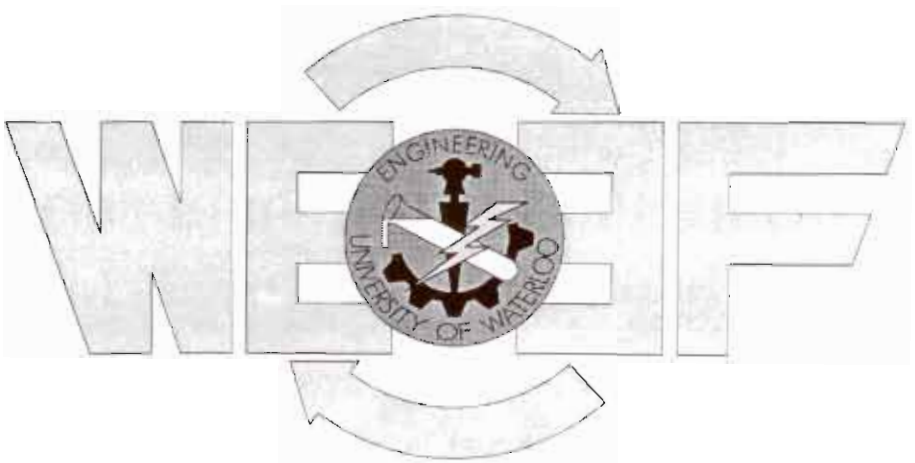
WEEF Proposals & Allocations	Fall 2001	
Chemical and Environmental Chemical	Requested	Allocated
Upgrading of Analytical Facilities for ChE 032 Laboratory	$ 14,040.00	$ 3,260.00
Ergonomic Chairs	$ 2,235.00	$ -
ChemCat Computer	$ 13,524.00	$ 6,762.00
		$ 10,022.00
Civil and Environmental Civil		
Civil Undergrad Network Switch	$ 5,400.00	$ 2,700.00
Highway Analysis and Signal Optimization Software	$ 3,160.00	$ 400.00
Survey Equipment	$ 5,790.00	$ 5,034.67
Osborne Reynolds' Experiment	$ 2,890.00	$ -
Jar Test Stirrer	$ 2,510.00	$ -
Environmental Engineering Field Equipment	$ 620.00	$ 620.00
Solinst Model 410 Peristaltic Pump	$ 843.00	$ 843.00
4th Year Civil Room Computers	$ 6,258.00	$ -
		$ 9,597.67
Electrical and Computer		
E&CE Public Room RAM Upgrade for Nexus	$ 750.00	$ 750.00
E&CE Lab Computer Upgrade	$ 45,000.00	$ 5,000.00
E&CE Public Computer Room Software for Nexus	$ 2,260.00	$ 560.00
E&CE E2-3344 Computer RAM Upgrade for Nexus	$ 1,150.00	$ -
		$ 6,310.00
Mechanical		
Laboratory Equipment Materials	$ 12,460.00	$ 5,405.00
New PLC Lab for ME-262	$ 15,000.00	$ 7,500.00
Teaching/Presentation Tools	$ 4,000.00	$ -
Polaris Computer Room	$ 11,700.00	$ -
		$ 12,905.00
Software		
Lego Robots for Concepts Design Project	$ 2,248.00	$ 2,248.00
		$ 2,248.00
Systems Design		
Multimedia Classroom Equipment	$ 5,500.00	$ -
Digital Imaging Equipment	$ 2,650.00	$ 2,200.00
Wireless Network	$ 3,665.00	$ -
An Automated Panning Camera System	$ 1,000.00	$ 1,000.00
		$ 3,200.00
Misc		
Equipment Student Shop	$ 4,469.00	$ 4,469.00
		$ 4,469.00
Sub-Total Department	**$ 169,122.00**	**$ 48,751.67**
Student Groups		
Free Flight Glider Team	$ 500.00	$ 250.00
UWAFT	$ 11,500.00	$ 3,000.00
Midnight Sun	$ 7,905.00	$ 3,625.00
Student sfor the Exploration and Development of Space	$ 450.00	$ -
Robocup Vision System	$ 3,000.00	$ -
R/C Aero Design Team	$ 950.00	$ 625.00
Clean Snowmobile Challenge	$ 5,000.00	$ 4,026.49
Team Advancement of the UW Formula SAE Team	$ 5,600.00	$ 3,600.00
Waterloo Aerial Robotics Group (WARG) Equipment	$ 5,050.00	$ 1,125.00
Sub-total Student Groups	**$ 39,955.00**	**$ 16,251.49**
Total	**$ 209,077.00**	**$ 65,003.16**

Waterloo Engineering Endowment Fund



Fall 2001 Proposals

WEEF Proposals - Spring 2001

	CHEMICAL AND ENVIRONMENTAL CHEMICAL	
1	Upgrading of Analytical Facilities for ChE 032 Laboratory	$14,040
2	Ergonomic Chairs	$2,235
3	ChemCat Computer	$13,524
	CIVIL AND ENVIRONMENTAL CIVIL	
4	Civil Undergrad Network switch	$5,400
5	Highway Analysis and Signal Optimisation Sofware	$3,160
6	Survey Equipment	$5,790
7	Osborne Reynolds' Experiment	$2,890
8	Jar Test Stirrer	$2,510
9	Environmental Engineering Field Equipment	$620
10	Solinst Model 410 Peristaltic Pump	$843
11	4th Year Civil Room Computers	$6,258
	ELECTRICAL AND COMPUTER	
12	E&CE Public Room RAM Upgrade for Nexus	$750
13	E&CE Lab Computer Upgrade	$45,000
14	E&CE Public Computer Room Software for Nexus	$2,260
15	E&CE e2-3344 Computer RAM Upgrade for Nexus	$1,150
	MECHANICAL	
16	Laboratory Equipment Materials	$12,460
17	New PLC Lab for ME-262	$15,000
18	Teaching/Presentation Tools	$4,000
19	Polaris Computer Room	$11,700
	SOFTWARE	
20	Lego Robots for Concepts Design Project	$2,248
	SYSTEMS DESIGN	
21	Multimedia Classroom Equipment	$5,500
22	Digital Imaging Equipment	$2,650
23	Wireless Network	$3,665
	MISC	
34	Equipment Student Shop	$4,469
	Sub-Total Departmental	**$168,122**
	STUDENT	
25	Free Flight Glider Team	$500
26	UWAFT	$11,500
27	Midnight Sun	$7,905
28	Students for the Exploration and Development of Space	$450
29	Robocup Vision System	$3,000
30	R/C Aero Design Team	$950

31	Clean Snowmobile Challenge	$5,000
32	Team Advancement of the UW Formula SAE Team	$5,600
33	Waterloo Aerial Robotics Group (WARG) Equipment	$5,050
34	An Automated Panning Camera System	$4,000
	Sub-Total Student Groups	**$41,255**
	TOTAL	**$209,377**

Table of Contents

1. Upgrading of Analytical Facilities for ChE 032 Laboratory

Submitted by:

Lillian Liao
lliao@engmail X6161
Analytical Chemist

Description of Proposal:

To replace and upgrade laboratory equipment that is outdated. To purchase new equipment for increased number of students in the laboratory.

Benefits of the Proposal:

Access to this equipment would permit more accurate chemical determinations and improve success rate of experiments. It would also improve exposure to up-to-date basic laboratory equipment. Approximately 150 students of ChE 032 would greatly benefit from this upgrade.

Cost Breakdown of Proposal:

	Item	Price	Use	Description
a)	4 –Spectrophotometers – to complete the WEEF commitment of 8 (3 years?)	$2,510.00	to measure absorbance of solutions;	Spectronics □20 Genesys
b)	1 –Microscope backup	$2,500.00	To examine microbiological samples;	Nikon YSI compound Microscope
c)	6 – MicroPipettors	$250.00	to aliquot set volumes of liquid;	Nichiryo Adjustable Volume 100 – 1000uL and 1 - 5mL
	TOTAL	**$ 14, 040.00**		

Implementation Schedule for Project:

Equipment will be used once available.

Department to provide $5000.

Additional Information:

Priority given to the Spectrophotometers, item a) followed by the Microscope, item b) then the MicroPipettors, item c). All prices are current and does not include taxes.

Summary

Currently, the spectrophotometer being used gives an analog output. There is a large operator error associated with these readings. In labs 2 and 6, determining the growth curve of a bacterium. In lab 4, monitoring the colour change of an enzyme reaction.

Microscopic examinations of bacteria are used in labs 1, 2 and 6. The identification of microscopic organisms is a method of monitoring an ongoing experiment.

A pipettor allows repetitive measurements of volumes of liquid that is consistent and reproducible. This is vital in obtaining reliable results. In lab 6, a simulated industrial effluent experiment, serial dilutions are required to determine the IC50 of culture broth samples. In labs 4 and 5, again volumes of liquid are aliquoted into cuvettes and absorbance measurements are taken to determine the rate of reaction.

2. Ergonomic Chairs

Submitted By:

Kathy Janzen
kajanzen@engmail
Class rep

Description of Proposal:

Ergonomic chairs for the chemical engineering computer lab

Proposal Benefits:

Ergonomic chairs rather than the present wooden ones to benefit students who spend a lot of time working in the lab.

Cost Breakdown:

15 chairs * ($149.00) = 2235.00

Implementation Schedule:

We would order them online. Some assembly is required and our class would be happy to perform that task.

No dept. $ (Didn't check)

3. ChemCat Computer

Submitted By:

Steven Best
Stevebestee@hotmail.com
Chem Eng 2B Student

Description of Proposal:

My proposal is for the purchase of new computers to upgrade the second and third year chemical engineering computer room (ChemCat). All of the computers currently in this lab (with the exception of two of them) are considerably slow (133Mhz). In my opinion this inhibits the proper use of this lab and the resources of the university in general. I propose to upgrade the old 133Mhz systems with something more up-to-date (1GHz or equivalent).

Proposal Benefits:

These computers will allow the chemical engineering students to use the related software required for the new up and coming chemical engineers frontier, programs such as Aspen and MathCAD. These programs allow the students to model systems and solve problem with software that is used in the real world. This presents us with an excellent opportunity to expose the junior engineering students to modern engineering tools entering the workforce, giving them relevant skills for their resume. Although these programs can run on the current systems the delay from the processor makes them useless for solving problems by trial and error. I am proposing the following possibilities listed below for the weef committee to select the most appropriate. I am not only proposing that weef fund the total operation of the upgrade of the chemcat lab. I am suggesting that the weef committee donate 62.5% ($10000) of the funds required to complete a full upgrade ($16000).

The update of this lab should be done in steps so that all other faculties will have a chance to take steps at improving their resources as well. I propose that the first wave of upgrades should include the purchase of approximately 20 computer bases with new keyboards and mice. By not purchasing monitor the project can save $173 a piece. This will add up to approximately $3500. This will minimize the cost of the project while maximizing the benefits to the students. The 2B chemical engineering class is willing to donate $2500 in labour over a weekend to help with the set-up, installation, and decommissioning of the old units. This would save the proposal $6000 in total.

I propose also includes the donation all of the old systems to a local school. This act of charity will provide the Waterloo Engineering faculties a great opportunity to give something back to the community, along with free positive media coverage. I would imagine the final decision of the end use of these old systems would lie in the hands of the university. However, I would recommend that the university at least examine the possibility of our alternative in the donation of the computers to charity.

Cost Breakdown:

(Include partial funding options)

OPTION 1A

20 1Ghz systems
256MB Pc 133 Memory
20Gb Ata hard drive
32MB video Card
52X cd Rom
3.5 floppy
56k modem
with new keyboard and mouse

Piece	$ 588
Subtotal	$11760
Tax	$ 1764
TOTAL	$13524

OPTION 1B

15 1Ghz systems
256MB Pc 133 Memory
20Gb Ata hard drive
32MB video Card
52X cd Rom
3.5 floppy
56k modem
with new keyboard and mouse

Piece	$ 588
Subtotal	$ 8820
Tax	$ 1323
TOTAL	$10143

OPTION 2A

20 1 Ghz systems
256 MB Pc 133SDRAM
8 Gb hard drive
52X CD ROM
3D VIA video
3D VIA sound
Lan card
Keyboard and mouse

Piece	$ 439
Subtotal	$ 8780
Tax	$ 1317
Total	$10097

OPTION 2B

15 1 Ghz systems
256 MB Pc 133SDRAM
8 Gb hard drive
52X CD ROM
3D VIA video
3D VIA sound
Lan card
Keyboard and mouse

Piece	$ 439
Subtotal	$ 6585
Tax	$ 988
Total	$ 7573

Didn't check with dept. for $

Implementation Schedule:

Once the funding is approved the order for X number of computers will be placed.
The preparation of the computers will require approximately 2 to 3 weeks.
The following weekend upon confirmation of the completion of the order the Chem 2B class will pick up install all of the units in the ChemCat lab. Once the decision from the university is made regarding the use of the old computers they will be decommissioned, removed, and transported to the corresponding location.
The entire process should require no more than three weeks to accomplish if all go according to schedule.

4. Civil Undergrad Network Switch

Submitted By:

Michael Herz
mherz@uwaterloo.ca
x3411
Computer Systems Manager

Description of Proposal:

We need to upgrade our 4 year old network hub to a network swtich that serves E2-2340 (Civil Undergraduate Polaris Lab). All Civil, Environmental and Geological Engineering students will benefit from this upgrade.

Proposal Benefits:

Improved computer performance and network access speeds.

Cost Breakdown:

Cisco 3500 48 port 100Mbps switch - $5400 ½ of this . (2700).

Implementation Schedule:

About 1 month

Additional Information:

50% funding available from the Department of Civil Engineering

5. Highway Analysis and Signal Optimisation Software

Submitted By:

Prof. Bruce Hellinga
bhellinga@uwaterloo.ca
Ext. 2630
Associate Professor

Description of Proposal:

Purchase two software products commonly used by industry: (1) Highway Capacity Analysis Software (HCS2000), (2) Synchro 5 signal traffic signal and optimisation software.

HCS is the most commonly used traffic engineering software in North America for the analysis of freeways, and is also used for the analysis of signalised and unsignalised intersections. It is the software embodiment of the Highway Capacity Manual - the dominant analysis and design manual in North America. I have been using the methods from this manual in two 4th year technical electives (Cive 440 and 443) for several years, however, I have had to constrain the size of the problems to be examined due to the time required to carry out the analyses manually. I am also aware that there is a demand for this software for use by students in the 3rd and 4th year project courses.

Synchro is a relatively new software tool that has become extremely popular for the analysis and optimisation of isolated traffic signals and traffic signals along a corridor (www.trafficware.com). This software would be used in a 4th year technical elective (Cive443) as well as available on Polaris for the 3rd and 4th year design projects. In this course, I teach the underlying principles of signal analysis and design, but problem sets are deliberately constrained since the students must do the analysis manually. The availability of Synchro will permit students in Cive443 and the project courses to analyse problems of a more realistic size and complexity.

Cost Breakdown:

Highway Capacity Software 2000	US$250	$400.00
Educational Synchro 5 Site License	US$2974	$4,760.00
TOTAL		$5,160.00
Departmental Contribution		-2,000.00
WEEF Application TOTAL		**$3,160.00**

Notes:

1. Exchange rate assumed to be 1.6 Canadian $ per US$
2. HCS will run on Win 95/98/2000/NT platforms and therefore we should be able to install on Polaris even when this system is upgraded to operate on Win 2000 OS. HCS is a site license for unlimited users. The price listed is an academic price which is 50% of a standard license.
3. Synchro will run on Win 95/98/2000/NT platforms. Synchro is site license for 30 students plus instructor. Students may also install Synchro on home machines, but may not use for commercial work. Standard single user license is the same cost as a 31-user educational site license.

Implementation Schedule:

Software would be obtained and installed this term and would be used in CivE440 and available for use in CivE300 (Project Course) in the Winter term of 2002.

6. Survey Equipment

Submitted By:

Ken Bowman
kbowman@uwaterloo.ca
x3656
Lab Technician

Description of Proposal:

4 Transits model Sokkia KT5, 4 Automatic Levels model Sokkia C330, 8 Tripods

Proposal Benefits:

The addition of this equipment will increase our present inventory to provide each student group with comparable units for their field work. We are slowly trying to upgrade our transits and levels to reflect equipment used by the industry.

Cost Breakdown:

4 Sokkia KT5 Transits @ $1243.00 = $4972.00
4 Sokkia C330 Automatic Levels @ $415.00 = $1660.00
8 Sokkia tripods @ $ 115.00 = $920.00
Total $7552.00 plus taxes

Partial Funding Available from the Civil Engineering Dept. of one-third the total cost.

Implementation Schedule:

September 2002 Need for this date.

Additional Information:

We would like to be prepared for the increased enrollment anticipated in the coming year(s). Currently approximately 140 students in first year Civil, Geological and Environmental Engineering use this equipment.

7. Osborne Reynolds' experiment

Submitted By:

Terry Ridgway
tridgway@uwaterloo.ca
x3042
Lab Technologist

Description of Proposal:

To replace a 30 year old experiment in the fluid mechanics labs on demonstrating laminar, transitional turbulent flow and allowing calculation of Reynolds' number. This is one of 4 parts to the CE 280/ENV214 Fluid Mechanics Lab (a core course). The equipment also allows the apparatus to be connected to an existing hydraulic bench and taken to the classroom for practical demonstrations.

Proposal Benefits:

The apparatus will benefit approximately 80 civil students and approximately 40 environmental and geological students per term

Cost Breakdown:

$4,335.50 Total includes all taxes and shipping

Implementation Schedule:

Immediately upon receipt of equipment

Additional Information:

Partial funding available from the Civil Engineering Department of one-third the total cost.

8. Jar Test Stirrer

Submitted By:

Bruce Stickney
bstickney@uwaterloo.ca
x2908
Technician

Description of Proposal:

Jar Test Stirrer, 6-paddle with Illuminator to simultaneously stir six jars/beakers to test/determine coagulant dosage for the removal of suspended coloidal solids in Water and Wastewater treatment.

Proposal Benefits:

This would replace a 30 year-old unit that is malfunctioning and is required for CivE 375 and 126 and EnvE 375 and 126.

250 students/year.

Cost Breakdown:

Jar Test Stirrer with Illuminator and Jars	$ 3766.00

Implementation Schedule:

This would be used in the Winter and Spring Terms

2002.

Additional Information:

Partial funding available from the Civil Engineering Department of one-third the total cost.

9. Environmental Engineering Field Equipment

Submitted By:

Bruce Stickney
bstickney@uwaterloo.ca
x2908
Technician

Description of Proposal:

Grab Sampler for taking surface water samples from depths up to 3 m.
Secchi Disks for measuring surface water turbidty/clarity in the field
Imhoff Cones to measure settleable solids in surface waters and wastewaters.

Proposal Benefits:

The grab sampler and secchi disks are required for routine surface water sampling and evaluation and are new acquisitions that will make sampling from rivers and lakes safer, and more representative.
The plastic Imhoff cones would replace broken glass cones that have been used for many years. They are much lighter in weight and are much more durable than glass.

Cost Breakdown:

Grab Sampler	$ 700.00	
Secchi Disks (2)	$ 35.00 ea.	70
Imhoff Cones (3)	$ 40.00 ea.	120
Imhoff Cone Stand	$ 40.00	

Implementation Schedule:

The equipment would be put to immediate use for Projects and would go into use in the winter Term in CivE 375, EnvE 375 and CivE 126 and in the Spring Term for EnvE 330 and EnvE 126.

Additional Information:

Partial funding is available from the Civil Engineering Department of one-third the total cost.

10. Solinst Model 410 Peristaltic Pump

Submitted By:

Mark Sobon
msobon@uwaterlloo.ca
x5263
Chemical Engineering Technologist.

Description of Proposal:

The Solinst Model 410 Peristaltic pump operates on an external 12-volt DC supply. It has a variable-pumping rate that can deliver from 10ml/min up to 3.0L/min.

Proposal Benefits:

The pump would be used in two ENV330 field-sampling labs. It will be used for stream, depth and well sampling. It would also be made available for project use for students in Env330/275 and Civ E. 126/375. (Approx. 120 students/year)

Cost Breakdown:

Model 410 Peristaltic Pump	**$ 1101**
Plus 15% Taxes	*165*
Total	*$ 1265*

Partial funding available from the Civil Engineering Department of one-third the total cost.

Implementation Schedule:

Immediate.

Additional Information:

Available upon request.

11. 4th Year Civil Room Computers

Submitted By:

Denis Viens, Mike Herz
dviens@engmail, mherz@engmail
x3411
Student, Civil Computer Technician

Proposal Description:

The 4th year civil room, located on the main floor of E2, currently has a single operating computer. This is not on par with other 4th year rooms, which typically have 5-10 computers each. New computers are needed to allow upper year civil students to make full use of the study room. Many assignments in civil engineering require the use of computer programs to be completed. Financial assistance, in combination with department help, would make these computers in this room a reality.

Proposal Benefits:

These computers would keep these students away from the already busy civil computer lab in E2 2340. Computers would benefit every civil class using the room that reaches 3B, when the room becomes available to them until graduation. Each civil class typically has about 80 students.

Cost Breakdown:

- P4 1.5 Ghz Processor
- 256 MB Ram
- 20 gb hard drive
- Sony 17" monitor
- 100 mb zip drive
- 16x DVD drive

Cost per System: $2,086
3 systems @ $2,086

Grand Total: $6,258

Implementation:

ASAP

12. E&CE Public Room RAM Upgrade for Nexus

Submitted By:

Eric Praetzel
praetzel@ece.uwaterloo.ca
ext. 5249
Lab. Staff

Description of Proposal:

Before September 2002 Waterloo Nexus [Win 2000] is slated to replace Polaris.
Most of the E&CE Lab computers will be moving to Nexus for January 2002.
In order to move our Public computers to Nexus we need to upgrade the RAM in each computer.
15 of the 20 public computers are capable of being easily upgraded to Nexus with the addition of RAM.

The proposal is to upgrade the computers to 256M of SDRAM (PC133).

Software upgrades are also necessary and that is a separate proposal.

Proposal Benefits:

All students. Win 2000 computers for general purpose computing.

Cost Breakdown:

$45 + tax per computer for 256M of RAM
5, 10 or 15 computers for $250, $500, $750 [tax included]

Implementation Schedule:

Late December 2001

Additional Information:

These computers are 433 MHz Celeron with 8G hard drives. They are expected to be useable for perhaps 2 more years maximum, before hardware upgrades are necessary. The RAM being purchased is easily moved to newer 1+GHz Pentium 3 and 4 computers when they are purchased.

Priority:

Medium (needed, must be done before September 2002)

13. E&CE Lab Computer Upgrade

Submitted By:

Eric Praetzel
praetzel@ece.uwaterloo.ca
ext. 5249
Lab. Staff

Description of Proposal:

Starting in Winter 2002 the new E&CE 324 lab [E&CE and Mechatronics students] will be moving to Altera Quartus 2 software on Waterloo Nexus (Win 2000). The computers in the laboratory (Pentium 200MMX, K6-2/333 MHz) are not capable of running this software or operating system.

$54k is needed to upgrade the lab with 40 new computers. $9k has already been donated by WEEF.
$20k [$3k donated by WEEF] has been spent purchasing the new hardware equipment for each station.

This is to upgrade the computers in two labs: E2-2363, E2-2364. These two labs are 24 hour access for students taking the courses.

Any computers made available by this upgrade will be used to replace older computers [386, 486, Pentium 90..133] and/or become available for use by 4th year project groups (E&CE 492).

Proposal Benefits:

E&CE 324	Winter term: 220 E&CE, 45 Mech. students
	Spring term: 10 E&CE students
E&CE 222	Spring term: 150 E&CE students
	Fall term: 100 E&CE Students
E&CE 427	Fall term: 200 E&CE students [use lab as a general purpose computer room]

Cost Breakdown:

$1350 per Pentium 3-1GHz (or 1.5GHz P4) computer with 512M, 40G HD
Any amount up-to $45,000

Implementation Schedule:

Mid December 2001

Additional Information:

These two labs currently have 53 computers. This upgrade will reduce the number of computers.
The E&CE Dept. is currently installing 6 Unix Ultra 10 computers in one of the rooms.
The E&CE Dept. will make up any shortfall for the upgrade cost.
For ease of install and uniformity the E&CE Department aims to keep all computers in a lab identical.

Priority:

High (necessary for Winter 2002)

14. E&CE Public Computer Room Software for Nexus

Submitted By:

Eric Praetzel
praetzel@ece.uwaterloo.ca
ext. 5249
Lab. Staff

Description of Proposal:

By September 2002 Waterloo Nexus [Win 2000] is slated to replace Polaris. → Sept. 2002.

Many software packages are not freely available Nexus. Unfortunately the university no longer has a site license and must purchase the software for each station. The department does not plan to purchase any of this software for laboratory computers due to the cost.

In this proposal the students must choose which software package they wish to purchase and how many licenses. Since we have 20 computers in these public rooms I am limiting the proposal to installing the software on half or all of the computers.

These computers are in the E2-2360 and E2-2362 public computer rooms.

Please select none, one or both of the software packages and 10 or 20 licenses for each.

Proposal Benefits:

All students. Nexus office software for general purpose computing.

Cost Breakdown:

$28 per computer for Word Perfect Suite 10
10 or 20 licenses for $280 or $560

$113 per computer for MS Office XP
10 or 20 licenses for $1130 or $2260

Implementation Schedule:

Late December 2001

Additional Information:

I expect to upgrade at least 5 or 10 of computers to Nexus for Winter 2002.

All free software [ZIP, Matlab, Netscape, Eudora] will be available on these computers.
Polaris users can log onto these machines with their Polaris password.

Priority:

Medium (some people feel a need for this sort of software!)

15. E&CE E2-3344 Computer RAM Upgrade for Nexus

Submitted By:

Eric Practzel
praetzel@ece.uwaterloo.ca
ext. 5249
Lab. Staff

Description of Proposal:

The E2-3344 is a closed lab for students in selected courses only. There is no 24 hour access.

This lab was moved to Waterloo Nexus and we have found that with only 128M of RAM, the computers do not have enough memory for Corel Presentations / MS Powerpoint. In the Fall of 2001 the E&CE 241 lab started using Corel Presentations and there are expectations of using Matlab [another RAM hungry program] in future terms.

The proposal is to upgrade each of the 46 computers to 256M of SDRAM (PC133).

Proposal Benefits:

E&CE 318	Winter term 100 E&CE students Fall term 180 E&CE students
E&CE 241	Spring term 200 E&CE, 45 Mech students Fall term 200 E&CE students

Cost Breakdown:

$25 per computer for 128M of RAM
Any amount up to $1150 [upgrade all 46 computers]

Implementation Schedule:

Late December 2001

Additional Information:

These computers are 466 MHz Celerons with 15G hard drives. They are expected to be useable for at least 3 more years at a minimum. The computers are "firewalled" so no external, even to the campus, access is allowed.

Priority:

Low (not necessary but it would be helpful)

16. Laboratory Equipment Materials

M. Kaptein. Mechanical Engineering
rkap@mecheng1.uwaterloo.ca
Lab Director, Mechanical Engineering

Description of Proposal:

Students enrolled in Material Science related courses frequently are required to take pictures of their lab work. This is especially the case in ME 435 when they perform materials testing on engine parts. They are required as part of the final report to submit a photograph for the record. A digital camera with direct download to a 3.5" floppy would speed up the recording process for all students.

The students make materials samples for analysis from the engine parts by means of a cut-off saw. These parts are later polished and etched for observation/analysis. Our cut-off saw is badly in need of replacement and a new one is required.

Benefits of the Proposal:

All ME 435 students and other project course students, such as ME 481.

Cost Breakdown of Proposal:

Sony Mavica MVC-F097 camera	$ 1,650.00
Cut-off Saw	10,810.00
TOTAL REQUEST	**$12,460.00**

Implementation Schedule

December 2001

17. New PLC Lab for ME-262

Submitted By:

Amir Khajepour
amir@mecheng1.uwaterloo.ca
x6159
Professor, Mechanical Engineering

Description of Proposal:

Programmable logic controllers (PLCs) are being introduced into the Mechanical Engineering curriculum at the University of Waterloo through the second-year core course ME-262. Since last year, with the support of the Mechanical Engineering Department, donations from SMC Canada and OMRON, and also the works of many 4th year undergraduate students a new PLC/pneumatic lab has been designed. Currently, 10 PLCs and most of the electrical and pneumatic components have been purchased. It is required to make 10 special tables to house the components for the lab.

Figure 1 shows the pneumatic pick and place robot that has been designed for providing more industrial environment for the PLC programming. A prototype of the robot and its PLC control is in the Mechatronics lab. Figure 2 shows the table, which is used as a stand for the robot, control panel, and computer.

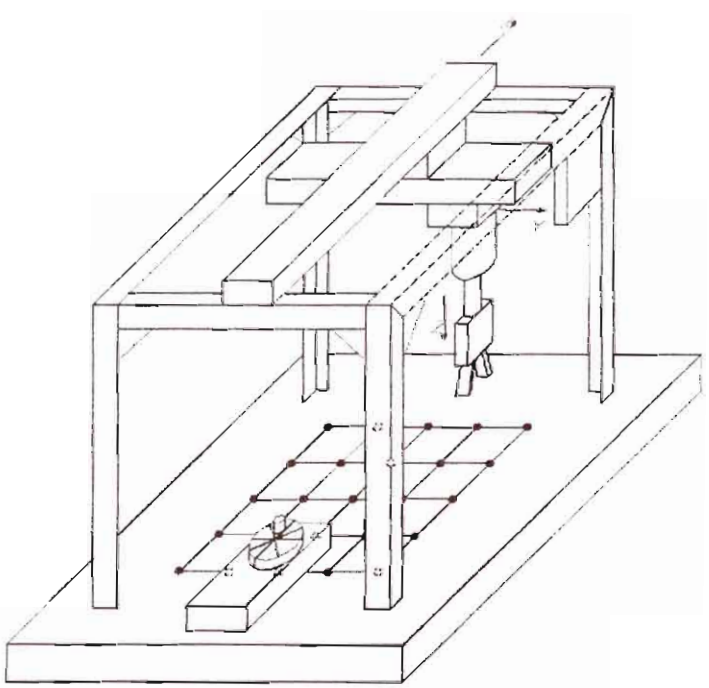


Figure 1. Pick and place pneumatic robot

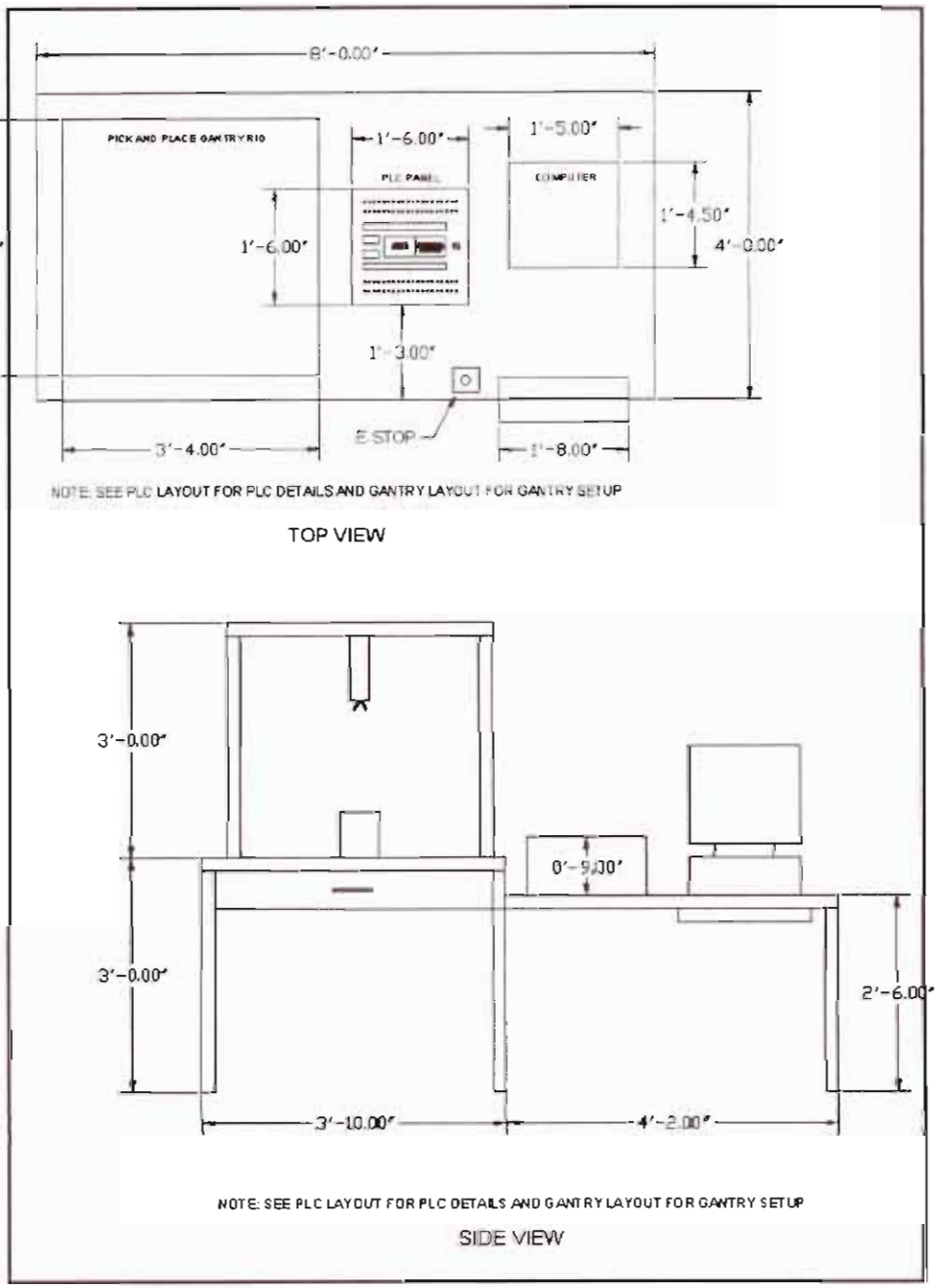


Figure 2. Table for PLC lab

Proposal Benefits:

1. Students will learn PLC programming for machine automation.
2. Students will learn new automation techniques using pneumatics

Cost Breakdown:

1.	Department contributions for purchasing electrical and pneumatic components (already paid):	$14,000
2.	SMC Canada donations (already received):	$20,500
3.	OMRON Canada donations (already received):	$21,400
4.	Requested WEEF contributions for fabricating the tables and purchasing the remaining components :	$15,000
	Total new lab cost:	$69,450

machine shop.

deferred payments over multiple terms?

Implementation Schedule:

The lab is scheduled to be ready for Spring 2002.

Additional Information:

ME-262 is a core course that is offered twice a year with enrolment of about 90 students per term. The lab can be used for other courses in Mechanical and possibly in Systems Design Departments.

18. Teaching/Presentation Tools

M. Kaptein, Mechanical Engineering
rkap@mecheng1.uwaterloo.ca
Lab Director, Mechanical Engineering

Description of Proposal

~90 students

Students enrolled in ME 481 and ME 380 are requested to make a design presentation proposal and a final presentation of their course project. For this purpose the department of Mechanical Engineering has purchased a computer image projection system ($11,000.00) and request funding for a laptop to make this an independent undergraduate teaching/presentation tool for the Department.

Benefits of the Proposal

All students taking ME 481 and ME 380 plus any student project requiring such equipment.

Cost Breakdown of Proposal

Dell Laptop Computer	$ 4,000.00

Implementation Schedule

November 2001

Department will match any funds provided.
i.e. $2000

19. Polaris Computer Room

Peter Routledge, Mechanical Engineering
proutled@engmail.uwaterloo.ca
Computer Specialist, Mechanical Engineering

Description of Proposal:

Last week Mechanical Engineering upgraded the only "Polaris" computer Room, E2, 2354 from Pentium 133 computers to Pentium II 300 computers and replaced defective 17" monitors.

It appears that a number of Mechanical students have at time difficulties to access a Polaris computer station. To minimize these difficulties, the Department of Mechanical Engineering will free up space to expand it's Polaris network by 10 network computers, which will become "NEXUS" stations when "Polaris" will be phased out next fall.

Benefits of the Proposal:

All Mechanical Engineering students.

Cost Breakdown of Proposal:

10 Pentium III computers, with 17" monitors $ 11700.00

Implementation Schedule ~$5800

Spring 2002

Dept. to pay ½ of funds.
(Matching by WEEF).

20. Lego Robots for Concepts Design Project

Submitted By:

Prof. Joanne M. Atlee
jmatlee@se.uwaterloo.ca
x4871
Director of Software Engineering

Description of Proposal:

I propose and have developed for the software engineering concepts course a design project in which students work in teams to write software to control a Lego robot. The robot runs special firmware that acts as a tiny Java virtual machine, hence the students write Java programs for the robot. Their task is to control the robot to correctly "read road signs" that direct it to follow a particular path on a grid. The project description can be obtained from the course web page:

http://www.student.math.uwaterloo.ca/~se101

This proposal is to pay half of the cost of six (6) robots and nine (9) light sensors that I have already bought and half the cost of six (6) new robots and three (3) new light sensors. A class of 102 software engineering students is currently working with nine robots, six of which I bought myself and three of which we're borrowing from ESQ. Most students are working in teams of 12, 3 sub-teams of 4 students each. The extra light sensors are needed because our robot design uses two sensors to help the robot detect in which direction it is veering off course, and the robot kits only come with one light sensor.

Proposal Benefits:

One of the main benefits of the Lego robot design project is that SE students see early on some key differences between computer science and software engineering: how writing software for a special-purpose device differs from writing software general computer, and how non-functional aspects of software such as size and performance can be as important as whether the software generates the correct output. Another benefit is students practice what they learn in class about working in teams.

On top of the equipment I've already bought, I would like to purchase six additional robots and three additional light sensors to cover the robots we are borrowing from ESQ and to let students work in sub-teams of 3 students rather than sub-teams of 4 students. Teams of size twelve are unwieldy, especially when the students get the stage where they are integrating their code. Teams of size nine would still be large, but more manageable.

Cost Breakdown:

Costs I have already incurred and for which I have not been reimbursed are

- 1 Lego Mindstorms System 1.5 $ 229.99
- 5 Lego Mindstorms System 2.0 $ 1,724.95
- 9 Lego light sensors $ 350.00 (225.64 USD)

12 robots $ 2248

9 robots $ 1669

no costs already spent: $1150

Anticipated costs of additional equipment are

• 6 Lego Mindstorms System 2.0	$ 2,070.00
• 3 Lego light sensors	$ 120.00
Total costs	$ 4494.94

This proposal is for WEEF to cover half of these costs. I will be submitting a similar proposal to the Math Endowment Fund to cover the other half. Thus, if the proposal were accepted, the WEEF contribution for this project would be $2248.47.

As a plan B, I would propose that WEEF pay half of the cost of the purchases already made, and SE 101 would try to operate the robot design project in future years with the same team size and (hopefully!) parts borrowed from ESQ. Under this plan, the WEEF contribution would be $1152.47.

Implementation Schedule:

As mentioned above, the SE 101 design project is currently underway this term, with some robots bought by me and some robots borrowed from ESQ.

Additional Information:

The project description can be obtained from the course web page:
http://www.student.math.uwaterloo.ca/~se101

21. Multimedia Classroom Equipment

Submitted By:

Name:	Kevin Krauel	Name:	Jason Foster
E-mail:	Kbkrauel@kingcong	E-mail:	jafoster@engmail
Extension:	5760	Extension:	3831
Position:	Lab Director, SYDE	Position:	Graduate Student, SYDE

Description of Proposal:

This proposal is for a multimedia data projector that will be installed in the E2 1303E classroom. It continues a proposal that was presented, and approved, in the Winter 2000 term.

Proposal Benefits:

The installation of multimedia equipment in the E2 1303B classroom has resulted in significant benefits for Systems Design students and lecturers. In class, students have received enhanced tutorials and lectures, for example through live demonstrations of software tools. Outside of class, Systems Design students have leveraged the 24-hour access to a dedicated projector to hone their presentation skills, in preparation for the OEC and for the Sandford Fleming speaking competitions, as well to enhance their design meetings and activities.

As more lecturers and students have integrated multimedia presentations into the undergraduate experience, having only the one fixed data projector in E2 1303B has complicated scheduling and classroom management. An additional projector would extend the proven benefits to an increased number of students and lecturers.

Cost Breakdown:

Item	Quantity	Unit Cost	Total Cost
Data projector	1	$11 000	$11 000
		Total	$11 000

Systems Design is looking for 50% funding for this proposal.

Implementation Schedule:

System Design intends to have the new data projector installed and operational by the start of the Winter 2002 term.

Additional Information:

Future WEEF proposals are anticipated as Systems Design continues to add to and enhance the multimedia aspects of its curriculum and facilities.

22. Digital Imaging Equipment

Submitted By:

Name:	Kevin Krauel	Name:	Jason Foster
E-mail:	kbkrauel@kingcong	E-mail:	jafoster@engmail
Extension:	5760	Extension:	3831
Position:	Lab Director, SYDE	Position:	Graduate Student, SYDE

Description of Proposal:

This proposal is for a suite of digital imaging equipment that supports video, still, and low-fidelity web applications.

Proposal Benefits:

WEEF supported the purchase of a digital video camera by Systems Design in the Summer 2000 term. As student and lecturer awareness of the camera has grown the single camera has been unable to meet the demand. A second digital video camera would allow more students to and lecturers to benefit from access to a source of digital video.

Systems Design currently owns a single digital still camera. As with the digital video camera, the still camera cannot meet the student demand. The interface to the current camera is sufficiently out of date that, while functional, it is not effective when paired with modern computer hardware and software. A new digital still camera will be compatible with more hardware and software, allowing the students more flexibility, as well as enabling more students to create and manipulate digital still images.

To offer a complete digital imaging package for student use, the still and video cameras are supplemented with a set of low-fidelity web cameras.

Cost Breakdown:

Item	Quantity	Unit Cost	Total Cost
Digital video camera	1	$1500	$1500
Digital still camera	1	$700	$700
Web cameras	5	$90	$450
		Total	$2650

Systems Design is looking for 100% funding for this proposal.

Implementation Schedule:

The digital video and still cameras will enter circulation among Systems Design students and staff immediately. The web cameras will be installed in the Systems Design Workshop Lab immediately.

23. Wireless Network

Submitted By:

Name:	Kevin Krauel	Name:	Jason Foster
E-mail:	kbkrauel@kingcong	E-mail:	jafoster@engmail
Extension:	5760	Extension:	3831
Position:	Lab Director, SYDE	Position:	Graduate Student, SYDE

Description of Proposal:

This proposal is for the hardware required to create a wireless network that covers the six major Systems Design classrooms and student activity areas.

Proposal Benefits:

Students and lecturers in Systems Design who need classroom network connectivity, for example during presentations, lectures, or design meetings, are currently limited by the small number and fixed locations of the network drops. Wireless networks overcome these difficulties. As the number of students who bring laptops with them to class continues to increase, wireless networking will allow these students to connect to networked resources with a minimum of hassle and cost.

The rooms that would benefit from wireless networking are E2 1303A, E2 1303B, E2 1303E, E2 1307C, DASL, and the SYDE Workshop Lab. Each room is currently equipped with multiple wired network drops and as such need only a base station to provide wireless connectivity.

To ensure security a network authentication appliance, as designed by Engineering Computing, will be required. Systems Design will divert an old student workstation for this purpose as part of our ongoing efforts to upgrade student computing resources.

Systems Design currently owns two laptops that are accessible to students. Both of these laptops will be equipped with a wireless network card. To allow students with personal laptops to connect to the network, a limited number of wireless network cards will be made available to students on a sign-out basis.

Cost Breakdown:

Item	Quantity	Unit Cost	Total Cost
Base stations	6	$455	$2730
PC wireless cards	5	$187	$935
		Total	$3665

2 for SYDE laptops.

Systems Design is looking for 100% funding for this proposal.

24. EQUIPMENT STUDENT SHOP

Submitted by:

Clarence Wallace, Supervisor, Engineering Student Shop
x2301
e3graham@engmail.uwaterloo.ca

Description of Proposal:

The Student Machine Shop provides essential hands-on experience and services for all undergraduate students either for core class courses or special projects. We would like to upgrade our sheet metal fabrication drilling, piercing, hole sawing and assembly areas.

Benefits of Proposal:

Students from all engineering disciplines will benefit from a better- equipped student shop. More courses are requiring hands-on projects - making it essential to have better and safer equipment available.

Cost Breakdown:

2. Roper Whitney Hand Held Piercing Kits and Mounting Bases	$ 1,168.60
3. Dewalt Scroll Saw with Light and Stand plus blades	1,058.65
Dewalt JigSaw and Blades	359.36
1. Heidenhain 3rd-axis upgrade on First Milling Machine	1,300.00
GST	272.06
PST	310.92
TOTAL REQUEST	$ 4,469.59

Implementation Schedule

Fall 2001

25. Free Flight Glider Team

Submitted By:

Martha Lenio
malenio@engmail.uwaterloo.ca
Team Leader

Description of Proposal:

The Free Flight Glider Team requires funding for the following items:

1. **Airfoil Template Materials**
   This year the team is going to use a new airfoil, and new airfoil templates will be required for the construction of the glider.

2. **Styrofoam**
   The UW Free Flight Glider is constructed using a styrofoam base. Styrofoam is required for all our testing and prototyping as well. The team requests funding for 2" sheets of styrofoam. All of our scale models and prototypes are kept for use in community events and displays.

3. **Wing Joint Materials**
   In an on-going effort from last year, the team will be replacing the old duct-tape method of holding the glider together with a new joint design. Prototypes of the joint will be built out of wood in order to keep costs down, and the final joint will be machined from small blocks of aluminium.

4. **Various Team Supplies**
   Includes Dremmel tool attachments, Xacto blades, masking tape, duct tape, West Systems Epoxy Resin/Hardener, plastic sheeting, markers, batteries, and latex gloves.

Proposal Benefits:

1. **Airfoil Template Materials**
   By changing the airfoil the team hopes to increase the flight duration and carrying capacity of the glider. By researching into different types of airfoils the team also hopes to increase their knowledge of gliders.

2. **Styrofoam**
   As the core construction material, this is an indispensible requirement in order to test and build the glider.

3. **Wing Joint Materials**
   One of the team's goals last year was the elimination of duct tape as a structural component of the glider, while maintaining an easily repairable design. The goal was nearly achieved, and the design flaws have since been remedied. The new joints should make a fast and easy way of snapping the glider back together after it crash lands at the competition.

4. **Various Team Supplies**
   Required for the building and testing of the gliders.

Cost Breakdown:

Complete Funding Option:

Item	Price
Airfoil Template Materials	$40.00
Styrofoam (6 sheets @ $20/sheet)	$240.00
Wing Joint Materials	$60.00
Various Team Supplies	$160.00
TOTAL:	**$500.00**

Partial Funding Option:

Item	Price
Airfoil Template Materials	$40
Wing Joint Materials	$60
Various Team Supplies	~~$160~~
TOTAL:	**$260**

They get $250 from last year

Implementation Schedule:

Fall 2001	• Complete preliminary glider design and begin analysis and testing • Have a successful wing joint created • Construct and begin testing prototypes
Winter 2002	• Continue construction, testing, and refining of prototypes • Building of final glider
Spring 2002	• 2002 Competition, early May • Community events (Aerial 2000+, ESQ) • Start work on next glider

Additional Information:

WEEF will be acknowledged as a sponsor of the Free Flight Glider Team on-line, in print, and on the competition glider.

26. University of Waterloo Alternative Fuels Team (UWAFT)

Submitted By:

David Havrlant, Eric Duiker
dhavrlan@engmail.uwaterloo.ca, esduiker@engmail.uwaterloo.ca
(519) 578-1791
Team Leaders

Description of Proposal:

Conversion of the UWAFT 1997 Malibu into UW's first ever ethanol-electric hybrid vehicle. Modifications include: removal of stock drivetrain components; sourcing of small, high-efficiency engine to convert to ethanol use, new AC drive motor, battery pack, and vehicle controls system. Installation, testing, and fine-tuning of all components for competition.

Proposal Benefits:

This project will include people from all departments within the engineering faculty, especially mechanical, electrical, systems-design, computer, and chemical engineering to implement all of the above-mentioned systems. Team members will gain knowledge in state of the art hybrid vehicle design to be carried forward for many years. The team currently consists of mechanical, electrical, systems design, and chemical engineers, and is open to anyone willing to join.

Cost Breakdown:

1) Battery Pack - $6000-$3000
Electric Motor - $1500
Control System - $2000 (built by us)
Combustion Engine - $2000

Partial Funding: 2) Battery Pack - $6000-$3000
Electric Motor - $1500
Control System - $2000 (built by us)
3) Battery Pack - $6000-$4000
Electric Motor - $1500

Implementation Schedule:

Working prototype using basic electrical controls to be completed by Sept. 2002. Advanced electronic controls system and hybrid optimisation to be completed by May 2003 for competition.

Additional Information:

This project has been undertaken for the purpose of gaining experience in the design of hybrid vehicles and advanced controls systems. It will also enable us to receive further vehicle donations for upcoming Future Truck competitions. The experience gained from this will be vital in ensuring UWAFT and UW's continued success at these and other competitions. UWAFT also seeks and uses outside sponsorship. N.C.R., Midas, Ontario Corn Producers Assoc., American Society for Engineering Education Inc., Sparc-Air ECD Systems, Linamar Corp., Degussa-Huls, and Canadian Renewable are some of our current sponsors. www.eng.uwaterloo.ca/~uw_afl

27. Midnight Sun VI Solar Car Project

Submitted by:

Chris Urbaniak
Urbaniak@midnightsun.uwaterloo.ca
x2978
Business Manager

Description of Proposal:

The Midnight Sun Solar Car Project strives to design and construct an efficient solar car. Every term, about 60 University of Waterloo students, primarily engineers, spend numerous hours working on our project. Midnight Sun VI placed third overall in the American Solar Challenge and is currently the top ranking Canadian team! Midnight Sun VI will be racing in the World Solar Challenge in Australia next month. Building on solid engineering practices, the latest in computer aided engineering, a wealth of past experience, and an influx of new ideas, the team is poised for the new challenge ahead. With the results demonstrated by the new car at ASC, the team is confident in bringing home another top 5 finish at WSC. However, success does come with a price. In our current situation we need more funds to fully benefit from our new solar array, perform faster CFD, improve our public-relations abilities, and update our office equipment to provide adequate environment for the final improvements to Midnight Sun VI and the design of Midnight Sun VII. Thus we approach WEEF for funding in the purchase of six (6) maximum power point trackers (MPPTs), a Sun Station network card, a digital camera, and a laser printer.

Biel MPPTs

With the recent purchase of a 22% efficient space-grade Gallium-Arsenide solar array, Midnight Sun would like to take full advantage of the additional power. For this reason, we are requesting the funding of six (6) Biel MPPTs. A maximum power point tracker regulates the solar array voltage and determines the operating point along the voltage-current curve such that the power produced is maximized.

Most terrestrial solar arrays have an efficiency of 14-19%; having a more efficient array obviously gives a team a tremendous advantage under race conditions. Therefore, it is critical to use the available power to its full potential - an impossible task without high-quality Biel MPPTs . The Biel MPPTs operate at a higher efficiency than the current AERL MPPTs, thereby making the Gallium-Arsenide solar array even more effective. The MPPTs are a long-term acquisition; they will be used with the new array for Midnight Sun VII.

Sun Station 100Mbit Network Card

Aerodynamics play a vital role in solar vehicle technology; due to the limited available power, aerodynamic drag presents the greatest force to overcome at high speeds; it should be noted that Midnight Sun VI has a cruising speed of approximately 75 km/hr, and as a result aerodynamics play a large role. Designing an aerodynamically sound vehicle requires a great deal of mathematical design and analysis. Midnight Sun VI was the first Waterloo solar car, which was tested as a complete vehicle using CFD.

- To develop an interdisciplinary engineering project that promotes education through applied engineering experiences
- To represent Waterloo Engineering through exposure of the project at races, trade shows, and media events
- To further alternative fuel technologies through research and development efforts

Cost Breakdown:

Approximate costs outlined. Exact costs will be discussed at presentation. Partial funding is appreciated as well.

	Item	Quantity	*Amount*	
Plan A				
	Biel MPPTs	6	$5850	(6 x $975)
	Sun FastEthernet Network Card	1	$705	
	Digital Camera	1	$700	
	HP Laser Printer	1	$650	
		Total:	**$7905**	
Plan B				
	Biel MPPTs	3	$2925	(3 x $975)
	Sun FastEthernet Network Card	1	$705	
	Digital Camera	1	$700	
	HP Laser Printer	1	$650	
		Total:	**$4980**	
Plan C				
	Biel MPPTs	3	$2925	(3 x $975)
	Sun FastEthernet Network Card	1	$350	(half-funded)
	Digital Camera	1	$350	(half-funded)
	HP Laser Printer	1	$325	(half-funded)
		Total:	**$3950**	

Implementation Schedule:

Items being requested will be purchased immediately upon the availability of funds. The Biel MPPTs will be installed on Midnight Sun upon the car's return from Australia, and will be transferred to Midnight Sun VII before VII races. The digital camera is desirable before the team departs for Australia, in order to fully support public relation functions. The network card and laser printer are required before the new year, as design upgrades and sponsorship activities are ongoing.

Additional Information:

Midnight Sun would like to thank WEEF for its on going support of Midnight Sun. As a result of contributions made by WEEF to Midnight Sun, WEEF has funded all of the data acquisition system and accelerated the design process through RAM for the Sun workstation. Due to WEEF's generosity, WEEF is currently a Silver Sponsor.

28. Students for the Exploration and Development of Space

Submitted By:

Martha Lenio
malenio@engmail.uwaterloo.ca
VP Public Relations

Description of Proposal:

Students for the Exploration and Development of Space (SEDS) requires funding for the renting of AV equipment, parking passes and gifts for guest speakers, and colour photocopying.

Proposal Benefits:

SEDS is a new club at the University of Waterloo, having begun just a few weeks ago. The main objective of the club is to promote interest in space and the aerospace industry by bringing in speakers to the university, as well as planning other space-related events to meet the interests of club members. Although the club is not affiliated with any faculty as of yet, the club is planning to affiliate itself with both the Faculties of Science and Engineering by the end of the term. By supporting SEDS now WEEF is helping to support bringing in speakers such as Canadian astronaut Chris Hadfield, members of the CSA, the president of the Mars Society, and engineers from companies such as COM DEV and MD Robotics.

Cost Breakdown:

Complete Funding Option:

Item	Price
AV Equipment Rental	$320.00
Colour Photocopies (50 sheets@$1/sheet)	$50.00
Gifts for Speakers	$80.00
TOTAL:	**$450.00**

Partial Funding Option:

Item	Price
AV Equipment Rental	$320.00
TOTAL:	**$320.00**

******Instead of money for AV equipment rentals, the club would readily accept free rentals from engineering!******

Cost Breakdown:

Implementation Schedule:

Fall 2001	• Already arranged for Chris Hadfield to come and speak at the university, and discovered we had inadequate funding to bring in more speakers after Col. Hadfield • Prepare a line-up of speakers for the rest of the term/year • Recruit members and get money from sale of memberships • Obtain affiliations with the Faculties of Engineering and Science
Winter 2002	• Continue with the planning of events and recruitment of members
Spring 2002	• Continue with planning of events and recruitment of members

Additional Information:

WEEF will be acknowledged as a sponsor of SEDS on-line and in print.

colour video camera	$3000.00
Total	$3000.00

Implementation Schedule:

Implementation of vision system would begin immediately upon receipt.

30. R/C Aero Design Team

Submitted By:

Ian Rainey & Steve Viola
ianrainey@altavista.net & stephen_e_viola@yahoo.com
Team Leaders

Description of Proposal:

We are preparing for the 2003 SAE Aero Design Competition, an event that attracts over 40 universities worldwide. WEEF funding would make it possible for our team to transform design plans that are under development into an actual flying prototype.

Proposal Benefits:

The R/C Aero Design Team offers a chance for undergrads interested in avionics to learn the fundamentals of flight and airplane design. Knowledge and skills are acquired through hands on construction of airplane components, flight-testing, and remote control flight.

Cost Breakdown:

Option #1

Item	Price
OS 61 FX engine	$ 275
Futaba servo-motor kit	$ 150
Monokote covering	$ 100
Epoxy	$ 75
Research/Learning Materials	$ 100
Balsa Wood	$ 75
Tachometer	$ 45
Multimeter	$ 40
Landing gear and other miscellaneous parts	$ 90
Total	**$ 950**

This preferred option would provide the team with all the missing materials and tools still needed to construct and test our first prototype plane.

Option #2

Item	Price
Monokot covering	$ 100
Epoxy	$ 75
Research/Learning Materials	$ 100
Balsa Wood	$ 75
Tachometer	$ 45
Multimeter	$ 40
Landing gear and other miscellaneous parts	$ 90
Total	**$ 525**

This option will permit the construction of our first prototype plane, however, we will have to use an old engine and servo-motors which have all sustained damage during previous crashes. This equipment cannot be fully trusted, thus greatly increases the odds of another devastating crash.

Implementation Schedule:

Place order for materials as soon as funds become available. Construction of first prototype will begin once all necessary supplies are acquired.

31. Clean Snowmobile Challenge (CSC2002)

Submitted By:

Tim VanDriel
tsvandri@engmail.uwaterloo.ca
CSC team member

Description of Proposal:

The Clean Snowmobile Challenge 2002 is a competition by Yellowstone National Park and the Society of Automotive Engineers (SAE). The focus of this competition is to improve the emissions, fuel economy and reduce noise levels of a snowmobile while maintaining or improving performance. The modified snowmobile will compete during the annual World Championship Hill Climb in Jackson Hole, Wyoming. The competition is scheduled to take place March 23-29, 2002.

I would first like to thank WEEF for the support that has been given to us in the past. Using WEEF's support University of Waterloo placed 2nd overall at CSC 2000 and 1st overall at CSC 2001. For this term, we would like to maintain our standing with the assistance of WEEF.

Proposal Benefits:

The Clean Snowmobile Challenge, although one of the newer engineering competitions, has provided valuable experience for a number of students while helping them complete required course material. With the current publicity of the impact of snowmobiles on the environment, more so in the USA than Canada, the CSC addresses a practical engineering problem.

We are requesting funding for the purchase of a data acquisition system for the implementation and diagnosis of the Engine Management Systems on both the four stroke and the two stroke snowmobiles to help reduce emissions and improve performance. It can be used on the UWAFT (Alternative Fuels Team) Laptop. This data acquisition system would benefit all the SAE team projects because it can be used for testing on any electrical system that requires multiple input and output signals.

> Several safety-related items are also requested. Under CSC 2002 rules a full-coverage helmet is mandatory. A helmet purchased for CSC 2002 could be used for future snowmobile competitions and possibly by other teams such as the Mini Baja.

The snowmobile room needs tools. We are currently using several students' personal tools. We are requesting a basic tool set which could be used by future Snowmobile teams.

A main objective of the team is to lower the overall sound levels of the snowmobile while maintaining performance. To properly identify and reduce the sources of noise, proper measuring equipment is necessary. Modern microphones and a recording device would be a great asset to future CSC teams and all design competitions such as Formula-SAE and UWAFT. We are in the process of obtaining microphones but need a sound card.

In order to attend the Clean Snowmobile Challenge competition in Wyoming, March 23- March 29, 2002 and effectively represent Waterloo by retaining our title, we would like to ask WEEF's assistance with travel expenses. Due to our limited budget, we have decided to drive (72 hrs return) to the competition and our lodging will be subsidised by competition sponsors. We plan to rent a van for our trip.

Cost Breakdown:

In order of priority:
(Including partial funding options)

1.) Noise Analysis
Crystal Sound PCMCIA Sound Card (for laptop) $110 + tx = **$126.50**

2.) Data Acquisition System
PCI-MIO-16XE-10 and NI-DAQ for Win 2000/NT/Me/9x and Mac OS 10 $ 3,195
SCB-68 Shielded I/O Connector Block 5 $ 475
Total cost: $3670

3.) Full-face motorcycle helmet:
Cyber U-215 (Solid Colour) with "Value Priced Thermo-composite shell" (US Dept of Transport certified)
$199.99 CAN + tx = **$229.99**

4.)
Mastercraft 96-piece socket set 1/4", 3/8" drives
$149.99 + tx = $172.48
Mastercraft 11-piece wrench set
$64.99 + tx = $74.74
Mastercraft 15-piece Screwdriver Set
$59.99 + tx = $68.99
12-Volt DeWalt Cordless Drill
$139.99 + tx = $160.99
Mastercraft plastic tool box
$59.99 + tx = $68.99
Tools total $ 546.19

5.)
Estimated Travel Expenses **$5000 CAN**
(partial funding requested – some funding is expected from the Sandford Fleming Foundation)

Implementation Schedule:

Travel expenses are required before CSC 2002 (March 2002)
Funding for other items is required as soon as possible.

Additional Information:

UW is one of only two Canadian teams at the competition and it is our national duty to maintain our standing as #1.

Last year the team developed both a two-stroke and four-stroke engine solution. The two-stroke engine was successful and was used in the competition, but the four-stroke engine has the potential to surpass it. Our team strategy is to continue to develop the two-stroke engine by working on tasks such as direct injection fuel delivery, airbox and exhaust re-design, cowling air flow improvements, catalyst development, drivetrain efficiency improvements, and reduction of weight. We are also continuing to develop the four-stroke engine with a focus on reduced weight and an improved engine management system.

32. Team Advancement of the UW Formula SAE Team

Submitted By:

Rafal Smerd
fsae@engmail.uwaterloo.ca
x5904
Formula SAE Team 2002 Team Leader

2002 Formula SAE

- 30 Undergrad Engineering Students
- Largest Mechanical Engineering Student Project
- Many Disciplines Participate
- Both streams
- First to fourth year

WEEF

Formula SAE support is an excellent public/corporate awareness tool available to WEEF. We are a consistent Top 10 finishing team, competing with over 125 other teams from around the world. Several large automotive (and related) companies sponsor the event.

Description of Proposal:

To purchase the following equipment in order to further progress the development of the 2002 Formula SAE car and cars to be developed by all future teams.

Option 1:

Items
Dampers
CV Joints
Differential
External CD-Reader/Writer
Literature
Banners

Option 2:

Items
Engine
External CD-Reader/Writer

Proposal Benefits:

Option 1:

Dampers: Adjustable dampers are proposed for the 2002 car. The 2002 team is planning on conducting extensive damper testing and development. The purchase of these dampers will benefit the 2002 team, providing more time for characterization and testing of them. These results will benefit both the 2002 team and future teams in damper tuning. Dampers have a service life of 2-3 years depending on wear and tear, and can be used by future teams.

CV Joints: A "tripod" style CV joint is proposed for the 2002 car. The advantage of these is a lower wear rate than the current ones in use and higher efficiency at higher shaft angles. This new CV joint is to replace three individual components in the vehicle, thus resulting in a simpler assembly. Further, this new packaging is potentially lighter than the current. CV joints have a service life of 2-3 years depending on wear. Since these joints have a lower wear rate than the current ones, they can be used by future teams.

Differential: The differential will serve to be installed in the 2002 car. The differential currently used in the 2001 car is a new model which has not been used by previous teams. To have a successful test season, two cars must be in full operating conditions. The purchase of this differential will prevent us for being required to remove the differential in the 2001 car, thus leaving it in operating condition for the next year's team. differential which is a number of years old and worn out. A new differential will last long enough to serve the needs of future teams for approximately 3-5 years, depending on wear. Development is underway by the 2002 Team on a fully sealed differential casing which would eliminate leaks for future teams.

External CD-Reader/Writer: Team Documentation is vital for future teams in understanding previous designs, Public Relations (investor's kits, thank-you letters, etc) and the financial aspects involved in the operation of the Formula SAE Team. Currently, documentation stored on the computer is taking up hard drive space, hard copies are taking up shelf space and others are getting lost. A CD-Reader/Writer will allow us to efficiently and cost effectively archive previous year's documentation to be used by future teams. An external unit will give us the flexibility of using it with our laptop computer.

Color Printer: In order to look like a professional team in the eyes of the public and sponsors, most of our literature is printed in color. Items such as Investor's kits and Information kits are given out regularly at shows and mailed to potential sponsors. A high quality color printer will allow us to generate these documents without having to endure the high cost of color printing. The current printer we have is down consistently. This printer would also be used by future teams.

Tools: A complete set of tools is essential for constructing a new car. Currently some of our drill bits are either missing or worn out, and we do not have ready access to items such as gear pullers on weekends.

Literature: All members on the team rely on technical literature in understanding the parameters involved in designing racecar components and components in general. New information is being released on a regular basis. Material such as the damper handbook, the Machinery's Handbook, SAE transactions, engine manuals and vehicle dynamics literature will be used by members of the current and future teams in designing the car.

Banners/Display Boards: A number of banners and display boards are used when the car is displayed at trade shows, parades and public relations events. The current banners and boards were purchased by the 2000 team, and bear the Formula SAE Team 2000 logo and text. These were modified in 2001 to bear the 2001 year, however they cannot be modified for 2002 and still look professional. It has been proposed to update the banners/display boards to read "University of Waterloo Motorsports – Formula SAE Team". These banners could then be used by future teams without to sacrifice a professional appearance by having to modify them

Cost Breakdown:

Option 1:

Item	*Cost*
Dampers	$2000
CV Joints	$1000
Differential	$600
External CD-Reader/Writer	$500
Tools	$500
Color Printer	$500
Literature	$500
Banners	$500
TOTAL	$5600

Option 2:

Item	*Cost*
Dampers	$2000
CV Joints	$1000
Differential	$600
TOTAL	$3600

Implementation Schedule:

The items listed above would be purchased as soon as possible. Each item would have an immediate positive impact on the 2001 FSAE team as well as future teams.

Additional Information:

Funding priority is to the dampers, CV Joints and Differential.

33. Waterloo Aerial Robotics Group (WARG) Equipment

Submitted By:

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WARG Team Members

Description of Proposal:

The Waterloo Aerial Robotics Group is currently preparing for the 2002 International Aerial Robotics Competition. To make progress over the next several months, the team will require electronic design and testing equipment, along with ORCAD licences, simulator software, and a laptop for field use. Finally, several workshop and fourth year design projects will use WARG subprojects as their topics and funding for these projects could be very helpful.

Proposal Benefits:

For the past four years, the WARG team has been providing undergraduate engineering students with a unique opportunity to experience hands-on robotics development including the design of flight control, artificial intelligence and computer vision systems. The team has now includes approximately fifty undergraduate engineering students from all disciplines. The students working on WARG have a chance to get a lot more out of their education than what is presented in class. They learn hands-on flight craft design, programming, and hardware design, to name a few areas. This equipment will help to maintain WARG's position as one of the very best teams competing in this international competition.
Due to the nature of the competition, WARG is expanding this year to include projects such as fixed-wing aircraft, ducted fan, and four-rotor platform, giving undergraduate students the opportunity to explore these disciplines as well as full design and construction of these vehicles.

Cost Breakdown:

Full package:

2 ORCAD licenses(Capture and Layout) for hardware (schematic and PCB) board design:	$2250 (US $1500)
Digital Multimeter (for measuring):	$50
Soldering Iron:	$200
2 anti-static mats (needed for doing hardware work on a tabletop):	$150
Helicopter/plane simulator software (needed for training pilot(s)):	$400
New laptop replacing current, dysfunctional one :	$2000

(for field-testing and use in competition - desktop isn't much use in the middle of a field)

1 oscilloscope (used for testing electronics and examining various control signals related to the helicopter and other vehicles)	$1500
1 Power supply (charging batteries, powering electronics, lab testing, helicopter ground supply)	$500

Total: $5050

Package 1:

1 ORCAD license:	$1125 (US $750)
Meter:	$50
Soldering iron:	$200
Anti-static mats:	$150
Simulator software:	$400
Laptop:	$2000

Total: $3925

Package 2:

1 Oscilloscope:	$1500
1 Power supply:	$500
Meter:	$50
Simulator software:	$400
Soldering iron:	$200
Anti-static mats:	$150

Total: $2800

Package 3:

1 ORCAD:	$1125
1 Laptop:	$2000

Total: $3125

Package 4:

1 ORCAD:	$1125
Anti-static mats:	$150
Soldering iron:	$200
Simulator software:	$400
Meter:	$50

Total: $1925

Implementation Schedule:

This is an ongoing student project that is expected to evolve for many years in the future. Funding for most of the above subprojects will be used immediately, though the equipment purchased will continue to be of great value to the group throughout the future.

34. An Automated Panning Camera System

Submitted By:

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Description of Proposal:

As part of our fourth year workshop project, it is our goal to develop a system that is capable of tracking a specified moving target and pan a video camera to follow the target accordingly. Basically, this camera will be capable of tracking the moving target. A high level system diagram can be found below.

The system will be broken down into 2 sub-systems: sensing and actuation.

Sensing: Determining the spatial coordinates of the target will be accomplished using infrared technology. Essentially, the target (person being tracked) will wear an active infrared (IR) emitter that will send modulated pulses. The IR pulses will be triangularized by a series photodiodes (sensitive to the IR spectrum) to determine the target's spatial coordinates.

Actuation: Once the spatial coordinates of the target have been determined, it is necessary to send actuating signals to the camera mount to pan the camera towards the moving target. As a means of panning the camera, we plan on using a low-cost stepper motor that will be interfaced with the video camera mount.

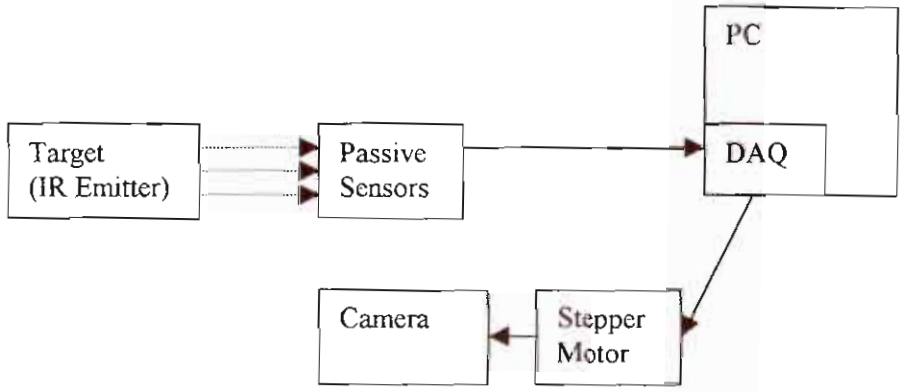

Figure 1: High level system diagram

The primary materials needed to implement this system can be found in the above diagram.

1. Target: The target itself could be a moving person, however, what distinguishes the target is the active emitter that will be attached to it. Essentially, the target must wear an infrared emitter for tracking purposes.

2. Passive Sensors: To detect the infrared emitted by the target, a series of IR sensors (photodiodes) will be needed. These will have to be fairly high quality parts because the sensors must be able to give accurate information about the general location of the target.

3. Personal Computer (PC): A PC will be needed to determine the location of the target and for calculations such as the degree of camera movement. The PC will analyze input and determine output for the system. We will provide the PC, so this is NOT an issue for the WEEF council.

4. DAQ (Data Acquisition Card): The DAQ serves a dual purpose; it receives the analogue output from the sensors and sends a digital output to control the stepper motor. The requirements for the DAQ are:
   a) Have a minimum of 3 analogue inputs (one input for each sensor).
   b) Have a quick sampling rate (in case it is later decided to calculate the Doppler shift).
   c) Have a minimum of 3 digital outputs (for the stepper motor).

   The main purpose for this WEEF proposal is to find funding for a data acquisition card.

5. Stepper Motor: In order to control the camera mount for panning, it is necessary to purchase a high power stepper motor that will interface well with the mount. The stepper motor should be capable of supporting a 10 pound load (along the axis of the motor) and capable of relatively high torque.

6. Camera and Camera Mount: The purpose of the system is to make a camera track a moving target, therefore, it is necessary to obtain a video camera and mount for testing purposes. Fortunately, the Systems Design department is willing to lend a video camera and mount for the upcoming project.

7. Power Supply: To control the stepper motors (provided by the Systems Design department).

Proposal Benefits:

From the above materials stated, there is a need for WEEF funding to obtain a data acquisition system (DAQ) and stepper motor. When choosing our system components, we were very careful to make sure that everything we purchase can indeed be reused for future projects.

DAQ

A data acquisition system will not only benefit us for this upcoming project, but also benefit students in future workshops. A DAQ card is a quick and easy way for anyone to test the functionality of their subsystems. As well, a DAQ is a low-cost way of sending digital/analogue test inputs to a system for testing purposes.

Stepper Motor

Most stepper motors are fairly low-cost and are used for a variety of applications. A cost break down can be found below.

Cost Breakdown:

We are currently investigating the possibility of obtaining funds from the Systems Design department. This is money allocated by the department for workshop projects. This money is obtained from the differential tuition fees. We have been informally told that the department would be more willing to fund our project if we have support from WEEF.

Also, to alleviate the financial burden from WEEF, we have confirmed the use of a variety of equipment from other sources (i.e. Systems Design department and personal funding). Such materials include a power supply, a video camera and mount, hardware components, a PC and sensors.

Below is a price comparison for data acquisition system and the stepper motor.

Product	Company	Part Number	Price	Description
Data Acquisition Card	National Instruements (www.ni.com)	777383-01	$1595 CDN	250 kS/s, 12-Bit, 16 Analog Inputs
Connector Block		777145-01	$155 CDN	CB-68LP I/O Connector Block
Cable		184749-02	$155 CDN	SH6868-EP, Shielded Cable, 1 m
TOTAL			$1905 CDN	
Data Acquisition Board	DataBoards (www.databoards.co.uk)	PCI-703S-16A	$1200 US	16 Channel PCI-bus Simultaneous Sample & Hold Board with 2 Analog Outputs
Connector Block		PC-43A4	$51 US	8 Independent DIG I/O Connector & Digital Control I/O Screw Terminal
Cable		DB50M/F	$25 US	DB50(M) to DB50(F) multi-core screened cable – 1m
TOTAL			$1276 US	

The ideal DAQ card is provided by National Instruments, this is a DAQ system that is very easy to use, and quick programs can be written in Labview to test sensing and actuation algorithms.

Product	Company	Price	Description
Stepper Motor	American Scientific Instrument Corp. (http://www.amsicorp.com)	$49 US	1.8 degree step angle...80 oz-in Torque
Stepper Motor	Mill-Shaf Technologies (http://steppercontrol.com)	$30 US	1.8 degree step angle...60 oz-in Torque
Stepper Motor	Future-Bot Components (http://www.futurebots.com)	$45 US	1.8 degree step angle...High Torque

The American Scientific Instrument Corp. stepper motor would be ideal since it has the largest amount of torque, which we feel is necessary for overcoming the inertia of the camera mount. Since the price difference is small between the motors, we feel that the performance gain outweighs the cost differential.

Implementation Schedule:

Immediately