educators' knowledge and expertise

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TO DATE…

- Has involved well over 10,000 students in grades 4-16 who work in teams to tackle missions based on the ocean STEM workplace
- Includes one international competition and a network of 23 (and growing!) regional contests
- Involves 100s of working professionals & organizations
- Includes underwater missions and technical reports, engineering presentations, and poster displays
- Gets students excited about STEM and motivates them to problem-solve, think critically, manage a project, and work together as a team
- Is encouraging students to pursue STEM degrees and jobs in the field

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2014 marked the 13th international competition!

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13 Years of Underwater Robotics: The History of the MATE ROV Competition

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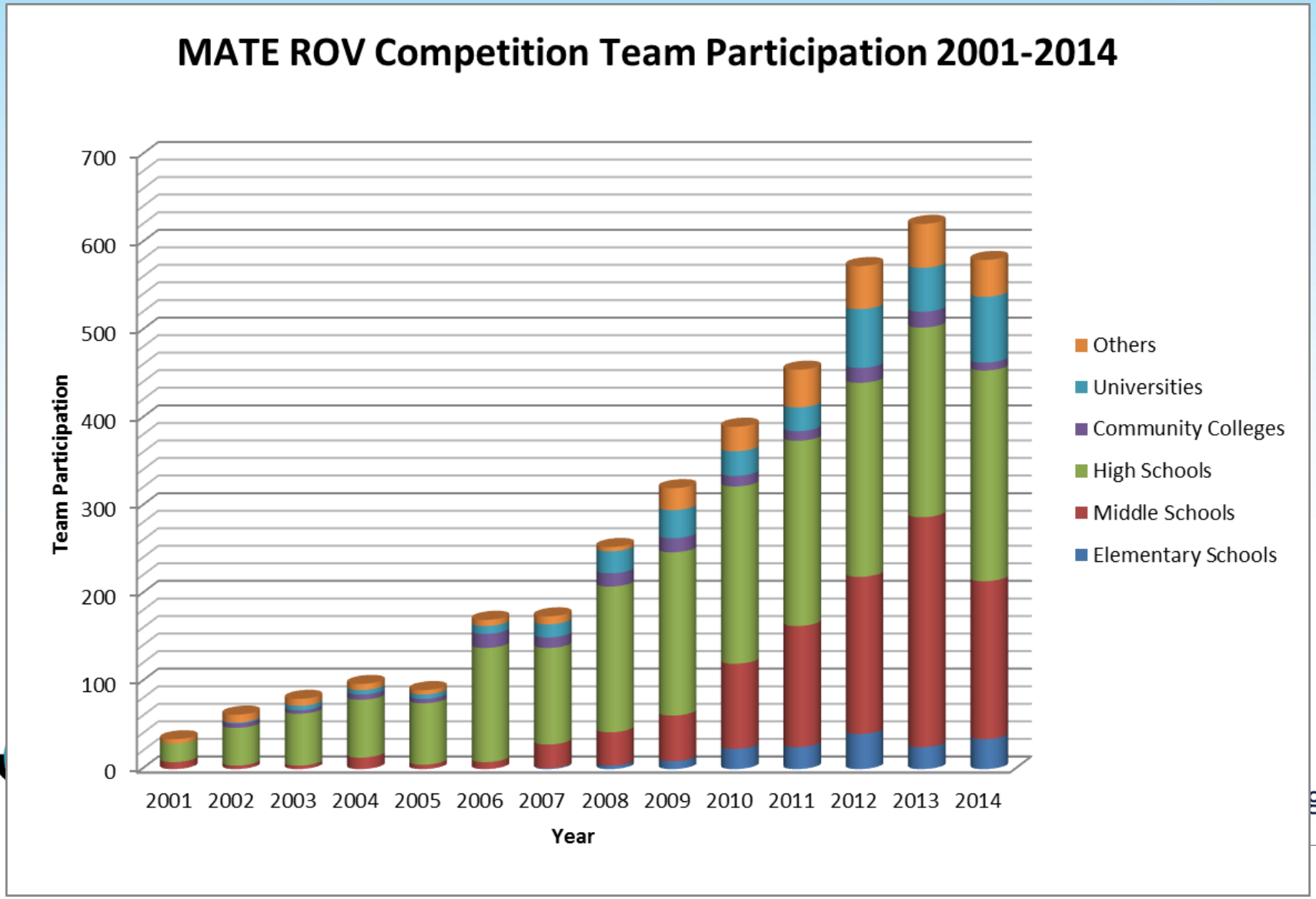
COMPETITION REACH



MATE Regional ROV Competition Network

The MATE Competition Network began in 2001 and currently consists of 24 regional events that take place across the U.S. and around the world.

Use this information to find the regional event near you!

MATE International Regional Competitions:

Canada (Newfoundland & Labrador and Nova Scotia), Egypt, Hong Kong, Japan, Scotland, Russia

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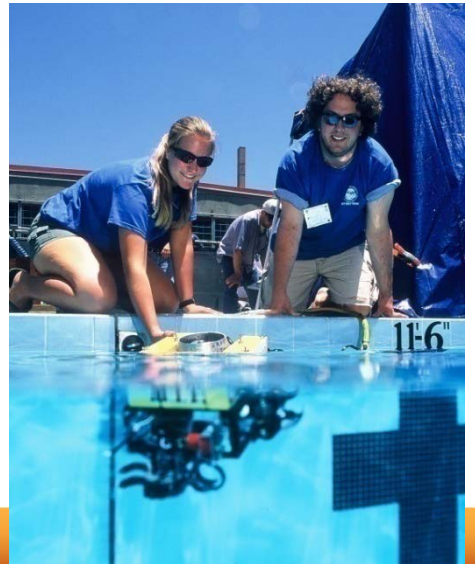
COMPETITION STRUCTURE

The competition is divided into 4 classes that vary depending on the vehicle specs & complexity of the mission tasks:

- ***EXPLORER*** *(advanced)** *(vehicle demonstration required)*
- ***RANGER*** *(intermediate)*+* *(participation in regionals required, some exceptions)*
- ***NAVIGATOR*** *(beginner/intermediate) +*
- ***SCOUT*** *(beginner)+*

**these classes participate in the international competition*

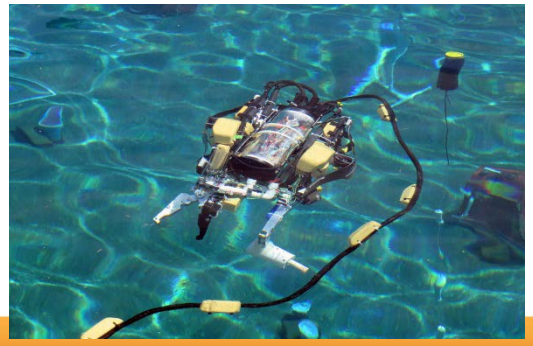
+these classes participate in the regional contests



COMPETITION STRUCTURE

- ***EXPLORER***
  - 48 volts, 40 amps
  - Camera required
- ***RANGER***
  - 12 volts, 25 amps
  - Camera required
- ***NAVIGATOR***
  - 12 volts, 15 amps
  - Camera required
- ***SCOUT***
  - 12 volts, 15 amps
  - No camera required

- ***OVERALL***
  - “Platform” of your choice
  - Must have a fuse, follow safety protocol, and pass a safety inspection
  - No onboard electrical power
  - Fluid power is permitted – see detailed specs for more information
  - No limit on building materials, but they must not damage the pool



SAFETY

Pre-competition:

- EXPLORER class demonstration requirement
- Pneumatics/hydraulics quiz
- Technical report safety review
- Safety inspection
  - Inspection sheet specific to each class posted online
  - Tutorial posted online walks safety officers and teams through each line item on the sheet

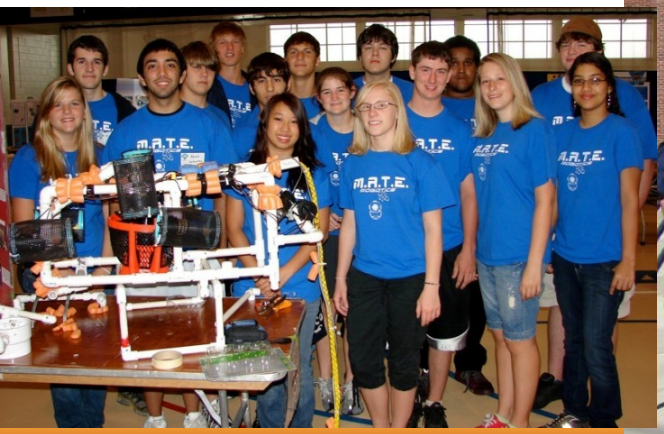
At the event:

- EXPLORER demonstrations
  - Company spec sheets and schematics due to the MATE Center 2 weeks before demo
  - Reviewed by MATE safety inspectors
- Safety inspections
  - Dedicated safety officer(s)
  - Improved and expanded info and training
  - Process used at the international as an example
    - System of red, yellow, and green cards/flags
    - Involve mission judges

"Think of yourselves as entrepreneurs"

- Emphasize applying skills in new & innovative ways, working as part of a team, & understanding the breadth of business operations

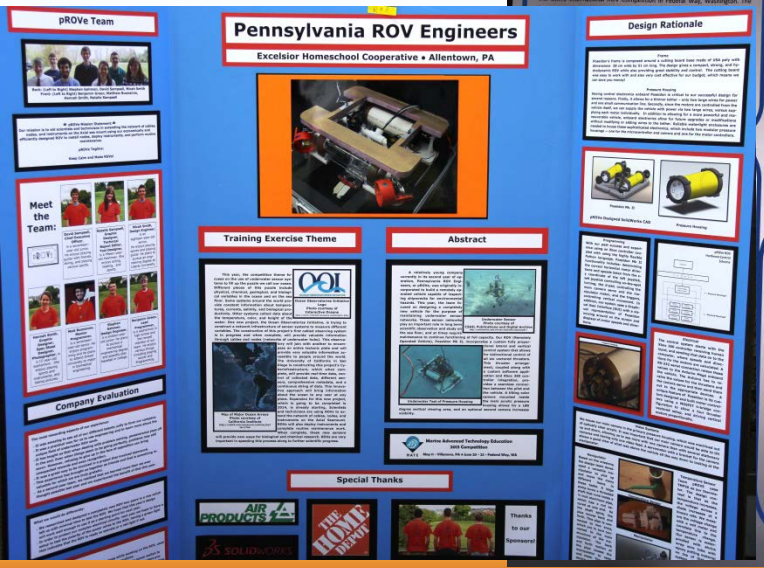
- Challenge students to form companies and structure them with the personnel necessary to design, build, perform, & "sell" their product
  - Who is the company CEO and CFO?
  - Who manages government and regulatory affairs?
  - Who is responsible for R&D? Systems engineering? Operations?
  - Who handles marketing and media outreach?

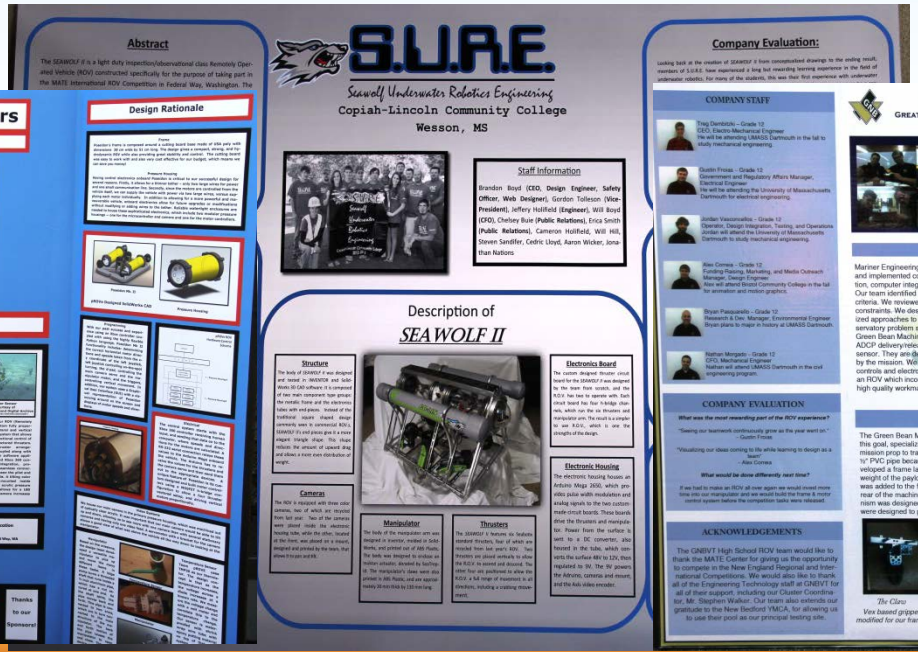


REQUIRED “PRODUCTS”

Engineering & Communication component includes:

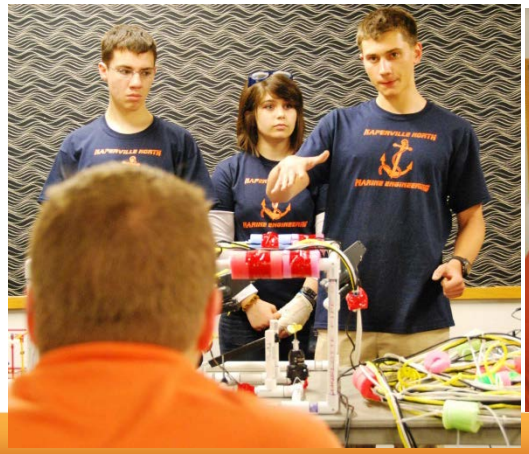
- *“Technical storytelling”*
  - Technical reports & company spec sheets
  - Engineering presentations
- Poster displays & (international only) media outreach kit





REGIONAL REQUIREMENTS

- Teams must prepare and submit at least 2 of the 3 engineering & communication components
- Whatever component is not required, regionals are encouraged to offer the winning team(s) a chance to submit it for review and feedback before the international event
- Teams must prepare and submit (in advance) a company spec sheet AND schematics for the safety inspection

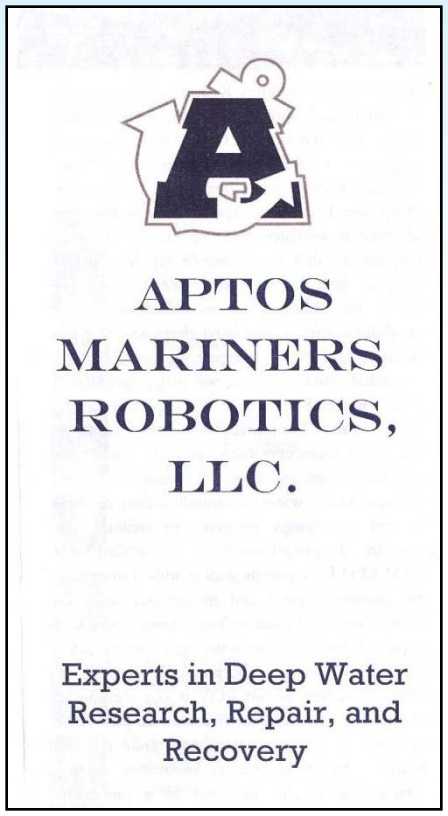


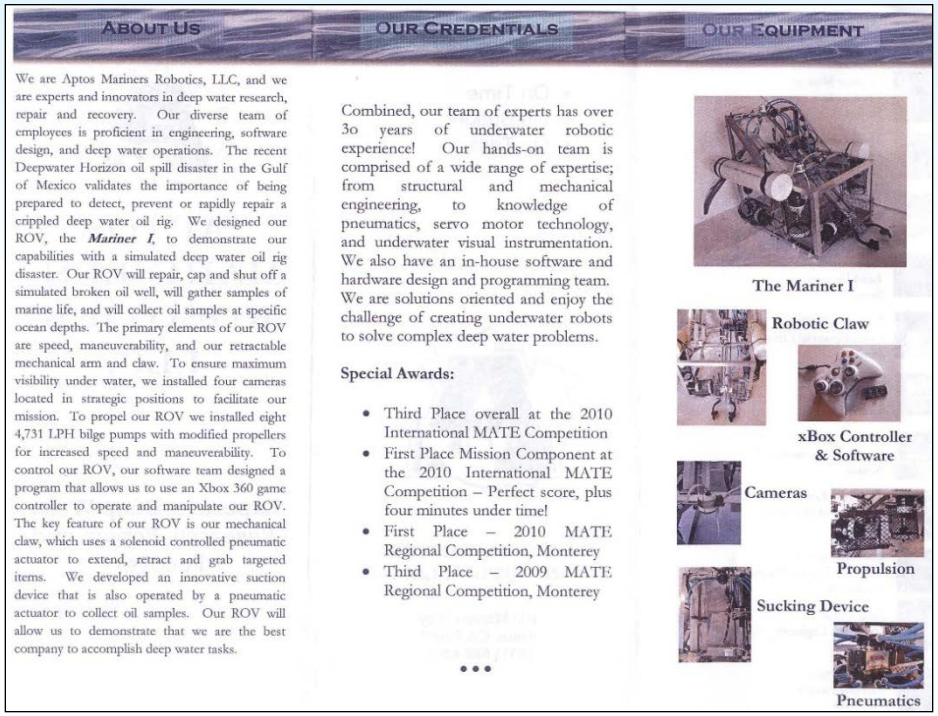
Company names, logos, & tag lines

- Global Ocean Exploration Systems
  Providing, surveying, sampling, and completion of underwater tasks around the world
- Endeavor Enterprises
- Triton Technologies
- 4-D Oceanus – *A subsidiary of O'Donel High School*
- Nimitz Marine Recovery Unit

Marketing materials

- Brochures
- Business cards
- “Swag” – pens, lapel pins, stickers
- One company developed an “app” that is available on the iTunes store





Creative approaches to technical reports

Georgia Robotics Technologies

Georgia Institute of Technology
Savannah, Georgia

Chief Executive Officer:
Michael Tam

Chief Financial Officer:
Michael Tam

Mechanical Systems Co-Design:
Michael Bunch
Evelyn Kim

Electrical Systems Design:
Phillip Cheng

Software Design:
Nicholas Parham

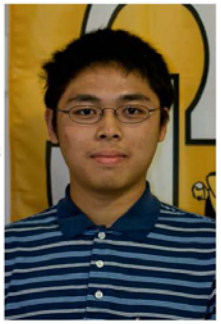
Human Interface Design:
Brian Redden

Dive Master:
Patrick Lizana

Dive Operations:
Cameron Schriner

Mentors:
Dr. Fumin Zhang
Steven Bradshaw
Lisa Hicks
Spencer Burch
Brandon Groff

Note from the CEO



Although Georgia Robotics Technologies is only in its third year, as the new CEO of GRT, I'm excited to bring the newest in GRT's robotics lineup to the market - the ROV Beta II.

For three years GRT has brought the newest in underwater robotics technology to the market - introducing new systems like wireless control systems, intuitive joystick control, flight safety envelopes, onboard control interpretation, fail safe modes, and the best in structural foundations. As the new head of GRT I promise to continue delivering the front line technology you've come to trust and depend on.

This year's ROV Beta II (ROV Beta Mark II) offers additional redundancies, simplified control systems, easy to maintain manipulators, and highly efficient power systems for prolong runtime. As always the ROV Beta II continues to be built with top of the line components from National Instruments, National Semiconductor, Texas Instruments, Castle Creations, SeaCon, and Crust Crawlers. GRT products sacrifice nothing for the very best.

As always - Georgia Robotics Technologies and all of the employees here wish you the very best with our new ROV Beta mark II.

The leading wave - Georgia Robotics Technologies

Michael Tam
Chief Executive Officer
Georgia Robotics Technologies
mtam77@gatech.edu

As the foremost underwater robotics venture in the southeastern United States, Georgia Robotics Technologies is located in Savannah, Georgia. With easy access to oceanic fronts, and other testing facilities, our products undergo constant testing and improvement in order to bring you the pinnacle of underwater robotic technology.

Photo on cover:
Image of ROV Beta during completed testing stages.

Marketing pitch

Engineering presentations delivered as marketing pitches designed to their product (and personnel) to the “client”

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TIMELINE/COST/RESOURCES

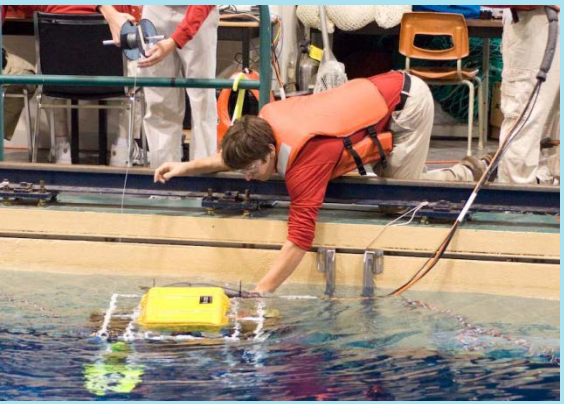
- **Competition timeline**
  - Mission briefing released in September
  - Specs and missions released in November
  - Registration opens December 1st
  - Regional contests in April & May
  - International competition in June
- **Registration fees**
  - No fee for SCOUT or NAVIGATOR
  - $75 for RANGER & $100 for EXPLORER*
- **Resources**
  - MATE web site (www.marinetech.org/rov-competition-2/)
    - Teams only area, FAQs board, tech help forums
  - Workshops, mentors, travel stipends, etc.

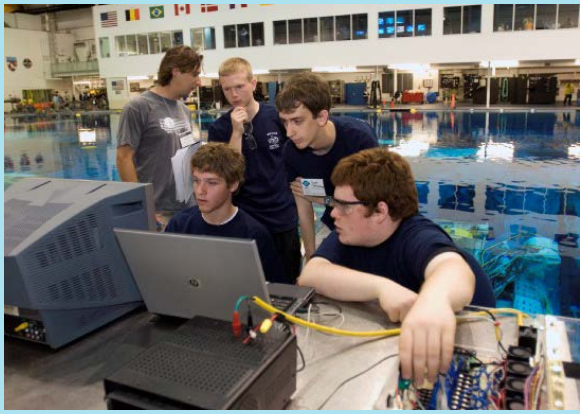
*some regionals waive fees

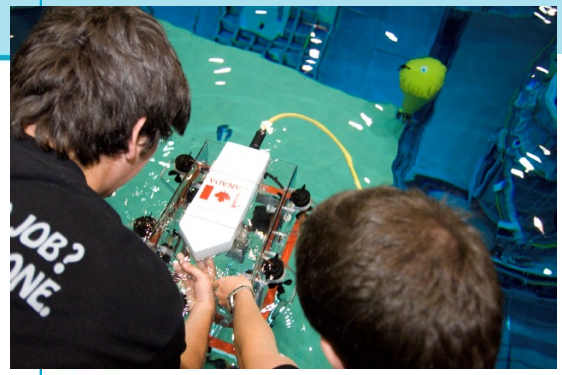
The MATE Center and its
COSEE partners

present

Ocean Career Expo







being held in
conjunction with

MATE's International ROV Competition

The ***Ocean Career Expo*** is designed to:

- Highlight ocean career opportunities
- Connect students with employers
- Help employers find skilled employees

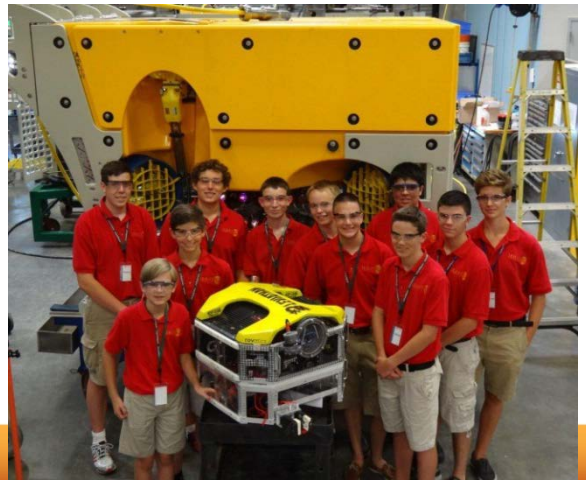
RETURN ON INVESTMENTS

High school students have…

- Used the MATE competition as the focus of college entrance essays
- Gone on to pursue engineering or technical degrees at MIT, UNC-Charlotte, Purdue University, US. Naval Academy, and others
- Been awarded scholarships or internships as a result of their participation in the ROV competition

College students have…

- Gone on to work at research facilities like WHOI and MBARI
- Been hired by companies like Oceaneering, Schilling Robotics, SeaTrepid, VideoRay, and more



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Questions?

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