



# **WEEF PROPOSALS SUMMARY**

**F2017**

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# Chemical Dept (CHE)

F17-1183



## Flow Visualization and Measurement Platform

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Senior Laboratory Instructor, Chemical Dept (CHE)

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### Description of Proposal

The proposal is to construct a flexible flow visualization and measurement platform for undergraduate students to perform hands-on flow visualization, measurement, and design/calibration. The proposed devices in the proposal will be essential for the experimental platform to meet the needs of open-ended undergraduate labs for our third-year and four-year undergraduate lab courses, specifically, the proposed experimental platform include:

1. A versatile flow meter capable of measuring mass and volumetric flow rate of various fluids in sufficiently broad flow rate range.
2. A reliable differential pressure transducer capable of measuring pressure difference across different flow components under above flow rate range, and
3. Various plexiglass and transparent PVC pipes and fittings with flexible mounting flanges for student hands-on activities.

### Proposal Benefits

1. Students will use the equipment and proper tracer injection techniques to directly visualize/observe flow patterns and velocity fields of various flow components such as pipes, fittings, nozzles, and reactor vessels, and compare with the theory to achieve in-depth understanding of the underlying theory.
2. The modern flow meter and pressure transducer, coupled with easy mounting connections and flanges, will allow students to design and assemble their own test/measurement rig and so to truly have an open-ended and hands-on lab experience in design and test flow measuring devices as well as pressure losses.
3. The flow measuring device will further allow students to design/test experiment on flow control systems, and to characterize chemical engineering process equipment (flow systems, reactors) in terms of flow characteristics and residence time distribution.

### Estimated Equipment Lifetime

All equipment in the list has proven quality and should serve our purposes for many years to come.

### Implementation Schedule

The equipment can be assembled and tested in four months and will be ready for the laboratory course in the fall term of 2018.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Krohne Mass Flow Meter OPTIMASS 1400	\$ 5014	\$ 5014	\$ 0	\$ 0
Rosemount Differential Pressure Transducer	\$ 1779	\$ 0	\$ 0	\$ 0
Plexiglass and PVC pipes & Fittings	\$ 200	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 6,993</b>	<b>\$ 5,014</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Civil and Environmental Dept (CEE)

F17-1171



## Purchase of New Mineral Identification Kits

Allen, Anne

Laboratory Technologist, Civil and Environmental Dept (CEE)

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### Description of Proposal

To replace and obtain additional “Moh’s Hardness Scale Kits”.

### Proposal Benefits

The Moh’s hardness scale kits are a necessary tool used to identify rocks and minerals during mandatory lab sessions. The purchase of these new kits will help to replace very worn and used old kits, but also the additional kits will help ensure that all students have a kit to use to complete their required labs.

### Estimated Equipment Lifetime

The current kits the students are using were purchased 10 years ago. With proper care, instruction and preservation these kits could last even longer than the 10 years.

### Implementation Schedule

To purchase this fall (2017) to have ready for use beginning of winter term 2018.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Moh's Hardness Scale Kits	\$ 1500	\$ 1125	\$ 0	\$ 0
<b>Total</b>	<b>\$ 1,500</b>	<b>\$ 1,125</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Nanotechnology Engineering Dept (NANO)

F17-1179



## Variable Temperature Heat Guns for Nano Undergrad

Saad, John F.

Laboratory Instructor, Nanotechnology Engineering Dept (NANO)

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### Description of Proposal

This proposal is for purchasing Variable Temperature Heat Guns for Nano undergraduate laboratories.

### Proposal Benefits

The variable temperature heat guns allow the student to heat up a pinch semiconductor resistor at different temperatures in order to measure temperature dependence of the resistivity and carriers mobility. Currently, all NE students are borrowing 5 of these heat guns from the NE wet labs, and as the NE program already doubled the throughput of the circuit's laboratory since spring 2016, there is a need to purchase another 10 new sets. Those setups will be used to expand our equipment to fit in devices testing lab for NE 242 course (Electronic devices).

The expected benefits of the proposal are:

1. To provide new units needed for doubling our labs.
2. To provide spare units to enable quick replacement of faulty units during the lab thus reducing inconvenience to the student group at the problem station.
3. These heat guns will be used in engineering undergraduate course : NE 242 (Electronic devices)
4. It will serve about 120 undergrad students.
5. Could be used for capstone design projects

### Estimated Equipment Lifetime

10+ years

### Implementation Schedule

Winter 2018

### Additional Information

It is our expectation that NE will match WEEF Funding.

Option#1 for 10 units while option#2 for 5 units

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Varitemp Heat Guns, Master Appliance Model VT-750	\$ 2500	\$ 1250	\$ 0	\$ 0
<b>Total</b>	<b>\$ 2,500</b>	<b>\$ 1,250</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Nanotechnology Engineering Dept (NANO)

F17-1180



## Infrared Thermometers for Nano Undergrad Labs

Saad, John F.

Laboratory Instructor, Nanotechnology Engineering Dept (NANO)

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### Description of Proposal

This proposal is for purchasing Infrared Thermometers for Nano undergraduate laboratories.

### Proposal Benefits

The Infrared Thermometers allow the student to measure the resistivity and carriers mobility of a pinch semiconductor resistor at different temperatures. Also, they will use the new sets to examine the reverse breakdown temperature coefficient of diodes, focusing on the Zener, and Avalanche mechanisms.

Currently, all NE students are sharing 10 of these thermometers, and as the NE program already doubled the throughput of the circuit's laboratory since spring 2016, there is a need to purchase another 12 new sets. Those extra will be used to expand our equipment to fit in devices testing lab for NE 242 course (Electronic devices).

The expected benefits of the proposal are:

1. To provide new units needed for doubling our labs.
2. To provide spare units to enable quick replacement of faulty units during the lab thus reducing inconvenience to the student group at the problem station.
3. These infrared thermometers will be used in engineering undergraduate course : NE 242 (Electronic devices)
4. It will serve about 120 undergrad students.
5. Could be used for capstone design projects

### Estimated Equipment Lifetime

10+ years

### Implementation Schedule

Spring 2018

### Additional Information

It is our expectation that NE will match WEEF Funding.

Option#1 for 12 units while option#2 for 6 units

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
FLUKE-561, Infrared Thermometer	\$ 3000	\$ 1500	\$ 0	\$ 0
<b>Total</b>	<b>\$ 3,000</b>	<b>\$ 1,500</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Engineering Student Machine Shop

F17-1184



## BOMAR Ergonomic Manual Band Saw

*Adair, Graeme*

*Manager, Sedra Student Design Centre, Engineering Student Machine Shop*

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### Description of Proposal

We are seeking funding to replace our 40+ year old band saw with a modern, versatile and safer band saw.

### Proposal Benefits

The BOMAR Ergonomic band saw is the perfect saw for student use.

It has a higher working platform, more secure work holding and -45 deg to 60 deg miter cutting capabilities. Its simple to adjust cutting angles and quick clamping vice make the operation of this saw fast and simple. All the machine controls are located conveniently at a central control box and include the precise hydraulic feed control.

The machine has safety covered; with integrated blade guards, safety switches on the band wheel door and easy to reach emergency stop.

### Estimated Equipment Lifetime

30+ years

### Implementation Schedule

Immediate purchase

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
BOMAR Ergonomic Manual Band Saw	\$ 8871	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 8,871</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>



## TobyX Funding Proposal

*Lei, Tina Jiaming*

*Public Relations Director, ENGINEERING*

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### Description of Proposal

TobyX provides in-room digitalized service system by utilizing IoT and AI technology. TobyX's main target population are small to mid-size hotel businesses in Canada. We use digital solutions to eliminate unnecessary materials and reduced energy consumption. In able to deliver effective products to the clients, TobyX is seeking for financial funds that support research and developments for prototypes, devices, and business operation. in order to provide reliable products and solutions, excess funds will be needed to establish the goals. TobyX is the ideal target to receive the funding because our team has maturely experienced working with IoT industrial and digital solutions. We understand that we have the ability to impact the changes and trends affecting the importance of business intelligence, and with the final intention creating a smarter, greater world for all. We value the significance of each teammate's contribution to our aim and share the same motivation of improving the lives of each and every individual.

### Proposal Benefits

We aim to bring smart advertising and smart room solutions by providing reliable research and solutions. We use digital advertisement and optimized business model to eliminate unnecessary materials and energy consumption. Benefits from results including it enable hotels to customize and bring the most relevant information to individuals. Second, we assist hotels to provide more efficient services with fewer labour costs. in addition, we can make accurate and timely responses to any circumstances in hotel rooms by implementing a broadcast system that makes timely communication during emergency situations. Lastly, the algorithm will filter and analyze individual's preference according to their background information. As a result, we can allow hotels to better understand different demands from their customers and be prepared to deliver the best services based on the analysis.

Our research and development focus on the Internet of Things (IoT) and the interactive advertising field. To conform today's fast-changing customer demands, not only we focus on the research of more advanced fields such as machine learning and deep learning technology, but also emphasize the importance of business intelligence and cybersecurity.

### Estimated Equipment Lifetime

All of the equipment mainly focused on research development including domain host, virtual server, 3D printing, operating license, modeling, sensor, and other electronic components. Most of the prototyping devices are one time used and will become part of the demonstration product that will last for long term. The IT & Software tools are paid by license and have access on an annual basis.

### Implementation Schedule

Research Survey: (Sept. 2017)

Distribute surveys to potential hotels, including hotel staffs and accommodators by collecting their opinions and complaints about traditional hotel room services and in-room advertising.

Beta Version Release: (Oct. 2017)

Finish the prototype development and complete features. Launch the beta version that is ready to be used in a suitable setting.



Pre-sale Customer Touch-base: (Jan. 2018)

Connect with target beneficiary, propose solutions to meet their needs.

Version I (LTS) Release: (Mar. 2018)

Release the official version and begin to provide long-term support.

Product Line Expansion: (Sept. 2018)

Start to expand the product line and meet needs in a more diverse setting.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Research Development Components	\$ 4500	\$ 4000	\$ 3500	\$ 0
Operations (Travel, Business Events)	\$ 700	\$ 600	\$ 500	\$ 0
Team Building Support	\$ 300	\$ 250	\$ 200	\$ 0
Recruitment (Printing, Material, Banner etc.)	\$ 300	\$ 250	\$ 200	\$ 0
<b>Total</b>	<b>\$ 5,800</b>	<b>\$ 5,100</b>	<b>\$ 4,400</b>	<b>\$ 0</b>



# Engineering IDEAs Clinic

F17-1181



## Engineering Design Days III - Ideas Clinic

*Rennick, Christopher*

*Engineering Educational Developer, Engineering IDEAs Clinic*

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### Description of Proposal

One important key to students succeeding in the program is to feel a part of the discipline. To achieve this, students need to experience what it “feels like to be an engineer”. To this point, the Ideas Clinic has run Engineering Design Days activities in Mechanical, Mechatronics, Management, Electrical, Computer, and Civil Engineering. The goal of this proposal is to expand this experience to upper years through offering Engineering Design Days II and III.

Graduated exposure to industrial-grade equipment will lead to more polished, industrial-quality capstone projects, and will make students more comfortable using this equipment in their work terms, and in industry after graduation. Our goal is to have industry-ready graduates coming from all programs in the faculty.

### Proposal Benefits

Engineering Design Days III will provide third year students to design, build, implement, and test a 2-axis machine from the ground up. This will require that they integrate knowledge from all the courses they are taking that semester. The course instructors are using this design/build to augment existing labs, projects, and assignments. From the perspective of Engineering Education pedagogy, this initiative will fill gaps in students’ knowledge and increase student motivation, which will lead to more creative and successful Engineers.

Student feedback on Engineering Design Days I so far has been highly positive, with high demand for more hands-on activities. These events allow students to get an exposure to the breadth of Engineering as a whole; they see what the process is like to bring a concept to an executed solution on a very condensed timeline, but which carries a high impact. They gain confidence in dealing with the ambiguity present in real Engineering problems.

This initiative is being piloted in the 3A Mechatronics program in Winter 2018. All course professors in that term are architecting this integrative activity. There is desire to expand this project, using the same equipment to ECE, ME, and possibly SYDE.

### Estimated Equipment Lifetime

We expect these machines to last for a minimum of 5 years. The Engineering Ideas Clinic will maintain these machines for that duration.

### Implementation Schedule

This is running for the first time with 3A MTE students in Winter 2018. These machines need to be purchased immediately.

### Additional Information

The Engineering Ideas Clinic is purchasing 20 machine, with support from MME and ECE. We are seeking funding from WEEF for the remaining 5 we require. The Ideas Clinic is also investing an additional \$15,000 in equipment to support this initiative (such as controllers, power supplies, testing equipment, etc).

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
2-axis Machines - MISUMI	\$ 20000	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 20,000</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# 4th Year Design Project (FYDP)

F17-1172



## Baja Engine and CVT Tuning Dynamometer

*Davison, Graham Charles*

*Team Member, 4th Year Design Project (FYDP)*

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### Description of Proposal

The University of Waterloo Baja SAE Team currently utilizes a Gaged continuously variable transmission (CVT) for powering their custom gearbox and drive wheels. This Gaged CVT is very customizable in terms of shift points and performance. To effectively tune and optimize the performance of the CVT, a low power engine and CVT dynamometer is required to measure the speed, torque, power and transmission efficiency. Optimization of the power train will help the team be more competitive at competitions, procure new sponsors and new undergraduate members. Our FYDP is to design, build and test a dynamometer for the UW Baja SAE Team.

### Proposal Benefits

- Procuring new sponsors
- Getting undergrads excited to join a fun and competitive student team
- Better dynamic performance at competitions
- Provide an area and equipment to test engine and CVT performance.
- Provide opportunity to tune CVT
- Provide opportunity to design custom CVT
- Provided understanding of engine, CVT and power-train dynamics to new members

### Estimated Equipment Lifetime

7.5 years with goals to switch from a Gaged CVT to a custom designed and built CVT by undergrads.

### Implementation Schedule

Fall 2017-Complete Design and Mechanical and Electrical Components Order

Winter 2017-Building, Assembly, Testing and Training Current Baja SAE members to use dynamometer.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Data Acquisition Electronics and Hardware	\$ 1000	\$ 600	\$ 0	\$ 0
Mechanical Components	\$ 500	\$ 800	\$ 0	\$ 0
Engineering Materials, CVT Parts	\$ 500	\$ 900	\$ 0	\$ 0
<b>Total</b>	<b>\$ 2,000</b>	<b>\$ 2,300</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Engineering Society (EngSoc)

F17-1211



## E7 Engineering C&D Fridges

Arnold, Katherine

Vice President Operations and Finance , Engineering Society (EngSoc)

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### Description of Proposal

The new E7 building will be equipped with a brand new, student run and Engineering Society Operated Engineering C&D that will open in 2018. To serve the students best and offer the quality and variety of food, drink, coffee and doughnuts, the new C&D requires refrigerators.

Each fridge is approximated to be \$4000

We would require 6-9 fridges

To Date, WEEF has funded the Engineering Society for \$12000 to buy fridges. (3 fridges)

### Proposal Benefits

The Engineering C&D that will open in the new building Engineering 7 will benefit all students and faculty in the vicinity, which includes E5, E6 and E7. This is in close proximity to the student workspace in the E5 Student Design Center, and the new student space in E7, as well as all classrooms in E5, E6, E7.

Coffee is fuel.

### Estimated Equipment Lifetime

The similar fridges that we have in the CPH C&D have lasted more than a decade and continue to operate. We have only recently needed to replace a fridge that has served longer than 10 years.

### Implementation Schedule

These fridges will be a one-time purchase bought for the opening of the E7 C&D in September 2018.

### Additional Information

The cost is an approximation based on average current prices of industry standard refrigerators on the market today.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Fridge - Partial Funding Appreciated	\$ 4000	\$ 3000	\$ 2000	\$ 1000
TWO Fridges	\$ 4000	\$ 3000	\$ 2000	\$ 1000
<b>Total</b>	<b>\$ 8,000</b>	<b>\$ 6,000</b>	<b>\$ 4,000</b>	<b>\$ 2,000</b>

# Engineering Society (EngSoc)

F17-1212



## POETS Furniture: New Couches

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Vice President Operations and Finance , Engineering Society (EngSoc)

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### Description of Proposal

We have reached an era in EngSoc History where our furniture largely consists of duct tape. We have started to replace old furniture. It is important that the Society puts its best foot forwards, especially as POETS is a hot-spot of tours for incoming students.

### Proposal Benefits

The couches purchased will be immediately put into POETS. These couches will benefit all of the students who come and go from our student lounge everyday, for every event. Our lounge is open to be booked by all student teams and groups at the University of Waterloo. This includes coffeehouses, trivia nights, potlucks and board games.

The salvageable couches will be given (FREE OF CHARGE) to student teams and groups, and program/fourth year rooms, that apply for couches. Couches will be given based on application. Couches must stay on campus.

### Estimated Equipment Lifetime

These couches are industry standard for communal spaces and are expected to last decades. The couches currently in Poets are very old.

### Implementation Schedule

Immediate purchase.

### Additional Information

SLEF (FedS Student Life Endowment Fund) has provided funding for 3 couches to date. There are 8 Couches to be replaced in total.

Option 1: 4 Couches

Option 2: 3 Couches

Option 3: 2 Couches

Option 4: 1 Couch

1 couch = \$3075.85

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Poets Couches	\$ 12304	\$ 9228	\$ 6151	\$ 3076
<b>Total</b>	<b>\$ 12,304</b>	<b>\$ 9,228</b>	<b>\$ 6,151</b>	<b>\$ 3,076</b>

# UW Habitat for Humanity

F17-1197



## Warrior Home Design Team Funding Request

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*Events Manager, UW Habitat for Humanity*

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### Description of Proposal

The University of Waterloo Warrior Home is a newly formed undergraduate design team made up of members from a variety of engineering programs. Our team aims to combine philanthropic opportunities with real hands-on design experience, with the goal to design an eco-friendly, cost-effective home. We will compete in the annual Race-to-Zero Competition held in Golden, Colorado, which is hosted by the U.S. Department of Energy in the coming year.

We are currently developing a shed which we will build each year to raise awareness for our purpose to facilitate affordable housing. This shed will also serve as a storage unit for our supplies. We also will begin development of construction programs and workshops that teach students do-it-yourself construction projects.

Therefore, we are requesting financial support to purchase construction tools such as a saw, drafting supplies, a palm sander, a power drill, drill bits, and screws. We are also requesting storage organizers and a shelf for our house model that will be placed in E2. This will further work to highlight the club's presence within the Engineering Faculty on campus.

### Proposal Benefits

The UW Warrior Home provides an excellent educational background for undergraduate students interested in house design and energy conservation. From custom-designed houses with special environmental considerations, to building the houses at community build days, and taking part in the financial considerations of urban planning, the Warrior Home Project provides its members with complete exposure to everything it takes to complete a residential house.

The most direct benefit of the proposed tools is providing engineering students to gain hands-on experience even before their first work-term begins. Currently the design team and its representative club is made up of 11/14 Engineering disciplines. Students from the Faculty of Engineering make up 90% of the general body and 100% of team leads.

Furthermore, WEEF will be eligible to receive our "Foundation Layer" sponsorship tier. The benefits would include an invitation to the Warrior Home dedication when it is built in the future, the WEEF logo on the website, t-shirts, newsletter, and banners, a termly update newsletter, and an appreciation certificate.

### Estimated Equipment Lifetime

The drafting supplies (pens, pencils, markers, trace paper, tape) and storage organizers are expected to last between 1 to 5 years. The power drill, drill bits, screws, saw, and palm sander are expected to last 5 years. The licenses for RS Means and Bluebeam will last 1 year. The folding table, extension cords, and portable speaker are expected to last 5 years.

### Implementation Schedule

All items will be purchased once funding is received, as they are all critical to the success of the club.

### Additional Information

None.



## Cost Breakdown

Item	Option1	Option2	Option3	Option4
Palm Sander	\$ 120	\$ 120	\$ 0	\$ 0
RS Means Licenses (x2)	\$ 250	\$ 0	\$ 250	\$ 0
Bluebeam Licenses (x2)	\$ 260	\$ 0	\$ 260	\$ 0
Drafting and Modeling Supplies, Storage Organizers	\$ 450	\$ 0	\$ 0	\$ 450
Power Drill and Drill Bits	\$ 300	\$ 300	\$ 0	\$ 0
Saw	\$ 240	\$ 240	\$ 0	\$ 0
<b>Total</b>	<b>\$ 1,620</b>	<b>\$ 660</b>	<b>\$ 510</b>	<b>\$ 450</b>

# UW Habitat for Humanity

F17-1198



## UW Habitat for Humanity Campus Chapter

*Skirzynska, Arianna*

*Events Manager, UW Habitat for Humanity*

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### **Description of Proposal**

The University of Waterloo Habitat for Humanity Campus Chapter is a newly formed undergraduate engineering club made up of members from a variety of engineering programs. Our team aims to combine philanthropic opportunities with real hands-on design experience, with the goal to develop a strong community base within the University sphere.

We are currently developing a shed which we will build each year to raise awareness for our purpose to facilitate affordable housing. This shed will also serve as a storage unit for our supplies. We also will begin development of construction programs and workshops that teach students do-it-yourself construction projects. Throughout the each school term we conduct numerous campus fundraisers to further collect funds for Habitat for Humanity and the Campus Chapter, as well as spread awareness.

Therefore, we are requesting financial support to purchase event supplies such as a team and sponsor banner, folding table, extension cord, and portable speaker. Furthermore, we are requesting funds for hammers, bar clamps, and workhorses for our shed building and our hammer and nail events. This will further work to highlight the club's presence within the Engineering Faculty on campus.

### **Proposal Benefits**

The Waterloo Campus Chapter provides an excellent educational background for undergraduate students interested in home design and energy conservation. From custom-designed houses with special environmental considerations, to building the houses at community build days, and taking part in the financial considerations of urban planning, the Campus Chapter provides its members with complete exposure to everything it takes to complete a residential house in the Kitchener-Waterloo Community.

The most direct benefit of the proposed tools is providing engineering students the opportunity to gain hands-on experience even before their first work-term begins. Currently the club is made up of 11/14 Engineering disciplines. Students from the Faculty of Engineering make up 90% of the general body and 100% of team leads.

Furthermore, WEHF will be eligible to receive our "Foundation Layer" sponsorship tier. The benefits would include an invitation to the Warrior Home dedication when it is built in the future, the WEHF logo on the website, t-shirts, newsletter, and banners, a termly update newsletter, and an appreciation certificate.

### **Estimated Equipment Lifetime**

The folding table, extension cords, and portable speaker are expected to last 5 years. The team and sponsorship banner are expected to last 1-2 years.

### **Implementation Schedule**

All items will be purchased once funding is received, as they are all critical to the success of the club. The team and sponsorship banner will be purchased in January 2018.



### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Team & Sponsorship Banner	\$ 300	\$ 0	\$ 0	\$ 300
Hammers (x12)	\$ 200	\$ 0	\$ 200	\$ 0
4 Bar Clamps	\$ 150	\$ 0	\$ 150	\$ 0
Workhorses (x2)	\$ 250	\$ 0	\$ 250	\$ 0
Folding Table (x2)	\$ 250	\$ 250	\$ 0	\$ 0
Extension (x2)	\$ 100	\$ 100	\$ 0	\$ 0
Portable Speaker	\$ 150	\$ 150	\$ 0	\$ 0
<b>Total</b>	<b>\$ 1,400</b>	<b>\$ 500</b>	<b>\$ 600</b>	<b>\$ 300</b>



## UWSA - Digital Fabrication Lab Update

*Ethan Schwartz*

*Senior WEEF Representative, Waterloo Architecture Student Association (WASA)*

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### **Description of Proposal**

This proposal is for the purchase of an SLA resin printer in the Digital Fabrication Lab to be used for the fabrication of architectural models, and molds for prototyping. The stereolithography 3D printer uses liquid resin and an ultraviolet laser to cure the fluid layer by layer. Having the largest print volume (14.5cm x 14.5cm x 17.5cm) and strongest reviews for a consumer level SLA printer we have decided on a Formlabs Form 2 and the accompanying finishing accessories. The Form Wash provides a fully enclosed system to clean excess resin off of the printed parts. The Form Cure is then used to harden the resin and bring it up to its full strength.

### **Proposal Benefits**

Architecture students are deeply interested in integrating new technologies that enable them to realize and test their designs. The University of Waterloo School of Architecture is delving further into the capabilities of computation in architecture, exploring forms and designs that would not be possible to construct with traditional crafting methods. Through the expansion of the student run initiative of the MakerLab, more students have begun to learn essential tools for digital manufacturing and are progressively using 3D printers. While FDM printers are a powerful tool, they do have their limitations, in both resolution and printable geometry.

The Form 2 will allow for us to produce highly detailed models at eight times the current resolution (.025mm vs .2mm) that we are capable of with the current FDM printer in the shop. The isotropic nature of the finished prints allows for the parts to be stronger and hold up better than their orthotropic counterparts from an FDM machine. The upside down printing method allows for parts with overhangs that would not be capable on an FDM printer. There is also a wide selection of materials that have different properties. With prototyping and engineering resins with different physical properties, the system allows for the printing durable parts, TPU flexible parts, molds for injection molding or lost wax castings. Students will be able to explore forms that they have designed digitally, evaluate the feel and look of the model but also test their technical performance.

The Form Wash and Form Cure will stream line the process of printing and help to maintain a clean and functional work area around the printer.

Currently students do not have access to this type of printing technology on either campus. Small prints of this scale and resolution need to be ordered from external vendors and shipped to students at a very high cost.

### **Estimated Equipment Lifetime**

The equipment will be supported by the Architecture School workshop manager and technicians. With proper care and maintenance, the equipment should last in excess of 5 years. Maintenance of the equipment will be performed on a regular basis and all supplies and parts will be purchased by the School of Architecture.

### **Implementation Schedule**

Immediate.

### **Additional Information**

Option 1 – Full Update (Form 2, Wash, Cure, 2xResin Tank, Build Platform)

Option 2 – Form 2 and Form Cure (Form 2, Cure, 2xResin Tank, Build Platform)



Option 3 – Form 2 and accessories (Form 2, 3xResin Tank, 2x Build Platform)

Option 4 – Form 2

**Cost Breakdown**

<b>Item</b>	<b>Option1</b>	<b>Option2</b>	<b>Option3</b>	<b>Option4</b>
Form 2	\$ 4890	\$ 4890	\$ 4890	\$ 4890
Form Cure	\$ 1005	\$ 1005	\$ 0	\$ 0
Form Wash	\$ 730	\$ 0	\$ 0	\$ 0
Resin Tank	\$ 180	\$ 180	\$ 270	\$ 0
Build Platform	\$ 153	\$ 153	\$ 306	\$ 0
<b>Total</b>	<b>\$ 6,958</b>	<b>\$ 6,228</b>	<b>\$ 5,466</b>	<b>\$ 4,890</b>

## Baja SAE Fall 2017 WEEF Proposal

*Lu, Stan*

*Team Lead, Baja SAE*

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### Description of Proposal

The University of Waterloo Baja SAE team is seeking to design and build an entirely new vehicle by summer 2018. We have already obtained funding for new drivetrain and suspension components. This Fall 2017 proposal will be focused on a new brake system, as well as a new team computer and IR thermometer.

The 5 items are (presented from highest to lowest priority):

#### 1. Brake calipers

Members of the team will learn how to size hydraulic brake calipers and design brake rotors to work with purchased parts. Students will design front hubs to mount the calipers.

#### 2. Brake cylinders

Members of the team will learn how to size brake cylinders and integrate them into the pedal control system. Students will design brake pedals to actuate said cylinders.

#### 3. Team computer

The UW Baja team needs to create and modify large SolidWorks assemblies, as well as conduct very CPU-intensive Finite Element Analysis studies. The shared CAD lab can no longer accommodate our team due to the increased demand from other teams.

#### 4. Bias bar assembly

Members of the team will learn about the physics behind braking, brake bias, and design a brake system that will adequately distribute the front and rear braking forces evenly.

#### 5. IR thermometer

Numerous aspects of the car heat up during driving. An accurate IR thermometer is required to measure and record temperatures for testing/validation/failure prevention. Students will learn about test methods and optimizing designs for heat (dissipation).

### Proposal Benefits

See above. All items will assist the team in building a new 2018 vehicle and give members hands on design experience.

### Estimated Equipment Lifetime

-Brake calipers & cylinders



Will last under 2020.

-Bias bar assembly and IR thermometer

Could potentially last for 5 years.

-Team computer

Depends on how much is allocated for the computer. It will be used until it breaks or until its no longer cost effective to upgrade.

### Implementation Schedule

Brake components will be purchased winter or summer 2018 (when building the vehicle).

IR thermometer and computer will be purchased ASAP.

### Additional Information

We will gladly accept partial funding for any item.

UWATERLOOBAJA@gmail.com for any question. I would be happy to clarify any questions or concerns.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Brake Calipers	\$ 750	\$ 600	\$ 450	\$ 300
Master Cylinder	\$ 900	\$ 600	\$ 300	\$ 0
Team Computer	\$ 1500	\$ 1250	\$ 1000	\$ 0
Bias Bar	\$ 100	\$ 0	\$ 0	\$ 0
IR Thermometer	\$ 100	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 3,350</b>	<b>\$ 2,450</b>	<b>\$ 1,750</b>	<b>\$ 300</b>

# Midnight Sun Solar Rayce Car Team

F17-1188



## Solar Cells for Midnight Sun

*Vandenhoven, Clarke Raymond*

*Head of Sponsorship, Midnight Sun Solar Rayce Car Team*

*clarke.vandenhoven@uwmidsun.com*

### Description of Proposal

Midnight Sun 12 is currently being built, with a chassis and aerobody nearly fully built, and so it is time to start implementing the electrical systems, including the solar cells.

Looking ahead to the electrical systems, one of the most important parts of a solar car is the solar cells themselves. We will purchase Sunpower E60 Cells for Midnight Sun 12.

The car requires 90 of these cells, and we hope that WEEF will help support some of the cost.

### Proposal Benefits

Midnight Sun is a large student team that has over 75 members from almost every department in the Engineering Faculty. Its Mechanical, Electrical and Business teams provide students with an excellent opportunity to develop technical and soft skills in a challenging and self-driven environment.

As a solar electric car, one of the most significant costs is the solar array that powers the car. By helping support the solar array cost, WEEF will be supporting an important project for a significant amount of grateful engineers.

### Estimated Equipment Lifetime

The current plan is for these solar cells to be in use for MSXII, but it is likely that MSXIII and MSXIV will both use some, if not all of these cells, putting the equipment's expected lifetime at around 5 years.

### Implementation Schedule

The array is currently being ordered, so the funds will be used either at the end of this term, or at the beginning of the W2018 term.

### Additional Information

Midnight Sun is very grateful for WEEF's support and will be placing the WEEF logo in the largest possible size on the car as a show of our thanks.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
E60 Solar Cells	\$ 2000	\$ 2500	\$ 3000	\$ 0
<b>Total</b>	<b>\$ 2,000</b>	<b>\$ 2,500</b>	<b>\$ 3,000</b>	<b>\$ 0</b>

# Nanorobotics Group (UW\_NRG)

F17-1204



## University of Waterloo NanoRobotics Group (UW\_NRG)

*Lee, Jason Matthew*

*Business Development Officer, Nanorobotics Group (UW\_NRG)*

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### Description of Proposal

As a fully undergraduate research team, The University of Waterloo Nanorobotics Group (UW\_NRG) works on a variety of cutting edge micro design fields. Through the conceptualization of advanced physics principles, UW\_NRG is able to manipulate matter at the nano level. UW\_NRG has proven their abilities by their outstanding performances at the International Conference on Robotics and Automation (ICRA). This conference, hosted by the IEEE, provides a platform with which to showcase our work. On the world stage, UW\_NRG has received 1st place honours in micro-assembly along with 2nd in mobility at ICRA 2016. UW\_NRG looks to compete again this year at the 2018 Mobile Microrobotics Challenge hosted in Brisbane, Australia. The team is currently preparing the SAM design and improving the robot control system to be competition ready by May.

### Proposal Benefits

UW\_NRG serves to provide its members with hands on experience with nanotechnology and micro-fabrication techniques. The engineering disciplines of the members of UW\_NRG span across multiple faculties, including Nanotechnology, Electrical, Software and Biomedical. UW\_NRG is able to provide access to high quality labs, provide opportunities for undergraduate research and the experience of real life applications of engineering course materials. The technical teams challenge members to design, test, and develop unique nanorobots that can accomplish various tasks at the nanoscale. Students in the business and marketing team are able to develop additional skills beyond technical capability, such as communication and formal writing. All of these exciting and innovating opportunities ensure that every member of UW\_NRG can foster skills they can use throughout their undergraduate and professional career.

### Estimated Equipment Lifetime

Item: Dewar/Vacuum Flask

Purpose: To contain liquid nitrogen

Lifetime: 5 yrs -10 yrs

### Implementation Schedule

The development of SAM is urgent as it is our competition and main showcase robot. The implementation of these essential supplies will begin immediately and will last for several years. Thus, all materials will be purchased within a month of receiving funding. As well, additional parts for other robots will be used over the next year to conceptualize innovative ideas. These ideas could bring about newer, and finer ways to control movement in the nano-scale and thus hold a heavy importance not only to future competitions but also to industrial applications.

### Additional Information

The support of WEWF, the University of Waterloo's Faculty of Engineering, the Dean of Engineering, and all of our various sponsors are greatly appreciated and crucial towards the success of UW\_NRG. For more information on UW\_NRG and our sponsors, feel free to visit our official website at:

[www.uwnrg.org](http://www.uwnrg.org)



## Cost Breakdown

Item	Option1	Option2	Option3	Option4
Dewar/Vacuum Flask	\$ 300	\$ 0	\$ 0	\$ 0
Future Equipment	\$ 1000	\$ 0	\$ 0	\$ 0
Travel Expenses	\$ 5000	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 6,300</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Alternative Fuels Team (UWAFT)

F17-1187



## UWAFT Proposal

*Shaikhi, Ramin*

*Project Manager, Alternative Fuels Team (UWAFT)*

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### Description of Proposal

Previously got \$750 for a Generator for the SDC trailer however it has been discovered that the amount is not enough for the generator required

### Proposal Benefits

Student teams that have access to the trailer will have electricity. This can power the heater in the trailer which will be very useful during winter. Teams will also be able to charge their electronics or power up lights during events

### Estimated Equipment Lifetime

around 10,000 hours of use. If maintained will then it should last up 10 years

### Implementation Schedule

Once we get the approval we will buy it from home depot and put it in the trailer. It will then be accessible to anyone who is using the trailer

### Additional Information

the proposal cost will be the additional money required to get the required generator. (Additional to the previous \$750)

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Gasoline Generator	\$ 350	\$ 500	\$ 600	\$ 700
<b>Total</b>	<b>\$ 350</b>	<b>\$ 500</b>	<b>\$ 600</b>	<b>\$ 700</b>



# Robotics Team (UWRT)

F17-1176



## University of Waterloo Robotics Team Mars Rover

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*Team Lead, Robotics Team (UWRT)*

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### Description of Proposal

The University of Waterloo Robotics Team is a participant of the University Rover Challenge (URC), which is a competition focused on building a semi-autonomous Mars Rover robot that undergoes a series of tasks, such as object collection and delivery, soil analysis, and terrain traversal. The design team is comprised of approximately 40 active undergraduate students of all years and programs, which is a gradual increase from previous years. We recently finished our design cycle for URC, where we placed 2nd in Canada and 15th globally.

The UW Robotics Team will be modifying and making improvements on their Mars Rover project for University Rover Challenge 2018. In order to do so, the team will need some additional tools and equipment, so that it can perform its best at the competition.

On the electrical side, we need funding for

- 1) Antenna equipment
- 2) Logic analyzer

On the mechanical side, we need sponsorship for

- 1) Science module project
- 2) Turntable
- 3) New Tires

### Proposal Benefits

The UW Robotics team has proven to be a great educational ground for undergraduate students interested in robotics for over a decade as one of the most iconic student teams in Waterloo.

A large number of the team are interested in mechanical design, which is what the science module and turntable focuses on. The science module for our Mars Rover project will be used to extract soil samples and analyze them from the ground into our Rover. The science module utilizes gear boxes, motors, and soil sample testing sensors to heavily experience the design process for a complex mechanical system. Moreover, the turntable will be an iteration from last year's design, which performed above expectations. Optimization will be the focus this year, as new bearings, brackets, mounting plates, and a gear will be needed for the improvement. As for the tires, traction was a big problem last year, and we're looking to add newer, terrain resistant tires on our Rover.

The antenna components will enable the rover to send more data at a faster rate, thereby allowing us to be more creative and competitive with the communications sector of the rover.

### Estimated Equipment Lifetime

The science module extraction aspects, such as the motors and gears, will last around 5 years, while the soil analyzing sensors will need to be upgraded in the next 2-3 years. The turntable is expected to last another 3 years after this year's optimization. Moreover, the tires are expected to last 5+ years.



The logic analyzer will technically last a lifetime.

### Implementation Schedule

We will purchase the antenna equipment logic analyzer immediately so that we can begin troubleshooting circuits with digital signals, which will occur throughout the year. We will begin working on antenna during fall, and complete the project in time for the critical design review in winter. On the mechanical side, design is almost complete, so we will begin purchasing the parts by November and begin implementing them in the assembly soon after then.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Science Module	\$ 800	\$ 800	\$ 600	\$ 0
Turntable Project	\$ 150	\$ 150	\$ 100	\$ 0
Antenna Equipment	\$ 400	\$ 400	\$ 300	\$ 0
Logic Analyzer	\$ 300	\$ 0	\$ 0	\$ 0
New Tires	\$ 150	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 1,800</b>	<b>\$ 1,350</b>	<b>\$ 1,000</b>	<b>\$ 0</b>

# Rocketry Team

F17-1207



## Waterloo Rocketry - F17 Proposal

*Jacob Deery*

*Finance Lead, Rocketry Team*

*uwrocketry@gmail.com*

### Description of Proposal

Waterloo Rocketry is a student team specializing in the development of hybrid rockets. We compete annually at the Spaceport America Cup with more than 100 teams from across the globe. Our work comprises design, manufacture, and testing of vehicle and ground support systems.

At the 2017 Spaceport America Cup, our team was thrilled to carry out a successful launch and recovery of the Vidar III rocket. Our performance resulted in a first-place finish for our category, 10 000' Student Researched & Developed Liquid/Hybrid. Due to our iterative design approach in development of the Vidar series, we were also presented with the overall Technical Excellence award.

Building on our 2017 success, our team has begun development on a new rocket, Unexploded Ordnance (UXO) to compete in the 30 000' Student Researched & Developed Liquid/Hybrid category. UXO will feature a new high-powered engine and composite airframe, as well as greatly expanded avionics modules.

To support our development efforts, we are requesting funding for the following categories:

#### 1. Launch Vehicle Development

The launch vehicle consists of the airframe, which houses all other systems, the nosecone and fins, and the engine. The materials required include fabrication materials for the engine and body of the rocket. This is the most expensive and most fundamental development of UXO. An engine capable of reaching 30 000 ft allows us to perform experiments at altitude and optimize our overall rocket design going forward. The airframe will house the engine, avionics, and payload. Once developed, the engine and airframe will continue to be used by the team for several years at competition and will allow for further development into all further systems.

#### 2. Launch Tower

Our launch tower is a critical part of our launch system. The current system of launch tower erection is time consuming and has some safety hazards involved, since at least 6 students need to stand directly underneath the tower while it is being raised. The improved system would comprise a launch pad that is easier and faster to assemble, as well as a safer and more efficient raising mechanism.

#### 3. Avionics

Avionics encompasses all flight electronics, including data acquisition and recovery systems. The increased capabilities of UXO require new avionics modules across the board. Funding will be used for PCBs, sensors, and fabrication material to develop baseline systems as a platform for iterated development.

#### 4. Testing Equipment



As we upgrade our propulsion system, new sensors are required for testing. This funding would go towards a new load cell to support engine testing in Waterloo.

## **Proposal Benefits**

### **1. Launch Vehicle Development**

The benefits of the vehicle are that it allows for further development of the rocket in future years. It sets the foundation for what the team is capable of achieving for the next few years. Limiting our ability to develop a good launch vehicle now will limit the team in the future. A strong and robust initial design will allow new generations of Waterloo Engineers do exciting and innovative work in the field of rocketry.

### **2. Launch Tower**

Safety is one of the team's biggest priorities, and this system would make the setup for the launch tower much safer as students will not need to stand underneath the tower. Additionally, setup time is one of our biggest challenges at competition, and this system will reduce that time by a few hours.

### **3. Avionics**

Avionics systems are critical to development of our rocket. Parachute deployment systems are not only mandated by competition regulations, but absolutely necessary to ensure safe operation. A flight data acquisition module is necessary to allow us to analyze rocket flight and continue to improve our systems. The base systems designed for UXO will allow future generations of team members to extend avionics capabilities and implement increasingly sophisticated modules, such as more technically complex payloads for high altitude experiments.

### **4. Testing Equipment**

As we are unable to perform full-scale launches in Canada, ground testing remains the only reliable source of data for evaluation of our systems during development. New sensors will allow us to more accurately record data during engine testing, enabling us to tune our engine for increasingly improved performance. Thorough testing is required to ensure that our engine is reliable and safe prior to launch attempts.

## **Estimated Equipment Lifetime**

### **1. Launch Vehicle Development**

The previous rocket engine and airframe was developed and iterated for 5 years. This launch vehicle is expected to have a similar lifetime.

### **2. Launch Tower**

The current launch tower system is more than 5 years old and will continue to be used for the foreseeable future. Any upgrades to the launch tower will last as long as the team uses the launch tower (indefinitely).

### **3. Avionics**



Baseline avionics systems are expected to last for the lifetime of the UXO rocket (i.e. 5 years).

#### 4. Testing Equipment

The purchase of new sensors will be a permanent upgrade to our data acquisition system. The estimated lifetime of a load cell is 5 years.

#### Implementation Schedule

Research and design are underway for all projects. It is expected that manufacture and test of these critical systems will take place over the W18 term.

#### Additional Information

In the event that WEEF is unable to fully fund all of our requested categories, we would prefer that funding be directed towards Launch Vehicle and Avionics. These projects are critical for our technical development as a team, and will set the foundation for several years of development.

#### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Testing Equipment	\$ 600	\$ 500	\$ 400	\$ 300
Avionics	\$ 2100	\$ 1700	\$ 1300	\$ 1000
Launch Tower	\$ 650	\$ 550	\$ 450	\$ 250
Launch Vehicle	\$ 5200	\$ 4000	\$ 3000	\$ 2000
<b>Total</b>	<b>\$ 8,550</b>	<b>\$ 6,750</b>	<b>\$ 5,150</b>	<b>\$ 3,550</b>

# Combined Proposal (SDC)

F17-1199



## Student Team Trailer

*Teertstra, Peter M*

*Director, Sedra Student Design Centre, Combined Proposal (SDC)*

*peter.teertstra@uwaterloo.ca*

### Description of Proposal

The Sedra Student Design Centre includes a number of shared-use resources, including physical spaces for fabrication and testing, and equipment used by student teams. The student teams have access to 3 vehicles and a number of trailers as part of a fleet of vehicles administered by the SDC. For teams that have large projects, two pickup trucks and two large, enclosed trailers are available to haul the team's equipment to their competitions. Each trailer is 25 feet long and is capable of holding and transporting a full size project vehicle, tools, and other items.

A recent inspection of one of the team trailers (2004, manufactured by PACE) found that serious corrosion damage had occurred on the frame. Many of the support beams under the floor of the trailer had rusted and come loose from the frame. In addition, one of the axles needed replacing. The cost of repair was too high, given the age and condition of the trailer, so the trailer was sent to Central Stores for asset disposal.

The Student Design Centre is proposing to purchase a replacement trailer to be used by the student teams for transporting their projects. The specifications of the trailer are as follows:

Dimensions: 25 feet long x 102 inches wide by 102 inches high

Payload capacity: 7000 lbs

Torsion axles, ramp rear door, side door, V-nose to improve towing

### Proposal Benefits

Having vehicles and trailers owned and maintained by the University and administered by the Student Design Centre is of great benefit to all student team users. As these are considered commercial vehicles, there is a requirement for annual inspections and certifications which is paid for by the SDC. Regular preventative maintenance, including replacement of tires and small repairs, are also paid for by the SDC and performed by the UW Vehicle Shop. Insurance is administered and paid for by the SDC. Scheduling is performed by the SDC to ensure equal, fair access to all vehicles and trailers for all teams. Truck and trailer training is provided to all student team drivers to ensure they know how to tow and back up a trailer prior to their trip.

Another benefit to student teams is that having vehicles and trailers available to transport projects greatly reduces the cost associated with attending competitions. Regular, annual competition destinations for the SDC trucks/trailers include New Mexico, Utah, California, Nebraska and Michigan. The cost of a trailer is easily recouped in rental cost savings in just a few years.

### Estimated Equipment Lifetime

The trailer would be undercoated to reduce corrosion damage. The expected service life of the trailer is 15 years. This lifetime could be increased by routine spraying with a rust inhibitor (Rust Check, for example) to protect the steel frame from corrosion.

### Implementation Schedule

The goal is to purchase the trailer early in the Winter 2018 term. This will allow the trailer to be ready for the teams to use during competition season, which typically starts in March and ends in July.



# Waterloo Aerial Robotics Group (WARG)

F17-1210

## Fall 2017 Funding Proposal

*Lenover, Michael*

*Team Lead, Waterloo Aerial Robotics Group (WARG)*

*milenover@uwaterloo.ca*



### Description of Proposal

The Waterloo Aerial Robotics Group (WARG) is a team of passionate students developing autonomous aerial vehicles that perform various tasks with the slightest amount of human interaction. WARG recently participated in the 7th Unmanned Systems Canada (USC) Competition this past April, with the objective of surveying, analyzing and gathering information for the purpose of wildlife tracking. This is an annual competition, which WARG will be participating in at approximately the same time next year.

As in previous years, the upcoming USC competition will be in two parts: a large-scale aerial surveillance portion, and a smaller-scale probe retrieval/placement section. In prior competitions, we have attempted to modify a single, general-purpose system to complete both these tasks. Unfortunately, experience has shown that this method results in an aircraft that does not perform optimally in either regard. Therefore, in order to more effectively meet the requirements of upcoming competitions, WARG will be designing two systems for the next competition: a fixed-wing aircraft for aerial surveillance, and a general purpose multi-rotor aircraft for precision placement and retrieval of competition probes. In this proposal, WARG is seeking funding for avionics and tools to manufacture the fixed-wing aircraft. Thanks to the generous funding provided by WEEF last semester, the multirotor aircraft has been fully funded and is currently being manufactured.

The highest priority items in this proposal are avionics for the fixed-wing aircraft that is currently in development. Included with this is a pair of new radio transceivers, GPS module, inertial measurement unit (IMU), as well as a variety of other sensors including airspeed, ultrasonic distance, magnetometer and altimeter. In order to implement these sensors into our software, WARG is also asking for a logic analyzer, the Logic Pro 8. This will allow our team to debug electronics more effectively by allowing us read the data sent over a wire in real time.

WARG is also asking for new tools for the purpose of jig making, part manufacturing, and working with composites. WARG is requesting funds to buy a miter box, hand saw, and a new drill with clutch and speed control. These tools will help in fabricating more precise testing and manufacturing jigs than is currently possible due to the limited and aging tools available to us. We also wish to purchase a new shop vac with a stronger suction in order for us to be able to keep our bay and the communal areas cleaner and safer while grinding and sanding composite materials. Lastly, WARG wants to purchase a food dehydrator for the purpose of drying filament, which will allow us to print with specialty materials such as PVA for dissolvable support material, and Nylon for extra tough and durable material.

### Proposal Benefits

WARG's first priority is student learning, and prides itself in designing and building every aspect of the system from scratch. Because of projects such as our custom designed PCB that runs the autopilot, autopilot software, image processing suite, ground station, tracking antenna, and now soon the custom composite airframe, it is sufficient to say that our members get the utmost raw exposure to everything it takes to build an unmanned aircraft. As such we give all our members the opportunity to work on any of the above aforementioned projects, providing them with invaluable, applicable experience.

The shop vac and tools requested by the mechanical team at WARG will be used to create more precise jigs. Currently, WARG's jigs are built using improper tools, and have a significant amount of waste associated with them due to increased





rework. In the case of WARG's hotwire rig, this can result in inaccurate cuts in the foam components of the airplane. These simple tools will allow for much better results, and will result in less wasted material due to inadequate tools for manufacturing. The shop vac will be a great benefit to WARG since it will be used to collect fiberglass and carbon fiber dust when sanding and grinding composites, resulting in a cleaner and safer work environment than with working without the shop vac. The food dehydrator that WARG is requesting funds for is functionally identical to a commercially available 3D printer filament drier, at half of the price. Filament materials such as PVA and Nylon will naturally pull moisture from the air and will spoil. A filament drier will reverse this, and will make it viable to purchase and these materials, as they will not go bad over time.

The electronics components WARG is requesting will allow our fixed-wing aircraft to fly autonomously during competition next May. Firstly, during the previous competitions, we experienced signal dropouts due to the longer range that we were required to transmit compared to our test flights. The new radio modules will transmit at a higher power, and will significantly reduce the chance of signal dropout, which would cause our systems to go into failsafe mode and crash the plane. Secondly, WARG's computer vision system relies on combining data from images and the GPS coordinates at which they were taken. The current GPS module is fairly old and inaccurate. A more accurate GPS module will allow us to make more conclusive observations than we could previously. Thirdly, WARG's IMU is approximately five years old, and is no longer supported by the manufacturer. This makes writing code for this critical component much more difficult, and obtaining support in the event of a fault impossible. This new IMU will be less expensive than the existing one, more accurate, and most importantly, much more supported. The logic analyzer, as mentioned previously, is critical for debugging and developing our electronics systems, and will allow members to become familiar with technology used in industry as computer and electrical engineers. Finally, the funding for other peripherals including airspeed, ground distance, magnetometer and altimeter will be used to purchase backup components, in the event that any of them are damaged during a flight.

WEEF is currently in our highest sponsorship bracket. This proposal will allow WEEF to continue to be a "High Flyer" sponsor. Being a High Flyer means that a large WEEF logo will be added to our aircraft, website and on team apparel.

### **Estimated Equipment Lifetime**

The lifetime of the requested tools and shop vac is expected to be at least 5 years. The hand saw and miter box are sturdy hand tools, and the drill does not need any batteries (one of the first things to go bad in cordless tools). The new shop vac, should last as long as the current shop vac, approximately 5 years as well.

### **Implementation Schedule**

WARG will be acquiring all purchased items in the Fall 2017 term.

### **Additional Information**

Team Website: [www.uwarg.com](http://www.uwarg.com)

Photos: [www.flickr.com/photos/uwarg](http://www.flickr.com/photos/uwarg)



## Cost Breakdown

Item	Option1	Option2	Option3	Option4
Avionics	\$ 1500	\$ 1300	\$ 1100	\$ 800
Mechanical Tools	\$ 300	\$ 200	\$ 100	\$ 100
Logic Analyzer	\$ 700	\$ 500	\$ 250	\$ 0
Food Dehydrator	\$ 50	\$ 50	\$ 0	\$ 0
<b>Total</b>	<b>\$ 2,550</b>	<b>\$ 2,050</b>	<b>\$ 1,450</b>	<b>\$ 900</b>



## Suspension Sensors

*Syed, Mohammad Akmal*

*Project Manager, UW Formula Motorsports*

*ma3syed@uwaterloo.ca*

### Description of Proposal

UW Formula Motorsports designs, builds and races a small formula-style race car every year at the Formula SAE series.

A large emphasis in autocross cars such as ours is on vehicle dynamics. How the car's weight distribution and orientation in space affects track time is a large part of what our suspension team studies and tests. The pair of ride height sensors in this proposal are intended to support that goal.

### Proposal Benefits

The pair of ride height sensors would give us valuable information about the pitch and squat of the car as the car makes its way across a track. This data will be used to validate our lap time simulator, which has been developed by our own students.

The sensors would help advance our knowledge of vehicle dynamics, and would help refine and add to our simulator. This will create a reusable tool for many FSAE generations to come.

### Estimated Equipment Lifetime

Sensors do not suffer any wear and tear and are expected to last 5-7 seasons.

### Implementation Schedule

Sensors will be purchased immediately and will go onto the 2018 car, which rolls out in May 2018

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
IZZE Racing CAN Laser Ride Height Sensor 830 Hz	\$ 2080	\$ 1500	\$ 1040	\$ 0
<b>Total</b>	<b>\$ 2,080</b>	<b>\$ 1,500</b>	<b>\$ 1,040</b>	<b>\$ 0</b>

# Formula SAE Electric

F17-1196



## F17 - Waterloo Formula Electric - Emrax Motors

*Paribello, Jonathan*

*Head of Sponsorship, Formula SAE Electric*

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### Description of Proposal

Waterloo Formula Electric (Formerly Formula Hybrid) is a student-run design team dedicated to engineering electric racing vehicles for competition. It has a long history of success, coming first in the Autocross, Endurance, and Overall in Hybrid categories in the 2015 SAE Hybrid Competition. We provide students with well rounded educational opportunities in design and implementation, along with co-op opportunities and project/financial management experience. The goal of Formula Electric is as much about propelling our students and improving their careers as it is to make electric vehicles. We intend to continue our long tradition of representing Waterloo abroad and making our students better members of the Waterloo community.

Our number one goal for the 2018 season is reliability. In order to achieve this, we need to ensure that our powertrain is robust, we have time to test our chassis and electrical systems as a full-system, and drivers have sufficient training.

For the 2016 and 2017 seasons, a custom built set of motors was used. These motors were designed and constructed by a 2016 FYDP team, and are no longer reliable enough for continued use in the 2018 season. The time and financial investment required to design another set of custom motors is prohibitive, and would bring substantial risk if the custom motors fail to perform as designed.

Given our timelines and ambitions, the chosen solution for 2018 is to purchase reliable rotor and stator combinations, then focus team efforts on making the rest of the vehicle reliable. Following substantial research into every motor on the market within our power band requirement, EMRAX motors have been found to bring significant advantages over other competing options.

The two EMRAX 208 motors that we are requesting are reliable, lightweight, comparatively cheap, and serviceable. Having two motors of this caliber for the 2018 season will allow the team to focus on other important aspects of the car such as the battery design, electrical system, torque vectoring, traction control, chassis development, and aerodynamics.

### Proposal Benefits

- Design Experience
- Experience Pitching to Sponsors
- Co-op Networking
- Data Management
- International Publicity for U-Waterloo Engineering
- Exclusive Software Training and Experience
- Resource Management
- Connects Upper/Lower year students
- Financial Management
- Brings more Co-op Partners to Waterloo Engineering



## Estimated Equipment Lifetime

In use: 3-4 years

Post-obsolence monetary re circulation: Additional ~2 years (The motors hold their value on the used-market, and can be easily resold in a few years if the team chooses to eventually go a different direction).

Post-obsolence team circulation (Motors can be recirculated, to the direct benefit of at least four other design teams after we can no longer use them): ~3 years

## Implementation Schedule

Both motors will be purchased as soon as possible, and will be integrated into the 2018 competition vehicle by February, with manufacturing starting in January. Past this year, the motors will be integral to the construction of subsequent iterations of the car.

## Additional Information

The motors that we are requesting funding for are the determinant component of our car: without them, we cannot compete. As one of the largest and most active teams in the SDC, not having a reliable powertrain for 2018 will be crippling for a large body of students.

The EMRAX company has agreed to give us a student discount. The posted prices are in Canadian Dollars and reflect this discount.

Partial funding of the motors is of course accepted.

## Cost Breakdown

Item	Option1	Option2	Option3	Option4
EMRAX 208 motors	\$ 9000	\$ 7200	\$ 6750	\$ 0
<b>Total</b>	<b>\$ 9,000</b>	<b>\$ 7,200</b>	<b>\$ 6,750</b>	<b>\$ 0</b>



## **hEDGE Finance Conference Application for Funding**

*Ding, Jeffrey Jian Da*

*Managing Director, hEDGE*

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### **Description of Proposal**

At hEDGE, we seek to provide an introduction to the finance world for students at the University of Waterloo. Every year, we host numerous events in Waterloo and in Toronto that are open to university students across Ontario.

We offer networking opportunities, mock interviews, a sales and trading competition, and a large case competition which is projected to take place downtown in May 2018.

For this, we need equipment and funding. Every year, we spend over \$7,000 on AV equipment and set ups ranging from wireless presenters to laptops to speaker setups for the podium speakers.

This year, we'd like \$2,000 in order to invest in some basic AV equipment that can be used for the numerous events throughout the year. The bulk of this would go towards LCD projectors, basic speakers, microphones, and whiteboards.

### **Proposal Benefits**

Our finance based events are available to all students in Waterloo, with many engineering students who are interested attending each year.

Currently, engineering students are constantly being scouted by large firms who are investing more towards quantitative trading and large data analysis each year. In our sales and trading competition, engineering students will be able to experience what it's like to be a trader and understand the fundamentals of a career in trading.

Therefore, investing in our club will allow us to better educate and connect the students of uWaterloo to the finance world.

### **Estimated Equipment Lifetime**

The AV equipment we suggest should have an estimated equipment lifetime of 10-20 years depending on frequency of usage.

### **Implementation Schedule**

We plan to purchase the equipment as soon as possible. Events will be held starting from the Winter 2018 term so this gives us a period of time to research the best options available to us.

### **Additional Information**

None.

### **Cost Breakdown**

<b>Item</b>	<b>Option1</b>	<b>Option2</b>	<b>Option3</b>	<b>Option4</b>
AV Equipment	\$ 2000	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 2,000</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# UW Steel Bridge Team

F17-1195

## UW Steel Bridge Team Proposal

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*Finance Lead, UW Steel Bridge Team*

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### Description of Proposal

The UW Steel Bridge Team is participating in each of the ASCE and CSCE Steel Bridge Design Competitions. This student team provides its members with exposure to many aspects of steel design and fabrication. It also provides the opportunity for networking with industry professionals and students from other Canadian and American universities during the competition. The entirety of the project including the management, marketing, design, fabrication and construction is carried out entirely by the students, giving each of them a strong sense of ownership over the final bridge. The fabrication process is integral to the success of our team because it provides members with practical skills such as grinding, welding, drilling and cutting steel.

### Proposal Benefits

Having the power drill and the cordless ratchet will allow the team to do more work outside of the E5 Student Machine Shop. Our peak fabrication season unfortunately also corresponds to the busiest season for the student machine shop. The more equipment we have available to us during off-hours, the more efficient our team can be during the fabrication phase. The team is provided with the opportunity to work on the bridge both inside and outside of the machine shop. If the fabrication phase is completed earlier, more time will be allotted to the construction team for competition practice with all of the bridge pieces.

Having the cordless ratchet is also convenient for the construction phase, as it allows for a quick construction time during practices and competitions. The cordless ratchets can be an advantage for our team because it will allow multiple team members, including experienced and inexperienced members, to get familiar with the equipment and practice together at once. It will also cut down the construction time of the bridge significantly due to the fact that there will be more than one member working with the tool, which will be beneficial during competitions.

Lastly, the welding gloves are extremely beneficial for the fabrication phase as well as the safety of our members. Once the gloves are purchased, the existing gloves and newly purchased gloves will allow the fabrication team to be more efficient as there will be more hands working on the bridge. In the future, the existing gloves will no longer be safe, therefore the new gloves will provide the proper protection required to operate the equipment.

### Estimated Equipment Lifetime

We expect that the power drill, the cordless ratchet, and the welding gloves will last beyond 5 years.

### Implementation Schedule

All three of the listed items will be purchased immediately in Spring 2017 upon receiving the sponsorship money as all three items will be implemented during the fabrication and construction phase of the bridge.

### Additional Information

The following webpage has additional details about the ASCE and CSCE Steel Bridge Competitions:

Steel Bridge ASCE home & rules: <https://www.aisc.org/education/university-programs/student-steel-bridge-competition/>

Steel Bridge CSCE home & rules: <http://www.cscecompetitions.ca/Bridge>



### Cost Breakdown

Item	Option1	Option2	Option3	Option4
20V Cordless Drill and Driver Combo Kit	\$ 146	\$ 146	\$ 146	\$ 0
Lincoln Electric Premium Welding Gloves	\$ 26	\$ 26	\$ 26	\$ 26
Cordless 1/4" ratchet kit (w/ battery & charger)	\$ 518	\$ 0	\$ 259	\$ 259
Cordless 1/4" ratchet (bare tool only)	\$ 0	\$ 405	\$ 0	\$ 0
<b>Total</b>	<b>\$ 690</b>	<b>\$ 577</b>	<b>\$ 431</b>	<b>\$ 285</b>



# Waterloo Submarine Racing Team

F17-1203



## Waterloo Submarine Racing Team WEEF Proposal

*Allyson Hildebrandt*

*Safety Captain, Waterloo Submarine Racing Team*

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### Description of Proposal

The Waterloo Submarine Racing Team (WatSub) is Ontario's first human-powered submarine racing team, and one of very few active Canadian teams. We design, manufacture, test, and race the submarine internationally.

The team is formed by students who share a passion to push their technical boundaries and seek inventive ideas - in line with the true spirit of the Faculty of Engineering at the University of Waterloo. WatSub is an opportunity to showcase unique talents in the quest to become an international competitor in submarine racing. The team looks to integrate individuals from different engineering disciplines into an exciting new challenge that requires original and comprehensive solutions.

We are currently seeking equipment for our team. This equipment would allow us to continue the design, testing, and racing of our third submarine, project C. Its two predecessors, AMY and BOLT, competed in the 2016 European International Submarine Races (eISR) and 2017 International Submarine Races (ISR), respectively.

A description of the items and associated cost follows:

1. GoPro Camera Mounts - \$100 – these camera mounts would be used to shoot high-quality underwater footage, aiding both with marketing and the design process.
2. Personal Protective equipment (coveralls, respirators, heat gloves) - \$500 – we are hoping to improve our safety standards within the team, purchasing coveralls, respirators, and heat gloves for work with resins and composites and for in the shop.
3. Small CNC router - \$600
4. Ratchet straps - \$150
5. Cabinet for tool storage - \$50

### Proposal Benefits

We design, fund, manufacture, test, and race a human-powered submarine, with every step of this process done by UW students. This means exclusive learning opportunities for students, such as composites monocoque manufacturing, propeller design and optimization, advanced hydrodynamics, and many others. Our team consists of engineering students from a variety of engineering disciplines and skill levels with varying levels of time commitment, making the team inclusive and open to all students - independent of their background, experience, or schedule.

The personal protective equipment benefits the whole team, allowing people to work as safe as possible. The CNC router allows upper years on our team to train students on the use of a CNC router, and also allows us to save money. The remaining equipment – the camera mounts, ratchet straps, and tool cabinet – allow us to more effectively design the submarine.

For sponsorships over \$500, WatSub will include the WEEF logo on our website, t-shirts, and submarine.

### Estimated Equipment Lifetime



1. Camera mounts – 5 years
2. Personal protective equipment – 2 years
3. CNC router – 5 years
4. Ratchet straps – 10 years
5. Cabinet for tool storage – 10 years

### Implementation Schedule

All items would be purchased as soon as possible. We endeavor to have these purchases made by March 2018.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Camera Mounts	\$ 100	\$ 0	\$ 0	\$ 0
Personal Protective Equipment	\$ 500	\$ 0	\$ 0	\$ 0
Small CNC Router	\$ 600	\$ 0	\$ 0	\$ 0
Ratchet Straps	\$ 150	\$ 0	\$ 0	\$ 0
Tool Cabinet for storage	\$ 50	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 1,400</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Concrete Team

F17-1192



## UW Concrete Team - WEEF Proposal F17

*Dumouchel, Joelle*

*Finance Lead, Concrete Team*

*joelle.dumouchel@uwaterloo.ca*

### Description of Proposal

The UW Concrete Team is interested in purchasing a new barbecue which will be used to raise fund to build both the concrete canoe and the concrete toboggan and raise awareness for the team. This new barbecue would replace our old one which is damaged beyond repair and no longer meets the team’s requirement.

### Proposal Benefits

There are several benefits that would arise from the purchase of a new barbecue.

One of the burners on our current barbecue is no longer working and cannot be repaired. This new barbecue would allow us to be more efficient when selling burgers and allow us to serve more people since we could use the whole cooking surface. This would allow us to raise more funds and ensure a better financial future for the UW Concrete Team.

The new barbecue would also be safer and easier to transport from our bay to the different selling points since our current barbecue is missing a wheel and needs to be lifted onto another cart to be transported.

### Estimated Equipment Lifetime

The barbecue should last for five to ten years with minimum repairs.

### Implementation Schedule

The team would like to acquire the barbecue before the end of the winter term 2018.

### Additional Information

Thanks to WEEF’s funding in the spring term, WEEF is currently a bronze sponsor. If this proposal is accepted, WEEF will become a silver level sponsor.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Barbecue	\$ 700	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 700</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>

# Geo Eng Design Team

F17-1205



## Furniture for the geological engineering lounge

*Gurkar, Vachana*

*Assistant to the team lead, Geo Eng Design Team*

*vachana1@gmail.com*

### Description of Proposal

The geo design team operates from the geological engineering lounge located in the EIT building. The desks and chairs in this room are old and impractical. The productivity of the team and the geo eng classes will increase with an upgrade in equipment.

### Proposal Benefits

The upgrade in desks and chairs will increase our productivity and will facilitate a more collaborative workspace.

### Estimated Equipment Lifetime

12 years

### Implementation Schedule

Less than 1 year. Order the chairs and have them shipped to the university within the end of the next semester.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Chair	\$ 720	\$ 1200	\$ 1500	\$ 1800
Desk	\$ 1800	\$ 2300	\$ 3000	\$ 1400
<b>Total</b>	<b>\$ 2,520</b>	<b>\$ 3,500</b>	<b>\$ 4,500</b>	<b>\$ 3,200</b>

# Autonomous Sailboat (UWAST)

F17-1182

## UW Sailbot Fall 2017 WEEF Proposal



*Liu, Lily*

*Finance Lead, Autonomous Sailboat (UWAST)*

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### Description of Proposal

UW Sailbot, one of the newer design teams at the University of Waterloo, has been operational since June 2016. Every year, the team designs, builds, and programs autonomous wind-powered vessels to compete in the International Robotic Sailing Regatta (IRSR).

In June 2017, the team competed for the first time at IRSR 2017 in Annapolis Maryland, ranking 6th and the highest of all rookie teams. The competition is split into multiple events: a fleet race, navigation course, station keeping, a 10km endurance race, a presentation, an obstacle detection vision challenge, and a navigation test.

For the competition in 2018 (likely to be held in Boston), UW Sailbot plans to design and construct a large vessel from the ground up. The new design features an increased length of 2 metres for the hull and a keel length of 1.5 metres. These design elements will increase the speed of the boat fourfold while maintaining stability. On the software side, the team will be implementing autonomous path planning in addition to obstacle detection using GPS systems.

UW Sailbot is asking for the following items from WEEF: Sailwinch 4MG-280EL (\$340), Futaba controller (\$305), Sanding wheel (\$100), and Boat Hatch (\$108).

### Proposal Benefits

We are the University of Waterloo's first autonomous aquatic vessel team. As wind-powered vessels, sailboat dynamics are a unique and fun engineering challenge requiring skills not found on any other student design team. Over 30 team members learn about hull design, hydrodynamics, and aerodynamics through the design and manufacturing of custom hulls. This is in addition to experience with power electronics, electric motors, and sensor integration.

There's no other student design team at UW who autonomously navigates on the sea; it is truly a different challenge to land navigation. Path planning, location recognition, embedded programming, machine learning, and computer vision are the fields central to our team mission.

### Estimated Equipment Lifetime

Sanding wheel: 5+ years

Sailwinch: 3+ years

Futaba: 4+ years

Boat hatch: one competition year

### Implementation Schedule

All items will be purchased immediately after funding is granted.

### Additional Information

None.



## Cost Breakdown

Item	Option1	Option2	Option3	Option4
Sailwinch 4MG-280EL	\$ 340	\$ 340	\$ 340	\$ 340
Sanding wheel	\$ 100	\$ 100	\$ 0	\$ 0
Boat Hatch	\$ 108	\$ 0	\$ 0	\$ 0
Futaba controller	\$ 305	\$ 305	\$ 305	\$ 0
<b>Total</b>	<b>\$ 853</b>	<b>\$ 745</b>	<b>\$ 645</b>	<b>\$ 340</b>



## **Request for Funding - UW Management Consulting Club**

*Shi, Winnie*

*Finance, UWMCC*

*winnies100@gmail.com*

### **Description of Proposal**

The University of Waterloo Management Consulting (UWMCC), serves as a liaison between the management consulting industry and the student body of UW. We foster the leaders of tomorrow, through our workshops, office tours with industry leaders such as BCG (Boston Consulting Group), networking events, and our annual Case Competition, which attracts interest from numerous firms across Canada. We want to showcase the talent that UW has to offer, while shedding light on the rapidly growing industry that is Management Consulting. Please feel free to visit our club's Facebook page at <https://www.facebook.com/uwmcc> to get a better sense of what opportunities we offer for our students.

UWMCC hosts various workshops, case competitions, office tours, and other events every term. A majority of our funding goes towards covering expenses and running these events. Since its founding over 8 years ago, UWMCC has only purchased promotional items such as pens, lanyards, and stickers at one point. We currently lack the funds to replenish this supply and are asking for \$500 to support this. Without doubt, these items could be used for cross promotion of other business clubs and events.

### **Proposal Benefits**

UWMCC is an exceptional club which allows engineers to broaden their horizons. Many engineering students are interested in consulting as it is a promising career, and due to the top-notch problem-solving skills that engineers possess, many recruiters are eager to have them enter the field. Moreover, many of our Engineering students have recently secured co-op positions at leading consulting firms such as Oliver Wyman and Capco. Additionally, students interested in UWMCC are active participants in the Engineering Society's Waterloo Engineering Competition (WEC) in the consulting track.

Last term, the engineering faculty represented 14% of our total members. This term, the engineering faculty represents 23% of our total members, representing a growth of just over 40%. This term, 20% of our executive team alone is from the Engineering faculty. We have no doubt that we will continue growing and expanding our club to the Engineering faculty, but need your help in purchasing more club merchandise.

### **Estimated Equipment Lifetime**

The promotional goods we are hoping to purchase with this funding will be estimated to last roughly a decade long.

### **Implementation Schedule**

The promotional goods will be advertised and given at UWMCC's events, including the planned case competition and workshops planned for the Winter 2018 term.

### **Additional Information**

A cost breakdown of what UWMCC plans to spend with \$500 is roughly broken down below:

Customizable pens:  $\$0.40 * 150 \text{ pens} = \$60$

Customizable notebooks:  $\$1.50 * 100 \text{ notebooks} = \$150$

Customizable stickers:  $\$0.167 * 150 \text{ stickers} = \$25.05$

Retractor Banner: \$250



TOTAL: \$485.05 (above prices may vary as they are average prices)

**Cost Breakdown**

Item	Option1	Option2	Option3	Option4
Promotional Goods	\$ 60	\$ 150	\$ 26	\$ 250
<b>Total</b>	<b>\$ 60</b>	<b>\$ 150</b>	<b>\$ 26</b>	<b>\$ 250</b>





*Pande, Kamana Kishor*

*Sponsorship Director, WATonomous*

*sponsorship@watonomous.ca*

### **Description of Proposal**

In April of 2017, WATonomous was chosen to represent the University of Waterloo alongside seven other schools in North America, to compete in the Society of Automotive Engineers' (SAE) AutoDrive Challenge™. The competition spans over three years, during which student teams aim to develop a fully autonomous electric vehicle. This competition is the newest form of collegiate design series that SAE has to offer, having followed from Formula SAE and Baja SAE. The first annual challenge will take place in Yuma, Arizona in April of 2018. WATonomous has received a donated Chevrolet Bolt Electric Vehicle, a set of LiDAR and RADAR sensors, high-powered computing platforms, as well as initial funding for a GRA and other start up costs. We expect to receive all competition sponsored material by the end of this term and have started to transform the donated stock car into an autonomous vehicle with the items we have so far. Additionally, our team is required to fundraise to cover other associated costs, and will continue to seek sponsors over the course of the challenge in order to meet the ongoing demands for competition material. This proposal is to request funding to help support WATonomous. The resources will go directly towards the following required materials for the Fall 2017 term, and will last throughout the remainder of the challenge, and possible successor competitions:

**Simulation Computers:** GPUs and CPUs will be the most expensive components due to the need for heavy processing power. We would like to request two simulation/development computers with a cost of \$2,500 each. Receiving funding for these items is crucial to our success due to the size of the team.

**Development Laptop:** One development laptop is needed for the embedded controls team. This laptop would be used to do tasks including reading and sending commands to and from the vehicle (for example, commanding the car to go forward).

**Touchscreen Tablet:** The user interface team will need a touchscreen tablet to display the vehicle's sensor perception. The tablet will allow the driver to see any errors that could occur when testing the autonomous vehicle. The error and associated sensor data will be displayed visually.

**General Tools and Equipment:** We are looking to purchase a multimeter, a 1000-watt wave inverter, a circuit breaker, an Ethernet switch, an Ethernet cable spool, and multimeter leads with the remaining funding. These tools and equipment are essential basics for completing the project and have long lifespans. Thus, they can be reused for other engineering projects.

The price breakdown for each item can be found ahead.

### **Proposal Benefits**

All funding and sponsorship contributions to our team allow for members to gain extensive knowledge in the field of autonomous vehicles, which brings together students from a large variety of engineering and business disciplines. This term alone, over 300 students showed interest in the organization, and approximately 130 high achieving individuals were chosen to join the team in pursuit of this demanding endeavour, making WATonomous one of the largest student design teams in the University of Waterloo's SSDC. Furthermore, over 80% of our technical team members are from the Faculty of Engineering; all keen on using their skills and knowledge throughout this ambitious undertaking. Approximately 30 technical members are fourth-year students working on WATonomous as their Capstone Design projects. The technical



experience gained through competing in the SAE AutoDrive Challenge™ Team will further enhance engineering students' knowledge on software, electrical, mechanical, systems design, technical report writing, communication, and competition skillsets. Funding from WEEF will be able to help fulfill the high level of needs for the large volume of students that are engaged in the team.

### Estimated Equipment Lifetime

All of the requested items will be used throughout the three-year course of the project; longer if there is a successor project. These materials would also be highly desirable to other student design teams, and thus, could be donated to them if there is no successor competition.

### Implementation Schedule

Equipment is to be purchased immediately. It will be used to fulfill the needs of our 130-student team and tested on the Chevrolet Bolt EV this term.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Simulation Computer	\$ 5000	\$ 5000	\$ 5000	\$ 2500
Touchscreen tablet	\$ 500	\$ 500	\$ 0	\$ 0
Developmental Computer	\$ 500	\$ 500	\$ 0	\$ 0
Multimeter	\$ 250	\$ 0	\$ 0	\$ 0
1000-watt wave inverter	\$ 250	\$ 0	\$ 0	\$ 0
Circuit breaker block	\$ 80	\$ 0	\$ 0	\$ 0
Ethernet switch	\$ 180	\$ 0	\$ 0	\$ 0
Ethernet cable spool	\$ 75	\$ 0	\$ 0	\$ 0
Multimeter leads	\$ 40	\$ 0	\$ 0	\$ 0
<b>Total</b>	<b>\$ 6,875</b>	<b>\$ 6,000</b>	<b>\$ 5,000</b>	<b>\$ 2,500</b>

# Esperto Smartwatch

F17-1170

## Esperto Team WEEF Proposal

*De Sousa, Daniel*

*Team Lead, Esperto Smartwatch*

*dde Sousa@uwaterloo.ca*



### Description of Proposal

The Esperto Smartwatch team is a brand-new student design team whose goal is to design and prototype a new state of the art smartwatch from the ground up. A large interest in our team and an overall interest in developing wearable technologies from the student community has grown our team from 2 founders to a small team of 12 dedicated and passionate Waterloo Engineering students. On this team, students are able to work independently or cooperatively on a feature of the watch such as wireless communication or heartrate data collection, come together at the end of the week and show it off to the rest of their teammates. If approved, their feature will be implemented into the next iteration of the Esperto smartwatch.

The Esperto team is asking WEEF for funding pertaining to purchasing hardware components to build future prototypes for students to engage with and build upon. These components include microcontrollers, displays, batteries, sensors, 3D prints, PCB's, prototyping boards, and SD card, charging, and Bluetooth modules. The teams end-term goal is to build at least 3 functioning smartwatches in addition to the current prototypes already purchased and designed by the team. These prototypes will be enabled with features such as Bluetooth communication, accelerometers, PPG sensors, and other modules for battery charging and display.

### Proposal Benefits

Unlike many traditional design teams, students on the Esperto team are given the opportunity to not only choose what they get to work on, but actually develop and take ownership of the feature they have worked on. Students are able to use the knowledge they learned in previous courses and work terms, but also explore new avenues and skills in concepts which they had never worked with before.

Over the last 3 months, money was raised to purchase the hardware for the first two iterations. The team is asking WEEF for sponsorship in order to be able to continue their hard work on the next iterations of the Esperto smartwatch. Furthermore, funding from WEEF will result in more prototypes being readily available for students to work on. Currently, the team only has 2 functioning prototypes resulting in team members having to wait to attempt to implement and test their feature into the final solution. Funding would resolve this problem and also allow team leads to pursue and recruit more Engineering students, allowing more talented students to have the opportunity to experiment and build upon their own smartwatch and join the Esperto team!

### Estimated Equipment Lifetime

6 months for most components. Some components will be reusable such as the microcontrollers and can last up to a year.

### Implementation Schedule

Components are cheaper when bought in batch due to reduced shipping fees and therefore, will all be purchased immediately once funding is approved.

### Additional Information

Breakdown for one prototype:

Atmel Processor



- Bluetooth module
- SD card module + SD card
- Battery Charging Module
- Display
- Accelerometer
- PPG Sensor (SEN-11574 )
- 500mAh LiPo Battery
- 3D printed case
- Printed circuit board and components
- Prototype boards

\*Overall, each prototype will cost \$150 - \$200.

Funding Options:

- Option 1 – Build all 3 prototypes
- Option 2 – Build 2 prototypes
- Option 3 – Build at least 1 prototype

**Cost Breakdown**

Item	Option1	Option2	Option3	Option4
Display	\$ 45	\$ 30	\$ 15	\$ 0
Accelerometer	\$ 36	\$ 24	\$ 12	\$ 0
Battery	\$ 30	\$ 20	\$ 10	\$ 0
PCB and Components	\$ 100	\$ 70	\$ 40	\$ 0
3D Prints	\$ 60	\$ 40	\$ 20	\$ 0
PPG Sensor	\$ 70	\$ 50	\$ 30	\$ 0
Atmel Processor	\$ 40	\$ 30	\$ 20	\$ 0
SD Card and Module	\$ 24	\$ 20	\$ 16	\$ 0
Battery Charging Module	\$ 27	\$ 20	\$ 13	\$ 0
Bluetooth Module	\$ 40	\$ 30	\$ 20	\$ 0
Prototype Boards	\$ 12	\$ 9	\$ 6	\$ 0
<b>Total</b>	<b>\$ 484</b>	<b>\$ 343</b>	<b>\$ 202</b>	<b>\$ 0</b>

# Medical Makers

F17-1185



## 3D Printing Equipment for Medical Makers

*Collins, Mackenzie*

*Team Leader, Medical Makers*

*m22collins@uwaterloo.ca*

### Description of Proposal

The Medical Makers Engineering Design Team is focused on creating affordable and innovative medical devices for those in need around the world. As part of the larger organization in collaboration with Doctors Without Borders, the team will be assigned real-life medical issues for which they will design, improve and create solutions that Doctors Without Borders will then 3D print abroad and implement where they are needed. As Biomedical Engineers, this is an extremely relevant endeavor that will allow us to utilize our design skills and create meaningful solutions that will actually be implemented into society. In order to work with the Medical Makers organization, we require the same 3D printer that is used by Doctors Without Borders, so that we can prototype our designs and assure the device works properly using the same equipment that will be used when our design is printed abroad. The printer is a LulzBot Mini Kit that has been modified by the organization to include humanitarian features, such as portability and the ability to be used off grid if we were ever to complete a volunteer trip abroad with their organization, as well as spare parts and a laptop computer. We also would like to purchase excess filaments for the printer of several different materials, so that the best filament for each project can be determined.

### Proposal Benefits

By purchasing the LulzBot Mini with humanitarian features, we will be able to rapid prototype our designs, allowing us to improve and innovate our medical creations. Having a printer just for the team will also help with efficiency in creating these solutions, as the printer will be used exclusively for our designs. The printer also helps us assure that what we create will print and work as well when recreated abroad. Having extra filament will mean that we will be able to rapid prototype our devices at all times, without having to wait on the purchase of filament and will allow us to have different materials on hand to improve the efficacy of our devices.

### Estimated Equipment Lifetime

The Computer and 3D Printer should last 5+ years before the technology will be out of date. The filament will be used after 4-6 months of continuous use.

### Implementation Schedule

After purchase, the team will begin 3D printing using the equipment immediately.

### Additional Information

None.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
LulzBot Mini 3D Printing Kit	\$ 5650	\$ 5650	\$ 5650	\$ 5650
Extra 3D Printing Filaments	\$ 350	\$ 350	\$ 350	\$ 350
<b>Total</b>	<b>\$ 6,000</b>	<b>\$ 6,000</b>	<b>\$ 6,000</b>	<b>\$ 6,000</b>

# Global Business Brigade

F17-1186



## Global Business Brigade Material Supplies

Lenny Cheng

Student Group, Global Business Brigade

[lenny.cheng@uwaterloo.ca](mailto:lenny.cheng@uwaterloo.ca)

### Description of Proposal

We are a student-led group here on campus. Our core group has two operations: recruit new members for volunteering abroad, and secure sponsorships. To do these tasks, we require material supplies - physical goods that we could put WEEF stickers on - such as staplers, binders, special markers, and accessories that are not easily available on campus. Note: We are NOT asking WEEF for sponsorships, simply tools that enable us to spread our message to more students and enable us to present collateral to potential sponsors.

### Proposal Benefits

The benefit of this proposal allows us to acquire the tools to facilitate and streamline our outreach initiative:

- 1) Faster creation of sponsorship materials
- 2) More flexible in producing materials for outreach programs
- 3) Commonly used resources belonging to our club (instead of personal belonging) so that future members could use the tools too

### Estimated Equipment Lifetime

1-2 years

### Implementation Schedule

Within 1 day to a couple weeks of receiving proposal approval. We aim to use the tools on a regular basis.

### Additional Information

Global Brigades (GB) is the world's largest student-led global health and sustainable development organization with over 1200 chapters across the world in countries such as the USA, Australia, Switzerland, Germany, Ireland, Britain, and Canada. Since 2004, Global Brigades has mobilized more than 47,000 volunteers to support more than 500,000 community members in Central America. Business Brigades provides volunteers the opportunity to empower businesses & micro-enterprises in Panama, Honduras, and Nicaragua to become more economically sustainable by providing financial literacy education through workshops, consulting entrepreneurs & micro-enterprises, establishing community banks and making recommendations for potential business loans & investments during a 7-9 day business brigade (volunteer trip).

As a chapter of Global Brigades, our student organization works to organize 1-2 volunteer trip(s) abroad each year. This year, we are travelling to Panama from August 27 to September 2. Throughout the year, we work to educate community members, students, and volunteers on major global issues, host business/consulting/microfinance training workshops, and connect students & professionals to career opportunities in global health and sustainable development.

### Cost Breakdown

Item	Option1	Option2	Option3	Option4
Supplies	\$ 100	\$ 60	\$ 50	\$ 25
<b>Total</b>	<b>\$ 100</b>	<b>\$ 60</b>	<b>\$ 50</b>	<b>\$ 25</b>

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3	WP-1171	Purchase of New Mineral Identification Kits	\$ 1,500
4	WP-1179	Variable Temperature Heat Guns for Nano Undergrad	\$ 2,500
5	WP-1180	Infrared Thermometers for Nano Undergrad Labs	\$ 3,000
6	WP-1184	BOMAR Ergonomic Manual Band Saw	\$ 8,871
7	WP-1175	TobyX Funding Proposal	\$ 5,800
9	WP-1181	Engineering Design Days III - Ideas Clinic	\$ 20,000
<b>Total</b>			<b>\$ 48,664</b>
<b>Miscellaneous Proposals</b>			
10	WP-1172	Baja Engine and CVT Tuning Dynamometer	\$ 2,300
11	WP-1211	E7 Engineering C&D Fridges	\$ 8,000
12	WP-1212	POETS Furniture: New Couches	\$ 12,304
13	WP-1197	Warrior Home Design Team Funding Request	\$ 1,620
15	WP-1198	UW Habitat for Humanity Campus Chapter	\$ 1,400
17	WP-1206	UWSA - Digital Fabrication Lab Update	\$ 6,958
<b>Total</b>			<b>\$ 32,582</b>
<b>Student Proposals</b>			
19	WP-1178	Baja SAE Fall 2017 WEEF Proposal	\$ 3,350
21	WP-1188	Solar Cells for Midnight Sun	\$ 3,000
22	WP-1204	University of Waterloo NanoRobotics Group (UW_NRG)	\$ 6,300
24	WP-1187	UWAFT Proposal	\$ 700
25	WP-1176	University of Waterloo Robotics Team Mars Rover	\$ 1,800
27	WP-1207	Waterloo Rocketry - F17 Proposal	\$ 8,550
30	WP-1199	Student Team Trailer	\$ 5,000
32	WP-1210	Fall 2017 Funding Proposal	\$ 2,550
35	WP-1213	Suspension Sensors	\$ 2,080
36	WP-1196	F17 - Waterloo Formula Electric - Emrax Motors	\$ 9,000
38	WP-1208	hEDGE Finance Conference Application for Funding	\$ 2,000
39	WP-1195	UW Steel Bridge Team Proposal	\$ 690
41	WP-1203	Waterloo Submarine Racing Team WEEF Proposal	\$ 1,400
43	WP-1192	UW Concrete Team - WEEF Proposal F17	\$ 700
44	WP-1205	Furniture for the geological engineering lounge	\$ 4,500
45	WP-1182	UW Sailbot Fall 2017 WEEF Proposal	\$ 853
47	WP-1177	Request for Funding - UW Management Consulting Club	\$ 250



49	WP-1202	WATonomous Fall 2017	\$ 6,875
51	WP-1170	Esperto Team WEEF Proposal	\$ 484
53	WP-1185	3D Printing Equipment for Medical Makers	\$ 6,000
54	WP-1186	Global Business Brigade Material Supplies	\$ 100
<b>Total</b>			<b>\$ 66,182</b>