

Report on 6th Annual International ROV Competition

By Scott Fraser



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Picture of Underwater Robot

As the Department Chair of the Electrical Technology Department of Long Beach City College (LLBC), I led a team of student engineers in designing and assembling an underwater robotic vehicle for the purpose of competing with like-minded student teams from other educational institutions. We just finished competing in the 6th Annual International ROV Competition sponsored by the Marine Advanced Technology Education Center (MATE) of Monterey, California. This year's event was held June 22-24, 2007 at Memorial University in St. John's, Newfoundland, Canada. And while the event and the details of it were still fresh in my mind, I wanted to write a personal account of our experiences to share with some of our associates, sponsors and friends. I wanted to share our experiences in a personal and intimate way and write it so they could feel like they were truly a part of the experience. Therefore, I wrote about our experiences with a first person narrative and I avoided getting bogged down with technical detail, instead, focusing on the people on our team and their experiences, knowing that some of our supporters were not from technical backgrounds. Below is the informal report (as is, with only minor editing) that I wrote a few days after the event to update a few of my colleagues.

We are back from Newfoundland and almost completely rested. It was quite an experience for all involved. First off, I'll give you the bottom line and then the play by play.

Results:

LBCC Standings

Overall: 5th place

Engineering Evaluation: 2nd Place

Technical Report: 3rd Place

Technical Display: 2nd Place

(I've included the sorted standings for each category below, so that you can see how we placed relative to the other teams, including the overall winner)

Team Spirit Award (hard to ignore a bunch of friendly Vikings running around everywhere)

Explorer Class Technical Presentation MVP: Maria Borja

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We left LAX on Tuesday morning on 6/26 but not until after experiencing some significant difficulties. The TSA (Transportation Safety Administration) in their infinite wisdom saw fit to open every packed box with our ROV parts that we were checking on. It was frustrating for me to watch them unpack everything then throw the parts back into boxes without rewrapping or packing them. If I stood where I could watch their operation in progress, I was told to move "immediately". Standing on the side where I could not watch, it was a helpless feeling as all our boxes were opened and repacked. It took the students hours to carefully pack the contents and here they were scrambling all of them in an instant. The icing on the cake was the air cylinder. I had contacted TSA in Washington, DC and Air Canada. Air Canada's requirement for cylinders is that they are less than 100 psi and possess the ability to show that. TSA's requirement is "valve off" so that the cylinders can be looked into. Our cylinder had the valve loosely attached so that it could be removed by hand with a half turn. They refused to even attempt to turn the valve and see if it would come off. I asked them if they would just give me the package again, I would remove the valve and send it back through. "No Way! We have to call our supervisor". Half hour later, he arrives, gave me the deal about it being impossible to ship cylinders. He sang another tune when I told him of my conversations with TSA and Air Canada. He brought me the cylinder, asked if I needed any tools and was surprised when I quickly removed the valve by hand. He shook his head and threw it back into the box. I took off to catch the plane, just in time to find it in final boarding process.

Going through Canadian customs in Montreal, was a piece of cake thanks to the letter from the Canadian Customs Agency provided to us by the contest organizers. The inspector looked like he was going to point me into the inspection room, when I produced the letter and said that we were a group of 14. He looked at the letter and waved us in.

We arrived in St. John's sometime after midnight on 6/27 and found out later that we were the last flight into St. Johns for a day and a half due to fog. The ride from the airport to Memorial University Dorms could best be described as Mr. Toad's Wild Ride. Wow! Is that how Canadians drive? By the time we got settled into the dorms it was well past 3am.

Wednesday was a "settle in" day. The team toured the marine facilities at Memorial and did some food shopping. By evening they started opening up the cases with the ROV parts and found their nightmare was just beginning. With exception of the polycarbonate cylinders, just about anything that could have broken was broken. Connectors on the ROV were snapped off, fixtures were snapped, and the LCD monitor had a nice hole in the screen. The list goes on. The team went to work doing methodical checks on all systems. That's when the new electrical problems started showing up. The crabbing thruster was stuck ON at all times; they had lost communications to a camera. They diligently worked into the night and morning, calling it quits about sunrise.

After a few hours of sleep, the team got together Thursday morning for breakfast and discussed plans for the day, dividing up the labor to fix and repair. This was pretty much an all day process. There was a break for dinner with PB&J sandwiches in the middle. After dinner, they went back at it, steadily making progress, one fix at a time. The new intermittent problems were the hardest for them to find and fix, but they got just about all of them. Again, they worked until almost sunrise (4:30am up there).

Friday morning, they seemed to be running on fumes by now, but had to take a break for the opening ceremonies and activities at the Marine Institute. In the afternoon, everyone came back to the dorms and most crashed for a few hours of napping.

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The Friday night welcome ceremony was a blast. The team arrived in their team Viking shirts and their Viking hats. They were easy to spot from anywhere in the hall. Unlike many teams that hung together, the LBCC Vikings spread out and had fun talking with everyone. I met the Minister of Technology for the province and he got a kick out of the presence of Vikings, having grown up just 12 km from where the Vikings originally landed so long ago in history. It seemed like every time I turned around, he was talking to another group of our Vikings. Later that night when he addressed the crowd, he knocked all of our socks off by repeatedly mentioning Long Beach City College and then finished off his speech with a shout out to LBCC. (He was pulling for us if a team out side of Canada was to win it).

Back at the dorms, the team gathered to talk about their technical presentation. They had planned on using Wed, Thurs & Friday to practice it and sand off any rough edges. They were wanting to see that most of the time left was taken up with getting the ROV ready for the water; they were just a bit concerned. We gathered them in my dorm room and talked. "What did you work on, what do you know best?" After consulting with the entire team, I felt like everyone knew what they were going to talk about. No formal presentation, just a factual, informal conversation with the judges about the ROV and the systems. I felt confident in them and knew that if they just spoke about what they had been working on, they would do OK. I must admit, I didn't expect them to do as well as they did, but I was very proud of them for taking 2nd place in this category.

After the Tech presentation talk, about half the team dove into the ROV, going over every detail for going into the water on Saturday. I tried to go to sleep, but was awakened at 4am with a "just checking" question. They all had the right answer, but were so tired, they wanted to just double check to make sure. I marveled at their stick-tuit-ivness as they went through system checks and practiced with their stereo cams.

Saturday morning, they got up, had quick breakfast and it was off to the Engineering building for the technical presentation. Everyone was understandably a little nervous at first, but then they settled in and started talking about their baby.

Then it was off to the first underwater mission in the Offshore Basin. **Disaster!!** With the ROV in the water, all systems checking OK, thrusters moving properly and engaging the vertical thrusters to drive it down, BOOM! The battery in their control box exploded. That mission was over and done with. A later examination of the battery and the enclosure pointed to two problems. The first was the shipping damage to the battery. Both batteries in the enclosure were pretty banged up even though they were in a foam lined case. The second was the possibility of residual hydrogen from charging. It's hard to imagine that there was still hydrogen in the case as it had been nine hours since the batteries completed charging. The battery was a 10AH battery and they charged it at a 4 amp rate. Whatever the cause of failure, they were done for the first mission.

They quickly went to work opening up the case and bypassing the battery for the second mission of the day, the Ice Tank. In less than 30 minutes, they had moved venue's, bypassed the battery and were ready to go. Once started on the mission, they quickly deployed the Acoustic sounder then grabbed the jellyfish sample. Ian, the team captain had them bring the jellyfish to the surface so that they could ensure that it counted for points. Good call. They then spent the remainder of the time trying to get an algae sample, but found their sampler sucking them to the ice rather than sucking in an algae (ping-pong ball) sample.

The team was ESTATIC. They had achieved success. Everyone was jumping up and down; they had put their heads together and gotten past the earlier tragedy. It was time for a well deserved breather.

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Sunday morning was the final mission, which was to thread a messenger line through an anchor bolt while facing the onslaught of a continuous current. The design of the ROV with the large "back" float was their downfall in this mission. They could work their way over to the anchor bolt, but as soon as they put any angle between them and the water flow, the current would catch them and whip the ROV right out of position. They were persistent and hung in their, even after one of their thrusters became entangled in the messenger line. At the very last possible moment, they were able to make contact with the anchor and get 20 points for the mission. Whew!

By this time about a quarter of the team (myself included) were sick with various combinations of head colds. Everyone made their way back to the dorms and collapsed. We woke up in time for the closing ceremonies and dinner.

Monday was Fun time. We rented two additional cars and headed out for Signal Hill, Cape Spear (eastern most part of the continent), Conception Bay and then a few other small ocean villages along the coast.

Tuesday morning we were packed and headed back to LA. The Canadian equivalent of the US TSA was the polar opposite, friendly and helpful. They X-Rayed a few pieces, asked me to open them and then sent us on our way. They even asked if we enjoyed our stay.

Now you would think that after a week of non-stop ROV, the team would be DONE and in need of a break. No such thing for this team. While in the airport at St. John's we had a three hour wait for the plane. At one point, I looked over and saw a laptop open and heads were together talking about ideas for ROV 2008. Mid flight from Montreal to LAX, I got a tap on my shoulder and BAM, there was a 3d SolidWorks model of their ideas for next year's robot. How can you argue with enthusiasm like that!

Again, I want to thank you for your support of our team and your direct contribution to their success. As we get all of the photos together, they will be putting together a photo DVD that I will be sending to you.

Thank you again,

Scott Fraser

Detailed Results

Engineering Evaluation Sort	Engineering Eval.
Saint George's School	96.67
Long Beach City College	91.33
Eastern Edge Robotics Team	91
University of Waterloo	87.33
Massachusetts Institute of Technology	87
University of Victoria	86.67
University of Wisconsin-Milwaukee	86
Texas A&M University	84
Clatsop Community College	82.33

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City University of Hong Kong	80
British Columbia Institute of Technology	80
Jesuit High School	79.33
Nova Scotia Community College	76
Isfahan University of Technology	74.33
Riviera Beach Maritime Academy	73.67
Monterey Peninsula College	73.33
Sound School	68.33
Arizona State University	63.83
Missouri State University	60.33

Tech Report Sort Tech Report

Saint George's School	62
University of Wisconsin-Milwaukee	56.67
Long Beach City College	55
Isfahan University of Technology	54
Massachusetts Institute of Technology	53.67
University of Waterloo	53.33
University of Victoria	52.67
Jesuit High School	52.67
Missouri State University	52
Eastern Edge Robotics Team	50.33
City University of Hong Kong	49.67
British Columbia Institute of Technology	49
Clatsop Community College	48.67
Sound School	46.67
Texas A&M University	45.67
Arizona State University	41.33
Riviera Beach Maritime Academy	40.67
Monterey Peninsula College	40.33
Nova Scotia Community College	13

Tech Display Sort Tech Display

Eastern Edge Robotics Team	40
Long Beach City College	38
Massachusetts Institute of Technology	37
Saint George's School	34
Texas A&M University	33
University of Waterloo	32
Sound School	31
British Columbia Institute of Technology	30
University of Victoria	27
Riviera Beach Maritime Academy	26
Missouri State University	25
Isfahan University of Technology	24
Arizona State University	23
University of Wisconsin-Milwaukee	22

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City University of Hong Kong	20
Jesuit High School	18
Clatsop Community College	17
Monterey Peninsula College	15
Nova Scotia Community College	12

Overall Scores	Total
Jesuit High School	386.05
Eastern Edge Robotics Team	355.59
British Columbia Institute of Technology	292.44
University of Victoria	251.33
Long Beach City College	249.33
Saint George's School	242.67
Massachusetts Institute of Technology	212.67
Texas A&M University	202.67
Clatsop Community College	188
University of Waterloo	187.67
Monterey Peninsula College	173.67
University of Wisconsin-Milwaukee	169.67
Riviera Beach Maritime Academy	155.33
City University of Hong Kong	154.67
Isfahan University of Technology	152.33
Nova Scotia Community College	151
Arizona State University	148.17
Sound School	146
Missouri State University	137.33

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