



# ***Robotic Submarine***



## **CASE STUDY**

# The Falcon Robotics AUV Team - Autonomous Underwater Vehicle Competition

**A team of students builds a robotic submarine and makes it to the final round.  
Hollywood stardom follows...learn more.**

## **The Application**

The annual, week-long Robosub AUV (Autonomous Underwater Vehicle) Competition is held in San Diego, California every summer. Teams from prestigious colleges such as Cornell and MIT participate, and often win. The field widened a few years ago, however, when a team of students from a small high school in Arizona, Carl Hayden Community High School, entered the competition. And, what happened was quite amazing. Amazing because a group of high school students showed the collegiate competitors that they were up to the challenge, and successfully made it to the final round in 2013.

The students from Carl Hayden High School were no strangers to robotic competitions - they began participating back in 2004. Under the tutelage of energetic science teachers, Mr. Fredi Lajvardi and Mr. Allen Cameron who started the program in 2001, the kids in the after-school program have the hands-on experience of building a robotic sub. The students are typically first-generation immigrants; 97% are Hispanic. Many are the first to graduate from high school.

## **The Solution**

In simple terms, the goal is to build an airtight robotic submarine and maneuver it remotely, tethered underwater, to complete certain tasks in a specific amount of time, such as locating objects and distinguishing colors. While the AUV is remotely controlled, it is tethered to a WIN 7 laptop when AUV code is developed and downloaded to the sub. This connectivity can allow the students to tele-operate the AUV when needed. This is where fiber optics provided a solution. The tether was connected to the fiber optic media converters manufactured by B&B Electronics. The 10/100Mbps media converters support conversion from copper to fiber and bi-directional data transfer of 100Mbps; the team used 100 feet of single-strand, single-mode fiber cabling, connected by Seacon™ connectors to connect a converter that was connected to a laptop copper port, over to converters connected to the main CPU located inside the pressure hull. Tests were conducted daily during the competition, such as locating objects, dodging obstacles, and distinguishing colors of the objects.



Robosub students with coaches Allen Cameron (center) and Fredi Lajvardi (far right)

According to coach Faridodin Lajvardi, the goal of the program is strong and focused: "As an after-school organization, our goal is to help our students achieve the necessary skills to be successful and achieve any career goal they desire. Through our participation in both land and underwater robotic competitions, student members are able to apply math and science skills learned in class, as well as develop new problem-solving skills that are applicable to everyday life. With the help of our robots, we also spread the importance of STEM (Science, Technology, Engineering and Mathematics) to our neighboring community." These kids are bright and have a propensity for math and science, they just needed a venue to showcase those skills. Not funded by the school district, it is a flourishing program despite adversities.

Building the robotic submarine required hardware and software knowledge, and a team of sponsors and supporters to help the students, as well as being co-sponsored by the U.S. Office of Naval Research (ONR). In fact, students and mentors spend about 3 hours a day, year round, designing and building robots to compete in various competitions. They handily won the MATE (Marine Advanced Technology Education) competition over MIT, and others.

Since that time, the students who sign up for the program continue to build, learn, and participate in the competition. Their current design is built on a platform that can be used and modified in the future. The goal is to take home first place at Robosub 2014.

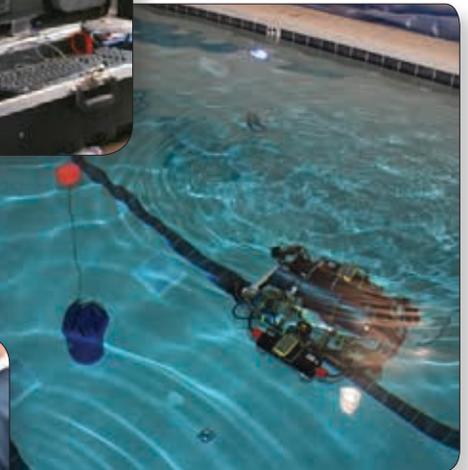
"With the help of our robots, we also spread the importance of STEM (Science, Technology, Engineering and Mathematics) ..."

Faridodin "Fredi" Lajvardi, Team Coach

## **Hello, Hollywood!**

As the Robosub competition has gained more visibility, Lionsgate and Pantelion is producing a movie, "Spare Parts," based on Carl Hayden High School in Phoenix Arizona students, their teachers, and their Robosub. Featuring George Lopez, Jamie Lee Curtis, Marisa Tomei, and a notable cast, Director Sean McNamara, felt it is important to produce a movie about what kinds of positive things are going on in America. The movie was scheduled to be released in January 2015.

The story details the journey of the students and their design – the first fondly named "Stinky" – to today's current model, named "Sovereign Falcon 2.0," and the upcoming competition. The real heroes are the students and those confident teachers who made this all possible.



## The Product - Industrial-grade 10/100 Miniature Media Converters



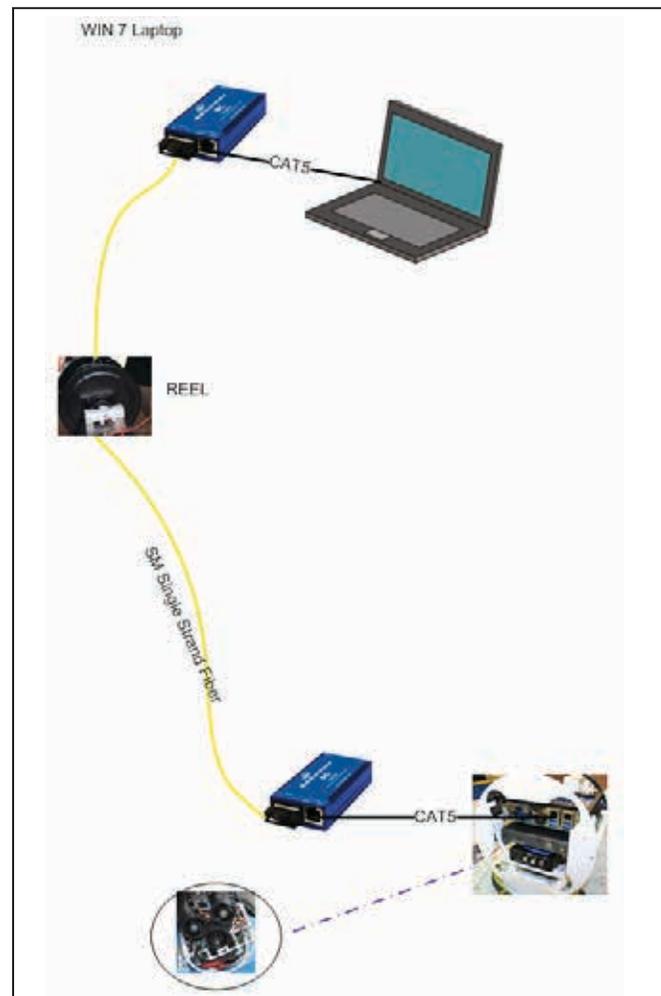
Model IE-MiniMc

### Features

- Industrial grade extended temperature
- PNP, auto-negotiation mode
- Auto-cross feature for twisted-pair port cable
- Stand-alone unit in small, rugged metal enclosure
- IEEE 802.3af Compliant
- NEMA TS2 (select models)
- Multiple powering options

Measuring less than 3.5"D x 2.0"W (8.9 x 5 cm), the IE-MiniMc Series is one of the industry's smallest copper-to-fiber media converters with both data connections on the same side. The IE-MiniMc family of media converters are a fraction of the cost of other industrial grade alternatives. These products provide the ease and convenience of plug-and-play operation with additional features like auto negotiation and auto-cross.

Powering options include Power-over-Ethernet (PoE/PD), AC wall adapter and USB, offering unsurpassed flexibility for a variety of installations.



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B&B Electronics provides M2M device connectivity solutions for wireless and wired networks using cellular, WiFi, Ethernet, USB, fiber and serial technologies. Specializing in data communication solutions at the network's "edge", the company is known globally for easy-to-use, rugged and reliable products, plus complimentary knowledgeable technical support and responsive customer service.

In recent years, B&B Electronics recognized opportunities to expand and extend network solutions by acquiring industrial-grade cellular routers; wireless embedded OEM modules, bridges, and gateways; plus industrial fiber media conversion and optical access solutions.

A leading manufacturer, B&B Electronics delivers excellence in product quality, customer satisfaction and value. The company is ISO 9001:2008 registered. All products are RoHS and REACH compliant, Made in the USA, and carry limited lifetime warranty (SFP products, 1-year warranty).

Founded in 1981, B&B Electronics is headquartered in Ottawa, Illinois USA with offices in California, Ireland and the Czech Republic.

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