Business Plan

Team Organization

Members

John Harris (Team Leader, Sr.), Norma Irigoyen (Chief Electrician, Sr.), Eduardo Fernandez (Chief Builder, Jr.), David Olivares (Technical Design Drafter, Sr.), Bianca Rodriguez (Material Manager, Fr.)

Adult Mentor

Faridodin "Ledge" Lajvardi

Support Mentors

James Haugen and Greg Harrison

Affiliation

Carl Hayden Community High School

Phoenix Union High School District

December 15, 2009

Business Plan

Internal Controls

All designs and costs are approved by the team as a whole and approval for expenditures of funds is accomplished by the Phoenix Union High School District

Fundraising

Financing of this project will be accomplished through tax credit donations (sate of AZ), corporate sponsorships and grants

Market

Considering that our product is a vehicle that will enable astronauts to do different tasks in a space craft without exposure to the harmful environment in which they are in, we reviewed the following corporations that are involved in space exploration or underwater ROV systems:

Space Exploration Technologies Corporation (SpaceX) *http://www.spacex.com/*
13201 Crenshaw Blvd.
Hawthorn, CA. 90250
Phone: (310) 363-6000
Fax: (310) 414-6552
Industry: Aerospace
Products: Orbital Rocket Launch, Commercial Orbiter, Transportation Services

Boeing: Integrated Defense Systems *http://www.boeing.com/ids/phantom_works/index.html*
325 McDonald Blvd.
Hazelwood, MO. 63042513?
Phone: (314) 232-0232
Industry: Orbital Express
Goal: “A safe cost-effective approach to autonomously service satellites in orbit.”

Lockheed Martin Orion Team Space Systems Company
12257 S. Wadsworth Blvd.
Littleton, CO 80125-8500
(303) 977-3000
Goal: "... the Lockheed Martin Orion Team is focused on providing NASA the capability to return to the Moon by the middle of the next decade with a low risk, high confidence program plan."

Space Dev *http://www.spacedev.com/*
13855 Stowe Drive
Poway, CA. 92064
Phone: (858) 375-2000
Fax: (858) 375-1000
Industry: Aerospace and Defense
Goal: a wholly owned subsidiary of Sierra Nevada Corporation (SNC), is an entrepreneurial space systems company that develops high performance, innovative components and systems that are changing how we get to explore, and use space.

SeaBotix *http://www.seabotix.com/*
2877 Historic Decatur Road, Suite 100
San Diego, CA. 92106
Phone: (619) 450 4000
Fax: (619) 450 4001
Industry: Underwater Robotics
Goal:"Defining Compact ROVs!"

Saab Seaeye Ltd *http://www.seaeye.com/*
20 Brunel Way
Segensworth, Fareham Hampshire PO15 5SD
Tel +44 (0)1489 898000
Fax +44 (0)1489 898001
Industry: **Saab Seaeye** manufactures a complete range of electric powered ROV systems for all professional applications. The range currently extends from the portable Seaeye Falcon ROV to the medium work class Panther Plus ROV

Scaled Composites, LLC http://www.scaled.com/
1624 Flight Line
Mojave, CA 93501
Phone: 661-824-4541
Fax: 661-824-4174
Industry: Aerospace and specialty composites development company

Selling Points

When comparing EVROV to other devices on the market you will find that the benefits are impressive; Safer, cheaper, faster. You name it and EVROV can do it. Through much research our team found it difficult to find a direct product comparison to EVROV, though we did succeed in finding a few partial matches. Take the Dextre, or the Special Purpose Dexterous Manipulator (SPDM), it has many of the capabilities that EVROV has but still lacks in a few departments. For example Dextre is equipment monochrome camera while EVROV is equipment with high definition stereoscopic color cameras. Dextre is also designed to only work with the Canadarm while EVROV is design as a standalone unit. Dextre's manipulator also has its limitations; it can only interface with certain "gasp interfaces". EVROV manipulators are dynamitic and extremely intuitive to control. EVROV is also wireless, Dextre is not. Other devices such as the Manned Maneuvering Unit (MMU) are somewhat comparable to EVROV in the light that both increase productivity outside the space craft.
(http://www.nasa.gov/mission_pages/shuttle/behindscenes/rms_anniversary.html)

Financials

Since we are a school-based robotics team, we do not have many of the costs associated with competitive businesses. We do not pay for rent, utilities, salaries, insurances, or other fees that business have. If we were to include transportation as well as room and board for travelling to the SOIA event, the associated costs would be higher. For this submittal, we look at our costs as only those that are associated with building our prototype EVROV. This is a list of the Major Components: Titanium Frame, 16 pneumatic solenoids, 2 Hi-Def cameras, 2 computers, 2 manipulators (4 servos each), heat blanket (gold foil), storage objects, 3000 psi nitrogen supply, 3-D vision monitors, pneumatic tubing, and batteries.

*This list states **only** the **major components**. Detailed components are not defined at this time.

This is a list of estimates of what these components will cost:

Titanium	$600.00
Hi-Def Camera	$6,000.00
Solenoids	$480.00
Computers	$2,000.00
Servos	$240.00
Heat Blanket	$3,000.00
Nitrogen Tank	$200.00
3-D Vision Monitors	$1,000.00
Pneumatic Tubing	$20.00
Batteries	$1,000.00
Operator Station	$500.00
Wi-Fi	$200.00
Arms	$2,000.00
TOTAL	$17,240.00

If our estimates are correct, the prototype will cost approximately **$17,240**. Since we do not know all the requirements the components will need in order to function properly in space, the overall costs may go up or down. For example, due to not knowing the actual costs for Rad hardening, as well as other key components, we estimate the final EVROV costs will be as high as **$50,000**.

We also estimate the cost for constructing the optional docking station will be about **$100,000** to **$300,000**. The cost is so high because it will have to be able to be built into the space vehicle or space station. This may result in remodeling a craft's original design in order for the docking station to be included.

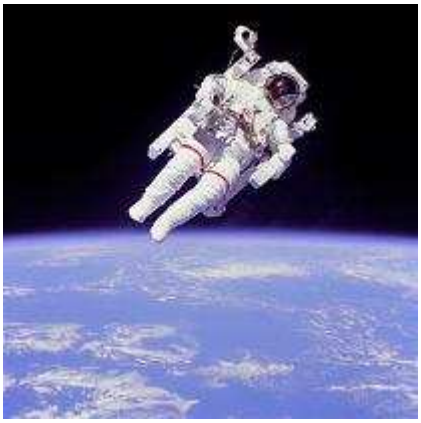
Comparative Reference

The following are other similar devices available

"Zip" gun or space gun

The ''zip'' gun here is being used by Edward White on the Gemini 4 mission in 1965. It was a hand held EVA device that used oxygen gas for its propulsion. The "zip" gun was designed to be an easy way to move during a spacewalk but it was later discovered that its propulsion simply was too limited and required precise aim through one's center of mass. (http://nssdc.gsfc.nasa.gov/planetary/gemini_4_eva.html)

Manned Maneuvering Unit (MMU)

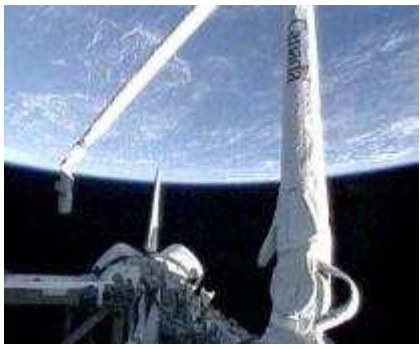


The manned Maneuvering Unit is a self-contained, propulsive backpack used by NASA in 1984. It allowed astronauts to perform complex untethered spacewalks at a considerable distance from the shuttle. Unlike the oxygen gas in the "ZIP" gun, Nitrogen gas was used to propel the MMU during an EVA. With 24 thruster nozzles its range of motion was vast. The MMU was only used in three missions then retired from use (http://history.nasa.gov/SP-4219/Chapter13.html)

Simplified Aid for EVA Rescue, SAFER

The SAFER is the offspring of the larger MMU, a simplified version of the self-contained MMU which also used nitrogen gas for its propulsion. It is used in tandem with a tether as a emergency rescue device during an EVA, it basically gives astronauts a plan B if their tether fails. (http://apod.nasa.gov/apod/ap011002.html)

Canadarm Robotic Arm



The Canadarm arm, named after the country of its origin Canada, is a Shuttle Remote Manipulator System (SRMS). With six degrees of movement it has the freedom of motion much like a human arm with the capacity to lift 29 tons in space. This arm is used on the Space Shuttle to manipulate payloads in to the shuttle's payload bay.

(http://www.nasa.gov/mission_pages/shuttle/behindscenes/rms_anniversary.html)

Canadarm2

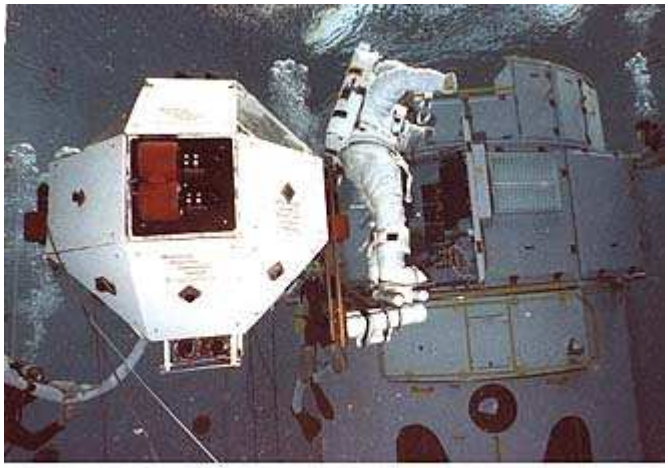
Canadarm2 or **Mobile Servicing System** (MSS) is a robotic arm connected in the international space station. Launched in April 2001 this is a larger more advanced version of the Canadarm is capable of having access to all most all areas of the space station in a inchworm like movement. The **Mobile Servicing System** (MSS) is vital to assembly and maintenance of the space station as well as for the movement of equipment and supplies around the station. In addition to assisting the astronauts in the EVA work.

(http://www.nasa.gov/mission_pages/station/structure/elements/mss.html)

The Dextre

The Dextre known as the **Special Purpose Dexterous Manipulator** (**SPDM**) is like a hand of the canadarm2 on the international space station. It has many complex variations of motion and activities that would otherwise require a spacewalk to complete. It also contains grasping jaws, a retractable socket drive, and a monochrome TV camera with lights. On the lower body of Dexter is a tool holster that is equipped with three different tools used to perform various task.

(http://www.nasa.gov/mission_pages/station/structure/elements/mss.html)



MPOD, an SSL robot, works cooperatively with a lab member to repair the Hubble Space Telescope during a neutral buoyancy simulation

MIT Space Systems Laboratory
SSL Ranger Neutral Buoyancy Vehicle
The space lab at University of Maryland tested a robotic helper for EVAs, that has the ability to work together with humans and provides a "third hand". With the EVA helper an astronauts can perform tasks that would otherwise be impossible. (http://www.ssl.umd.edu/html/scamp.html)

Exit Strategy

If the EVROV were to become viable and all the technical problems were solved, we would sell the Intellectual and manufacturing property rights to a larger company. This is because we are a school-based club and we do not have the money, people, or time to start a company or build the EVROVs ourselves. We would propose selling the rights to one of the companies listed in the Market Statement. We will allow the companies to make offers, and it will be sold to the company with the best offer. The funds raised by the purchase will go to the Falcon Robotics team for future operations of the club.