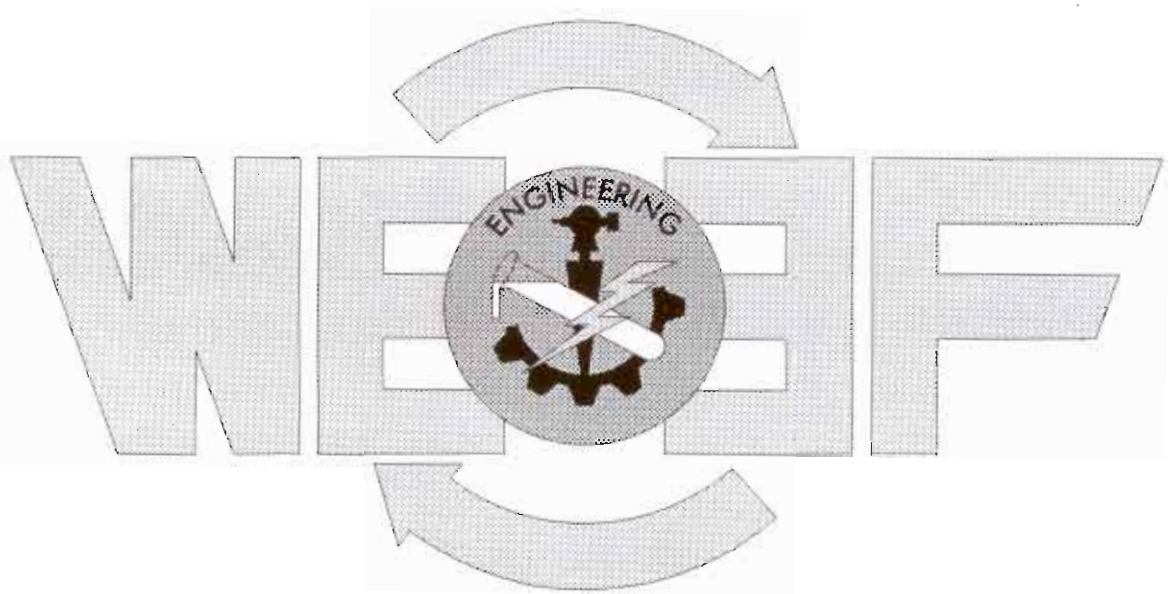
Waterloo Engineering Endowment Fund



Winter 1997 Proposals

TABLE OF CONTENTS

Reactor Engineering Experiment For Ch.E. 040 and Ch.E. 524

Submitted By:

P.L. Silveston
Professor
Chemical Engineering
silvesto@cape.uwaterloo.ca

Description of Proposal:

When this experiment was submitted to WEEF for funding in 1995, only about half of the funding requested was received. This "bare-bones" funding allowed us to build just the unit for the ChE 040 laboratory.

WEEF funding is requested for the remainder of the original project, that is, to undertake expansion of the experiment (and the equipment) so that it can be used for the process control laboratory as well as for the unit operations laboratory. Both laboratories are in the ChE 4th year program. ChE 040 is a core laboratory, while ChE 524 is an option, but one that is taken by about half the 4th year class.

Expansion involves adding mass flow controllers and a motor driven rheostat for the gas preheater so that process control experiments can be undertaken. Some refitting of the equipment is needed.

Process control experiments to be built around the catalytic fixed bed reactor (oxidation of CO to CO2 over Pt/Al2O3 or Pd/Al2O3 catalysts) are design and testing of 1) conventional PID feed-back control, and 2) model based control on conversion in the reactor under random, impulse type disturbances in inlet temperature, flow rate and feed composition.

Proposal Benefits:

The experiment mimics the type of control situations ChE students will encounter in industry. The system is highly nonlinear, exhibits multiple steady state and spontaneous oscillation. Various operating situations can be examined: start up, response to large or small disturbances, periodic operation, shut down.

The equipment is versatile so that a wide variety of experiments can be carried in both the unit ops and process control laboratories. This allows us to bring into the labs experiments that differ for each student group. Typically, about 6 to 8 groups will do an experiment each term on the same piece of equipment. Instead of each group doing the same experiment (which sadly encourages cloning), each group can have a separate experiment.

Cost Breakdown:

Expansion of the catalytic reactor experiment will require $ 15,400. The work can be undertaken using undergraduate student help and, if done in this way, would require 4 terms to bring into the process control laboratory. It is a project well suited for execution in stages so partial funding would not be detrimental.

Stage 1 - Adding flow control to the existing reactor

Purchases:	2 Mass Flow Controllers	
	@ $ 1800 (Can.)	$ 3600 (firm)
	Power Source & Control Box	
	@ $ 2500 (Can.)	$ 2500 (firm)
	Software	$ 500 (estimate)

	Fittings & Contingency	$ 500 (estimate)
Manpower:	Technician/Grad. student time	$ 1500 (estimate)
	Stage 1 Subtotal	$ 8600.

Stage 2 - Adding continuous temperature control on reactor preheater

Purchases:	1 Mass Flow Controller	$ 1800 (firm)
	Motor driven rheostat	$ 2500 (estimate)
	Software	$ 500 (estimate)
	Fittings & Contingency	$ 500 (estimate)
Manpower:	Technician/Grad. student	$ 1500 (estimate)
	Stage 2 Subtotal	$ 6800.

Implementation Schedule:

I have had good success in using undergraduate teams to do equipment design and selection, layout, construction, trouble shooting and preparation of lab manuals in the first half of our WEEF catalytic reactor project. Although this slows down the project, I believe the educational benefits compensate for the delay in getting the experiment on stream. Thus, I propose using undergraduate teams in our ChE 043/048 and 047 project courses once again to complete our WEEF project.

Stage 1 - Adding flow control

Select components, system design order components	Spring, '97
Build equipment, trouble shoot	Fall, '97
Trial laboratory, prepare lab manual	Winter, '98
Ready for Student Use	Spring, '98

Stage 2 - Adding continuous temperature control

Design, select components, order components	Fall, '97
Build equipment, trouble shoot	Winter, '98
Laboratory trial, prepare lab manual	Spring, '98
Ready for student use	Fall, '98

for 4A Chem

Additional Information:

- Continuation of project previously funded by WEEF

- New, original undergraduate experiment....not an adaption of an undergraduate experiment developed elsewhere
- Unit ops lab and process control lab experiment representative of industrial situations
- Heavy undergraduate involvement in equipment design, planning, preparation of teaching materials
- Can be implemented in stages so partial funding is possible

Purchase of 4 new computers for the undergraduate Chemical Engineering computer lab

Submitted By:

Brian Barclay	-	3A Chemical Engineering	-	brbarcla@chemical
Rob Sims	-	3A Chemical Engineering	-	rsims@chemical

Description of Proposal:

This proposal is submitted in response to the dire need for increased computing facilities for undergraduate Chemical Engineers. The computer facilities that are currently available for chemical engineers (in the Chem Eng lab - E1 2532) include, 2 286 based, 3 386 based and 3 486 based computers. Obviously, this is not nearly a sufficient facility for the use of 4 classes of Chemical engineers. The limits of the amount of money that can be given to any one project is well understood, therefore we request the consideration for the use of WEEF funds in the purchasing 4 new Pentium computers for the Chemical Engineering lab.

Proposal Benefits:

The Undergraduate Chemical Engineering department currently consists of approximately 350 students. With the increased facilities requested in this proposal the availability of computers to the members of this department would be increased to a tolerable level, as well as easing the stress in other computer labs around the engineering department. Overall, this proposal would help to ease the frustration that has existed as long as I have been a member of this department with regards to the availability of computers to Chemical Engineers.

It should also be noted that the current computers in this lab are extremely slow while running Windows 3.1 and will be completely unsuitable for running the Window95 platform that is expected to appear shortly as Watstar evolves. The current computer lab will become completely obsolete and the Chemical Engineers will be limited to the use of the first year computer labs which are already notoriously busy. Fulfilling this proposal would be a first step in bringing this lab to the level of technology required as network computing at Waterloo moves to a new level.

Cost Breakdown:

4 JKL Pentium 120 Computers
Each with:
16MB RAM
15" Daytek monitor
2 GB hard drive
all other peripherals

Estimated Cost for 1 system
$1800.00

Cost for total WEEF proposal (4 Systems)
$7200.00

Implementation Schedule:

The computers could be purchased immediately and installed into the Chemical Engineering computer lab by the end of the Winter 97 term.

Additional Information

- There is currently a high demand and low availability for computers in the Chemical Engineering department
- Chemical Engineering has the dedicated use of 7 computers, four of which are obsolete
- The majority of the computers currently in the Chemical Engineering lab are extremely slow running Windows 3.1
- The computers currently available will be unable to run Windows 95
- The upgrade of this lab is at a point of **absolute necessity**

Laboratory Equipment Upgrades - "Keeping up with the Times"

Submitted By:

Lillian Liao
E-mail: lliao@chemical
Phone Number: X6161
Position: Analytical Technologist

Description of Proposal:

To replace and in the process upgrade laboratory equipment that is outdated and in need of service, and to carry out laboratory preparations efficiently.

Proposal Benefits:

To allow more accurate measurements of chemicals that would produce more reliable and pronounced observable results. Enables students to perform the experiments more independently. Approximately 150 students of ChemE 032 would greatly benefit.

Cost Breakdown:

a) 1 X SuperRange 210g capacity, readability 0.1mg Analytical Balance - $4000

b) 1 X Model 521 VWR Dispenser, 10 -109ml capacity - $700

c) 1 X Reservoir Bottle for above, 2500mL - $20

d) 1 X Eppendorf Adjustable Volume Maxipipettor, 1 - 10mL - $500

e) 1 X Eppendorf Sterile Maxitip L, 1000/pkg - $100

f) 1 X Eppendorf Adjustable Volume Micropipettor, 100 - 1000µL - $400

g) 1 X Pipet tips, hinged box rack, 1000/pkg - $74

Implementation Schedule:

The equipment will be used once available. Course and lab is offered in Summer'97 term.

Additional Information:

Priority given to the Analytical Balance, item a) and to the Dispenser and Reservoir Bottle, items b) and c). Prices are 1996 quotes and taxes are not included.

There has been an increase in the number of students that are enrolled in the course since the previous 2 years, from approximately 120 - 150. Plans are in progress to have 3 rather than 2 lab sections running in one term. This has increased both space and equipment demands and students have had to share equipment which means that every two to three students within a group are the 'note-takers'. I have kept the 'wish' list relatively short but many areas of the lab are in need of attention.

As a person with industry work-related experience, I believe having experience on recent technology is an essential part of education that will be the differentiating factor between job candidates.

Watstar Server Upgrade for Civil Engineering Students

Submitted By:

Michael Herz
Email: mherz@uwaterloo.ca
Phone: ext. 3411
Position: Computer Systems Manager, Department of Civil Engineering

Description of Proposal:

As part of our ongoing upgrade program we would like to upgrade the Civil and Bridge Watstar servers. One is a 486-66 and the other is a 586-100. We would like to upgrade both motherboards to 686-200 and also to upgrade the peripheral cards.

Proposal Benefits:

The system will be faster now and will allow for future expansion and upgrades. Continuous and smaller upgrades avoid surprise and large mandatory upgrades.

Cost Breakdown:

Pentium Pro 200 $2500
SCSI Card $280
Video Card $100
Network Card $270

Total Each $3510

Total Both $7020

Implementation Schedule:

The installation will take less than 1 day and will be installed at the next possible break in classes.

Additional Information:

The department fully supports this proposal and will provide up to 50% funding.

New Monitors for E2-2340

Submitted By:

Ralph M. Korchensky VE3EUK
E-Mail rkorchensky@civoffice.uwaterloo.ca
Ext: 5045
Civil Engineering
Room E3-2141B

Description of Proposal:

In the past, WEEF has generously assisted in the upgrade of monitors in this room. Our last requests did not suggest replacement of every monitor as some were still serviceable at that time. Another year has passed and the remaining monitors are now in a condition where they are no longer in what should be considered good, or serviceable condition. The remaining monitors in question have been repaired "numerous" times, until they are now in a state where they are no longer "repairable".

I am respectfully requesting WEEF funding for 14 new AD1-4V monitors as are presently in use in the Watstar Lab. The normal price from our supplier is $489.00 per unit, however I have been able to negotiate a bulk price of $470.00 each.

Cost Breakdown:

14 monitors x $470.00 = $6580.00 (plus applicable taxes).

Computer Controlled Data Acquisition System

Submitted By:

Giovanni Cascante and Ken Bowman
Email: gcascant@civoffice or kbowman@civoffice
Phone numbers: 2098, 3656
Positions: Assistant Professor, Lab Technician

Description of Proposal:

The traditional instrument is self-contained, with signal input/output capabilities and fixed user interface features. Inside the box, specialized circuitry (A/D converters, signal conditioning, microprocessors, memory, internal bus) convert real-world signals to results for the user. On the other hand, virtual instrumentation empowered engineers to develop customized systems using computers as the engine for instrumentation. The basic components of a virtual instrument are: one analog-to-digital card, one computer, and a specific software to link the hardware. Then, this proposal is for a virtual instrument to be used by engineering students in any course or project that requires data acquisition from up to eight electronic devices.

The proposed software (LabView) is a graphical programming tool that permits a fast and easy development of customized applications. Once that the application is ready, it can be saved as an executable file, which can be used in any other computer with the specified ADD card. Therefore, with one license of the program, many students could get the benefit of this software.

Proposal Benefits:

- The proposed equipment can be used in any application that requires data acquisition from electronic devices. Then, it could be used in any experimental work required in the current curriculum. The virtual instrument technology permits simulation of different measuring devices such as oscilloscopes and multimeters.
- Students can upgrade laboratory tests by making them computer-controlled. So, the next class will benefit from it, and enhance the existing application by adding new modules to it.
- Students working on projects that involve data acquisition can speed up the data collection and processing by transferring the data directly from the measuring device to a spreadsheet for example.
- Students will get experience on instrumentation, which is an area of increasing concern in industry Development of techniques that can be economically implemented is clearly of interest to many industries, including regulatory agencies.

Cost Breakdown:

LabView Software: (including 35% discount for teaching purposes)	$1,950.00
Analog-to-Digital card with 8 channels (including 10% discount for teaching purposes)	$1,345.00
166 MHz computer (including 10% discount for teaching purposes)	$2,000.00
Total	$5,295.00

Implementation Schedule:

LabView provides a very friendly programming environment, and includes tutorials for different applications. A couple of days is required to start using the software at a basic level. Then, students willing to use this instrumentation software could start their projects immediately, after the purchase of the proposed equipment.

Flow Proportioning Valve and Control Module

Submitted By:

Bruce Stickney
Phone Number : 2908
Position : Water Resourses Group; Civil Engineering
Date of Submission : 97/02/28

Description of Proposal:

This valve and control would be used initially in our Civ.E. 472 Labs for flow control of Air to Continuous Reactors in the Biodegradation Lab and flow control of contaminant to Carbon columns in the Carbon adsorption Lab. It would be compatible with our current data aquisition/control system and make better use of the technology available. It could also provide better flow control for our Plug Flow Reactor used for the Civ.E. 375 Mixing Lab as well as other Student projects.

Proposal Benefits:

This valve would allow the operator/student to control flow from a data aquisition/control system as is being used in the current Civ.E. 375 Mixing Lab and also for upgrading of our Civ.E. 472 Labs expanding the scope the current experiments. This involves approx. 220 students per year.

Cost Breakdown:

$ 840.

Implementation Schedule:

Spring Term 1997

Peristaltic Pump

Submitted By:

Bruce Stickney
Phone Number : 2908
Position : Water Resourses Group; Civil Engineering
Date of Submission : 97/02/28

Description of Proposal:

This pump would be used for a recent upgrade to Civ.E. 375 Mixing Lab. and would allow for accurate measurement and control of flow to Mixing Models. The unit proposed comes complete with remote control capability so it can be incorporated into the current data aquisition/control hardware. It would also be appropriate for use in the Civ.E. 472 Biodegradation Lab. and Carbon Adsorption Lab. and Student projects.

Proposal Benefits:

This pump would allow the operator/student to instantaneously verify flowrate settings and provides for fast set-up and calibration for labs. and project work. In addition this unit has provision for external control from a data aquisition/control system as is being used in the current Civ.E. 375 Mixing Lab. The addition of the control function would also allow for upgrading of our Civ.E. 472 Labs expanding the scope the current experiments. This involves approx. 220 students per year.

Cost Breakdown:

$ 1420.

Implementation Schedule:

Spring Term 1997

DC Power Supply 150V/18A

Submitted By:

William Ott
Email: wmott@eestaff
Phone Number: Ext 6134
Position (Student, Professor, Organization, etc.): E. & C. E. Department Lab Director

Description of Proposal:

At the present time, no power supply exists (that I am aware of) with such high ratings. This variable power supply would be used in testing projects and performing labs specifically for E&CE-463. At present, we have DC power supplies of maximum 40V / 10A and these are regularly borrowed by other departments for their experiments or projects. The proposed power supply would also be available to other departments while not in use in the E&CE Department.

Proposal Benefits:

The proposed power supply would benefit E&CE-463 students in their projects and labs. Other E&CE labs in 261, 269, 362, and 485 could also benefit. Other departments could avail themselves of the power supply as their needs dictate. I have had several requests for higher ratings than our existing 40V / 10A power supplies.

An additional AutoBode System will decrease the waiting time for them during the lab pThe proposed power supply would benefit E&CE-463 students in their projects and labs. Other E&CE labs in 261, 269, 362, and 485 could also benefit. Other departments could avail themselves of the power supply as their needs dictate. I have had several requests for higher ratings than our existing 40V / 10A power supplies.

Cost Breakdown:

DC Power Supply 150V / 18A (used)	$1875.00
Total	$1875.00

Implementation Schedule:

We would like to install the Power Supply in April, so that it will be ready for the Summer 97 term.

AutoBode System

Submitted By:

William Ott
Email: wmott@eestaff
Phone Number: Ext 6134
Position (Student, Professor, Organization, etc.): E. & C. E. Department Lab Director

Description of Proposal:

Build an additional AutoBode System to enable E&CE-380 students to obtain automated bode plots (frequency response) of electronic circuits under test. At present five (5) systems are shared by twelve work stations. With the double 3B stream at present, there is a backlog waiting for a system.

Proposal Benefits:

An additional AutoBode System will decrease the waiting time for them during the lab periods.

Cost Breakdown:

HP-3557A Gain Phase Meter (used)	$3700.00	
PR-9102 Raven Printer (used, existing)	0.00	
DAS-08 A/D Computer Card	269.00	
Cart	250.00	
"IBM"-XT (used, existing)		0.00
Sine Card	250.00	
Tax	465.00	
Total	$4934.00	

Partial funding would be acceptable, with the E&CE department supplying the difference.

Implementation Schedule:

We would like to install the AutoBode in August, so that it will be ready for the Fall 97 term.

UltraSparc Computing Server for Unix System

Submitted By:

Roger Sanderson
Email: rsanders@eestaff
Phone Number: Ext 6184
Position (Student, Professor, Organization, etc.): E. & C. E. Department Lab Technologist

Description of Proposal:

The E&CE department has a network of Sun Workstations connected to a Sun UltraSparc Server. Three of the newer work stations are have their memory upgraded to 64M as soon as the ordered memory arrives. This will improve the overall performance a bit by eliminating a lot of program swapping in and out of the present 32M memory. A major improvement would occur if an UltraSparc Computing Server was added to the system. Its only function would be to supply computing power to the network and is the most cost effective solution at this time. Access to this computing server could be done via Unix Workstations as well as Dos machines on Watstar.

Proposal Benefits:

These Unix based systems are used by all fourth year and some third year E&CE students. Computing time for assignments and projects would be cut considerably.

Cost Breakdown:

One of the following two options would be acceptable.

Option 1 (Lower performance server):

UltraSparc 140 Computer	$7,026
Extra 64 meg of 3rd party memory	$1,000
SubTotal	$8,026
Tax	$ 834
Total	$8,860

Option 2 (Higher performance server):

UltraSparc 170 Computer	$14,057
Tax	$ 1,462
Total	$15,519

Partial funding would be acceptable, with the E&CE department supplying the difference.

Implementation Schedule:

We would like to install the Unix Computing Server in April, so that it will be ready for the Summer 97 term. This is a major installation, and can only be done between terms.

Conversion Heat Transfer Labs

Submitted By:

M. Kaptein, Mechanical Engineering
E-MAIL: RKAP@SURYUA
PHONE NUMBER: 3026
TITLE: Laboratory Director, Mechanical Engineering

Description of Proposal:

For teaching the Department of Mechanical Engineering utilizes for its teaching in Thermodynamics and Heat transfer undergraduate laboratory stations. This experimental apparatus was designed to be used with the refrigerant R11, which is now, by law, no longer an accessible refrigerant.

It is essential that we retain the use of these experimental teaching aids and need to convert these laboratory experiments to work with the refrigerant R1416.

Unfortunately, because of the arrangement of the equipment converting to a different refrigerant in not a simple task and we must involve the manufacturer

Proposal Benefits:

The boiling heat transfer unit and the Refrigeration Cycle unit are used in core courses in Mechanical, Electrical and Computer and System Design Engineering (ME 250, E & CE 309, SYD 381, ME 456 and ME 353).

Cost Breakdown:

The cost of the two conversion kits is $5,800.00

Implementation Schedule:

Summer 1997

MASTERCAM Software ME 548

Submitted By:

M. Kaptein, Mechanical Engineering
E-MAIL: RKAP@SURYUA
PHONE NUMBER: 3026
TITLE: Laboratory Director, Mechanical Engineering

Description of Proposal:

Manufacturing is a very important facet of Mechanical Engineering Technology. One of the courses is the Manufacturing Area is ME 548 (numerically controlled machine technology). This courses provides hands on experience and requires a software tool in conjunction with the NC machinery.

Our present software (ICAM 1988) is no longer supported by its supplier and is desperately outdated. WEEF supported this proposal in the Fall of 1996 ($1848.00) for a first copy of new software. Having found that this software is appropriate we require additional funding to make the change in software for the full course.

Proposal Benefits:

This project will benefit all students participating in ME 548 and many students doing design and manufacturing projects. This software allows machine parts to be readily designed and far more effectively manufactured.

Cost Breakdown:

10 copies = $10,500.00

20 copies = $14,785.00

Implementation Schedule:

Summer 1997

Pump Performance Demonstration Laboratories

Submitted By:

David Johnson
da3johns@surya.uwaterloo.ca
Mechanical Engineering Department
Phone: x3690

E. Weckman
Mechanical Engineering Department
Phone: x3345

Description of Proposal:

This laboratory is being developed to give mechanical engineering students exposure to the selection and performance of various types of pumps in a realistic setting.

The laboratory will require the analysis of a pump flow loop including piping losses and pump performance. Students will be given a set of operating conditions that must be met, for which they will select a pump type and appropriate operating characteristics. The selected pumps will be installed in the flow loop and the pump performance (efficiency, head) will be tested. Written lab reports will be submitted.

Proposal Benefits:

Many mechanical engineering students will have to analyze a flow network in a work term or in the course of their career. The theory for pump/piping systems is presented in ME 351 Fluid Mechanics I and ME 362 Fluid Mechanics II and in the advanced courses Me 563 Turbomachines, ME 566 Fluid Mechanics III and ME 569 Fluids Design Topics. At present in ME 351, an air flow laboratory demonstrates the concepts of flow measurement and losses in pipe flow. The new laboratory will be used in various forms in ME 362, ME 563, ME 569 and potentially ME 566.

Cost Breakdown:

• Pump with speed control	$ 1,000
• Flow meters, gauges, Tach	$ 1,600
• Dynamometer	$ 2,000
• Piping, Valves	$ 1,000
Total:	$ 5,600

Watstar Terminals in the Systems Design DASL Lab

Submitted By:

Susan Lee
email: slee@systems.uwaterloo.ca
phone number: (519) 884-0196
position: 3B systems design class

Description of Proposal:

The 3B systems design class would like to propose the purchase of 6 Watstar Pentiums in the systems design DASL lab.

** Excerpt from David Walsh's email **

You have our full support (Lab Director etc.) for asking WEEF for 6 Computers. If purchased 4 would go into the newly expanded section of DASL (scheduled to start towards the end of April) along with 2 NeXT machines. The other two machines will displace existing PC's in DASL which (the displaced machines) in turn will replace some of the computers (286's) used for Workshop Projects. Upon ordering the computers we would expect to have them delivered, cabled and operational within 2-3 weeks.

A Watstar Card can be purchased through Engineering Computing for $300.00 each.

** Excerpt ended **

We also have the full support of the systems design department for this proposal (represented by John McPhee of Systems Design Department)

Proposal Benefits:

Currently, there are 14 watstar terminals (486's) that are in systems design labs (DASL, RASL). As there are two to three systems design classes on term at all times, with each class size approximately 80 students, there is always a shortage of computers. Per term, there is a minimum of one course up to four courses that require the use of computers (programming languages like C, Maple, Matlab, and word processing for projects, assignments, and labs). Basically, systems design students live on computers and there just aren't enough computers to go around.

Cost Breakdown:

** Exerpt from David Walsh's email **

Here are the computer specs.

Pentium 166 PCI Workstation
512 K Cache
Mini Tower case w/ 2 fans
32 Meg EDO Ram
2 serial, 1 Parallel Port , Quad IDE Ports
1- 1.44 Meg Floppy Disk Drive
Quantum 2.6 Gig Enhanced IDE Drive ***
ATI Graphics Expression Mach 64 w/ 2Meg Ram
ADI 15 inch Color Monitor

Enhanced Keyboard
Microsoft Mouse w/ pad
Warranty : 2 years Parts and Labour - $2115.00

Upgrade to 17 inch ADI Color Monitor - $342.00

Final price → 15852.00 - 5.

*** the 2.6 Gig was chosen on suggestion of WATSTAR to comply with any unforeseeable requirements to the addition of WIN95 to the Watstar network.

** excerpt ended **

Will be set back

~~If not~~ dept will print in 1.

Implementation Schedule:

refer to "Description"

Purchase of Working Model Software

Submitted By:

Prof. John McPhee
Systems Design Eng.
DC-2629, ext.5341, mcphee@real

Description of Proposal:

Working Model is a software package that will automatically perform a static, kinematic, or dynamic analysis of a given mechanical system. Systems are created graphically, by selecting icons that represent bodies, joints, springs, dampers, forces, gears, et cetera. By automating the analysis of a system, the engineer can spend more time on the creative aspects of the design process.

Currently, I have 20 copies of Working Model 3.0 installed on the Watstar network, running under Windows 3.1. My proposal is that WEEF provide funding for an upgrade to version 4.0 of this software; a secondary proposal is that WEEF purchase a single copy of Working Model 3D, for evaluation purposes.

Proposal Benefits:

Working Model 4.0 is a 32-bit application, running under Windows'95 or NT, that runs 3-10 times faster than previous versions. Since plans are afoot to provide Windows'95 on the Watstar network, we will have a platform on which to provide Working Model 4.0 to UW students. Although version 4.0 does offer some additional modelling capabilities, its main advantage over 3.0 is its speed of simulation. Neither version is capable of modelling three-dimensional systems such as industrial robots and vehicle suspensions; the new Working Model 3D software provides this capability.

Currently, Working Model 3.0 is used in both SD 382 and ME 321; demonstrations of Working Model were given in both of these courses this term It is also used in workshop projects in Systems Design and Mechanical Engineering, as well as some 500-level courses. The Systems Design and Mechanical Engineering courses in Advanced Dynamics might particularly benefit from the use of Working Model 3D.

Cost Breakdown:

U.S. $1080 for upgrade of 20 copies of Working Model 3.0
(includes cost of manuals, as well as extra modelling tools for Autocad and beams)

U.W. $495 for purchase of Working Model 3D

Implementation Schedule:

Assuming Windows'95 is in place on Watstar by the Fall'97 term, the new software could be used in the Advanced Dynamics courses in Systems Design and Mechanical Engineering, and in SD 382 and ME 321 next Winter ('98).

Undergraduate Digital Circuits Lab Upgrade

Submitted By:

	Paul Fieguth	Kevin Krauel
Email:	pfieguth@uwaterloo.ca	bkrauel@kingcong.uwaterloo.ca
Phone:	x3599	5760
Positions:	Professor	Lab Director

Description of Proposal:

This proposal is meant to solicit your financial support to help the department of Systems Design Engineering upgrade its undergraduate digital circuits laboratory. This laboratory serves an essential role in the SD 192 (digital circuits) undergraduate course which is taught every summer. Since the summer of 1996, two changes have taken place, rendering the current state of the lab unsuitable for digital circuits instruction, making two upgrades mandatory:

1. A set of digital circuit prototyping boards were developed in-house in 1989. The boards have functioned very well, however the number of damaged or lost boards is such that we have ZERO spares, and any further damage or loss will affect the ability of the lab to continue to function. We urgently need a new set of boards to be manufactured.

   We have researched local printed-circuit board production options, and we propose to design an updated prototype board and to have twelve of these produced (with an option to produce additional boards in the future if needed).

2. The lab facility is shared with two other courses (SD 292, SD 352). Recently, the aging NeXT workstations in the facility were replaced with modern PCs (satisfying a badly needed upgrade for SD 352). The NeXT workstations had been used for digital circuit simulation, an essential component of the laboratory experience; such circuit simulation software needs to be purchased for the new PCs.

   We have tested several digital circuit simulation packages, and propose to purchase the B^2-Logic Version 3.0 simulation package from Beige Bag Software (Ann Arbor, Michigan). We would like to purchase eight licences - one for each lab station.

Finally, there is a third aspect to this proposal, which we believe would significantly improve the quality of the laboratory experience:

3. In addition to the classical digital circuitry (discrete logic, flip-flops, EPROMS etc.) currently taught in the lab, we would like to include a more modern component (programmable gate arrays).

An elegant and simple but powerful programmable gate array board is produced by XESS Corp (Apex, North Carolina) - the epX31 V1.0 based on the Altera 880 gate array. The board was designed for educational purposes and would complement our lab well. The Altera 880 can be reprogrammed an arbitrary number of times, so no incremental expenses are incurred.

Proposal Benefits:

The goals of the digital circuits laboratory are to educate students broadly in the design of digital circuits, and to prepare students for industrial circuit design problems encountered on workterms.

The proposed laboratory upgrade fulfills these goals well -- students are exposed to all manners of combinatorial, sequential, and state-machine circuits, and acquire experience in advanced simulation and gate-array design - both much more prevalent in practice than the typical undergraduate lab practice of point-to-point wiring. The most tangible benefits are those from the digital logic simulation and gate array hardware, which maximize the opportunities for digital circuit design and testing, while minimizing the frustration and tedium associated with wiring large circuits.

SD192 is a core first year undergraduate course, so approximately 80 students per year will benefit from the proposed lab upgrades. In addition, a significant number of third and fourth year undergraduate workshops undertake extensive digital circuit design, and the simulation software and, in particular, the gate-array hardware will make practical considerably more ambitious circuits and potential applications.

Cost Breakdown:

The complete cost breakdown is as follows:

Qty	Description	Unit Price	Cost
12	Circuit Prototyping / Testing Boards:		
	Board Layout and Circuit Routing		$900.
	Printed Circuit Board Manufacturing		$1200.
	Board Components	(@ $60)	$ 720.
	Board Soldering	(@ $10)	$ 120.
	Board Power Supplies	(@ $10)	$ 120.
8	Beige Bag B^2 Logic Simulation Package Version 3.0 with Educational Discount	($150 / Licence)	$1200.
12	XESS epX31 V1.0 - Student Version	($200 / Board)	$2400.
10	Altera 880 Devices	($75 / Device)	$ 750.
	Estimated Taxes and Shipping Charges		$ 340.
			$7750.

With respect to a partial funding arrangement, clearly any contributions which we receive from WEEF will be highly appreciated. Given the rather substantial recent outlay of the Systems Design department towards its SD 352 undergraduate laboratory, laboratory development funds are currently in short supply.

The prototyping/testing boards and the circuit simulation software are badly needed, and it is inconceivable that the lab could operate without these; however the lab would be able to function without the additional gate array components, although this would lead to a diminished laboratory experience. The corresponding bare-bones budget is as follows:

Qty	Description	Unit Price	Cost
12	Circuit Prototyping / Testing Boards:		

	Board Layout and Circuit Routing		$ 900.
	Printed Circuit Board Manufacturing		$1200.
	Board Components	(@ $60)	$ 720.
	Board Soldering	(@ $10)	$ 120.
	Board Power Supplies	(@ $10)	$ 120.
8	Beige Bag B^2 Logic Simulation Package Version 3.0 with Educational Discount	($150 / Licence)	$1200.
	Estimated Taxes and Shipping Charges		$ 200.
			$4460.

Implementation Schedule:

The equipment and software will be ordered as soon as WEEF and (if necessary, and possible) departmental funding levels are determined. The circuit simulation software, the epX31 boards, and the Altera 880 chips are all in stock at their respective suppliers and can be shipped immediately.

Initial design has begun on the prototype/testing boards, however detailed design cannot be completed until budgetary matters have been settled, since slight modifications would need to be incorporated to support the programmable gate array devices, if purchased. The quoted board layout and routing cost assumes a turn-around time of three weeks. As the summer term approaches, if a shorter turn-around time is required the corresponding cost increases

Additional Information:

There are three points which we would like to emphasize:

1. Some level of lab upgrade is essential!

2. Given that the 192 lab is being overhauled, it is far more efficient and cost effective to make all upgrades at one time, rather than to spread them over a period of years; thus it is vastly more straightforward to introduce gate-arrays now rather than in one or two years.

3. The upgraded lab will provide immediate benefits to 80 first year students each summer, as well as tangibly improved support for digital design in undergraduate workshops throughout the year.

3D Graphics Development Tools for Engineering Simulations

Submitted By:

Kieran Lal
amazon@systems
747-5581
Student 4B Systems Design Engineering

Description of Proposal:

This proposal recommends the purchase of 25 site licensees of Open Inventor Software Development Tool kits. Open Inventor is the standard development tools for developing 3D graphics. The original software was developed by Silicon Graphics and until recently has only been available on expensive SGI machines. The software is now available on standard PC's. The software greatly reduces the development time and difficulty of developing 3D graphic applications in particular the modeling of real-world systems.

The software company that develops Open-Inventor for the PC is Template Graphics Software. The software would be stored on a password protected server and the licenses would be restricted to a first come first serve basis as recommended by engineering computing. For more information about the software check www.sgi.com or www.tgs.com.

Proposal Benefits:

This software provides cost efficient development tools that are currently only available to select graduate students and a limited number of undergraduate students. Anyone wishing to model a system in 3D must either use low level programming environments such as OpenGL or have access to powerful workstations that have 3D software. The faculties that would benefit most would be Mechanical and Systems Design. However any student or professor that wanted to develop 3D simulations for labs or projects would greatly benefit from these tools. For example, the ME447 course is currently restricted to using 2 robot arms for its project course. A simulator could easily be developed that students could work with prior to using the robots and greatly reducing debugging time. Also, half a dozen Mechanical graduate students are currently developing robot simulators with OpenGL. This is a very time consuming and difficult task. The Open Inventor software provides the framework for application development and allows the developer to focus on the simulation rather than on programming.

Open Inventor allows for development with interactive graphics. It is also the standard for the Virtual Reality Mark-up Language. This would allow simulated 3D worlds to be viewed over the Internet using a standard browser.

Cost Breakdown:

I propose the following funding scheme. One copy on a 30 day money -back guarantee trial should be purchased immediately. This is to be followed by the purchase of 25 site licenses this spring for a cost of $4000 US plus a $1000 US annual renewal fee. Another option would be to buy 10 site licenses for $3500US. Finally, single copies could be purchased for $500 US each.

Faculty of Engineering Undergraduate WATSTAR facility upgrades

Submitted By:

Name: *Professor Beth Jewkes, Engineering Computing*
Phone Number: *885-1211 Ext: 4601*
E-mail Address: *emjewkes@mansci.watstar.uwaterloo.ca*
Position (ie student, professor): *Associate Dean for Computing*

Description of Proposal:

1. To prepare the labs for the introduction of Windows 95, the Hard Disk Drives on all the PCs must be upgraded to 2.2 GB if they do not presently have that capacity. The 32 machines in Shim and Wheel have 1.1 GB HDD. The PCs in Helix also have 1.1 GB HDDs. It is our intention to increase the capacity of the equipment in Helix to 2.2 GB HDDs. The existing 1.1 GB drives will be then added to the existing drives in Shim and Wheel for a total of 2.2 GB drives (2 x 1.1 GB). The addition of additional space will enhance the Windows operations by a factor of from 2 to 10 times. We are requesting the assistance of WEEF in the purchase of 28 2.2 GB hard drives for the Helix lab to make this room compatible with the remainder of the Watstar rooms.

Proposal Benefits:

1.E2 - 1302 (Wheel & Shim Watstar Lab)

- it is one of the most heavily used PC labs in Engineering and is in constant demand by the students for course work
- all undergraduate students using the Windows 95 software to be installed during the Fall 97 term will require a minimum of 2.2 GB hard disk drives
- development of course work accessible to all students in Engineering via the Internet will be enhanced with the purchase of the larger Hard Disks
- multimedia applications which are becoming commonplace will demand the use of space on these hard drives

Cost Breakdown:

Quantity	*Description*	*Unit Price*	*Total Cost*
28	*2.2 GB, 128 K Cache IDE Hard Drive*	*$365*	*$10,220*

Would partial funding to the cost estimate provided above be acceptable? (Y or N) **YES**

Room	Server	Present HDD 1.1 GB	Upgrades for W 95 2.2 GB	WEEF Support	Engineering Computing
EL 108	Helix	28	28	X	
E2 1302	Shim	16	16		X
	Wedge	16	16		X
E2 1308	Wheel		24		X
CPH 1390A	Lever	12			
CPH 2367	GAFF		16		

The 28 1.1 GB HDDs from Helix will be added to the existing 1.1 GB HDDs that are now in Shim and Wedge to increase the capacity to 2.2GB. Engineering Computing will purchase 16 2.2 GB HDDs for GAFF and 4 1.1 GB for the remaining pcs in Shim and Wedge.
The Lever lab will remain with its present configuration.

~~LANDAUISE~~
WILL HAPPEN REGARDLESS.

WILL TAKE ~~A~~ PARTIAL

Student Machine Shop Equipment

Submitted By:

C. Wallace
Phone Number: 2301
Position: Supervisor, Student Engineering Machine Shop

Description of Proposal:

The Student Machine Shop provides essential hands-on experience for all undergraduate students either for core class courses or special projects. The shop is in need of a digital readout system to facilitate machining activities on existing Standard Modern Lathe.

Proposal Benefits:

Without a digital readout system certain machining jobs are very difficult, or impossible. It would also help students to program imperial conversion to metric or vice versa, this is especially useful since the lathe dials show only imperial units.

All Engineering students and Engineering Departments will benefit greatly for this upgrade.

Cost Breakdown:

Sargon Gold Star Digital Readout System:

1	10"Cross Slide Scale for Lathe	$ 41.17
1	32" Mini Scale	644.00
1	Gold Standard Digital Readout	681.00
	Installation Charge	525.00
	Subtotal	$2,391.17
	GST	167.38
	PST	191.29
	Total	$2,739.84

Implementation Schedule:

Summer, 1997

Additional Information:

The purchase of the above digital readout system will help improve and upgrade standards in the existing Student Engineering Machine Shop. It will also improve safety conditions when operating the lathe. This funding would be very beneficial, since there are no extra funds available in the existing shop budget.

Mini Baja Team

Submitted By:

Chris Mitchell camitche@mechanical 699-5638
Steven Peplinski sppeplin@mechanical 885-2639

Description of Proposal:

The Mini Baja is an international student design competition jointly sponsored by the Society of Automotive Engineers and Briggs and Stratton Corporation. Each team must design and build a single seat off road vehicle to compete in a number of events. This WEEF proposal consists of three parts: partial funding for the enlargement of the door to the room, travel expenses, and helmet and goggles.

The Mini Baja team currently consists of 32 individuals from first to fourth year, representing 4 departments within the Engineering Faculty. Currently there are 7 students working on for credit in ME321 and two students working for credit in ME 482. In addition to this, many other students are gaining practical design and drafting experience using SDRC I-DEAS as well as actually building components.

Funding has been obtained for all of the major components of the car, however, racing expenses remain largely unfunded. The main component to this proposal is the enlargement of the door to the Mini Baja room. Currently, the tires must be removed from the 1996 car and the car must be lifted through the doorway. The 1997 car is 1.25 inches wider than the 1996 car and will not fit through the door unless the entire suspension is removed. The other two components of the proposal involve race expenses. A suitable helmet and goggles with "tear-offs" must be purchased to meet safety requirements and maintain the driver's visibility during the competition. We are also requesting partial funding for our travel expenses.

Cost Breakdown:

Enlargement of Door	1000
Travel Expenses	500
Helmet	200
Goggles and Tear-Offs	100
Total	1800

Implementation Schedule:

The competition will be held from May 30 to June 1 near Dayton Ohio. The expected completion date for this project is May 1 which will enable us to satisfactorily test the vehicle before the competition. This means that all purchases from this proposal will be completed by May 1.

Additional Information:

If you have any questions regarding this proposal or about the Mini Baja team in general, please contact me at camitche@mechanical or Steve Peplinski at sppeplin@mechanical.

Batteries for the Midnight Sun Solar Race Car Project

Submitted By:

Gregory Bridgett - Electrical Manager
Phone Number: x2978

Description of Proposal:

While solar cars are powered by the sun, they require some means to store the energy absorbed for later use. Battery storage systems are a **vital component of the solar race car system** since their capacity and efficiency directly relate to the ultimate performance of the vehicle. Therefore, in order to be competitive the Midnight Sun Race Car requires the best in available lead-acid battery technology.

In conjunction with GM's new electric vehicle program, Delphi Automotive has created a superb lead-acid electric vehicle battery module. It has a higher capacity than most on the market, is designed to be installed in cars and are thus very safe. During the race, they will be supported with expert technical advice. Moreover, the modules are being **sold to solar car teams for one half of their purchase cost**.

Batteries purchased for the solar car project have a life span of about four years, serving to power the solar car in races and shows, and then providing large power storage for remote power applications (such as power tools on the side of the road!)

Proposal Benefits:

The Midnight Sun Solar Car Project involves over 100 students from **all** departments of Engineering, as well as from numerous other university faculties (Science, Math/CS, Arts). The purchase of these batteries will enhance the overall design and performance of the solar car and thus the standing of UW in upcoming races.

In June, UW will be competing against Western, Queen's, and other Canadian schools in a race that will be passing through Waterloo. Later in June, we'll be competing in the US against North American schools.

The advanced batteries required will last for a long period of time, serving to power the Midnight Sun IV car for 1997/98 races, as well as for tours and appearances in the future.

Cost Breakdown:

Each unit costs $560 including current exchange rates, shipping and taxes. We are requesting $2800 for five units. Ten are required in MSIV. The remaining funding will come from the Federal Ministry of Natural Resources.

Partial funding could be given for the purchase of any whole number of these units, with the recommendation of four for $2240.

Implementation Schedule:

When WEEF provides the commitment for funding the units, they will be purchased from Delphi Automotive in Indianapolis. Upon competition of the electrical system construction, the batteries will be installed in the solar race car for systems testing. In May, the car will be on the road for full race testing before the two races in June.

Siva Ganesh - Chem F'97 x6161

$8438 → $3650 left E1-1516

W'97 Prof Silverstein x2541 E1-2913

$6800

Reuter Engr's Exp. for ChE 040 $524

W'98 $9000 → new experiments

L12 B E VAN x2296

cabevan@cape

(AA)

The 1998 Great Northern Concrete Toboggan Team

Submitted By:

Lana Russell (student)
e-mail: lrussell@rovers.com
phone: 746-7246

Sharla Howard (student)
e-mail: sdhoward@civil
phone: 746-7246

Description of Proposal:

The Great Northern Concrete Toboggan Race is an annual design competition involving universities from across Canada and the United States. This years race was held in Ottawa and was composed of approximately 25 teams. The 1998 competition will be held in Calgary.

The objective of the competition is to design and construct a toboggan with a concrete running surface, breaking and safety systems, and the capacity for five riders. Entries are judged based on technical presentation, sled design and logistics, and overall team spirit.

Proposal Benefits:

The Great Northern Concrete Toboggan Race allows students to apply many of the concepts developed through the civil engineering cirriculum. Not only does this competition allow application of principles studied, but it also strengthens the reputation of Waterloo internationally. The project involves 40 plus fourth year civil engineering students.

Cost Breakdown:

The 1998 team is currently in the start-up stage. We are preparing to initiate more intensive fundraising and to begin our preliminary toboggan design when we return to school in May. Presently, we require funding for:

- initiating fundraising events (eg. burger sales)
- updating and reprinting our promotional packages (which are used to solicit sponsorship from businesses)
- purchasing of building materials
- creating a base fund to transport the 40 plus people involved to Calgary

Request funding in the range of $5,000.00. (Partial funding is welcome)

Implementation Schedule:

Currently the project is already under way, all Arctic Fire members are soliciting sponsorship from family, friends and the business sector while on work term. Once back in classes in May (Summer 1997), Arctic Fire plans to continue fundraising efforts and to commence design of our toboggan.

Additional Information:

Important points to consider regarding the proposal:

- In 1998 the University of Waterloo will be represented by only one team due to the destreaming of the civil engineering classes. This is the reason why we are applying off-stream.

- Arctic Fire's race is in February of 1998, that's only one year away!
- Arctic Fire will be competing in Calgary, the cost of transporting 40 plus people and a toboggan (possibly two) to Calgary will be immense.
- Waterloo always does well at these competitions, we placed 1st and 3rd in the 1997 competition, thus the races enhance Waterloo's reputation.

1999 Concrete Toboggan Team

Submitted By:

André Brisson
725-3861
Student (Team Coordinator)

Description of Proposal:

The Civil class of '99 are asking for WEEF support for our concrete toboggan entry in 1999. This contribution will aid the team with fundraising start up costs, team communication costs (photo copies. etc), and aid with future expenditures.

Proposal Benefits:

This contribution will affect roughly 30 students in the Civil Engineering Department. The contribution will aid reduce the amount of personal monetary donations to the team which will result in a greater interest in the project. This Concrete Toboggan project will give the '99 class hands on experience in different areas which will be beneficial to our engineering career (eg. designing and implementing a project).

Cost Breakdown:

$85 team member entry fee = 85 * 30 = $2550
Transportation = $2000
Accommodations = $100 * 30 = $3000
Building of Toboggan = $2000

The 1999 Concrete Toboggan Team is asking WEEF for $2500.00

Implementation Schedule:

Race date will be end of January 1999
Building Date of the toboggan will be end of December 1998
Fundraising began February 27, 1996

1999 Concrete Toboggan Hosting Proposal

Submitted By:

Carrie Junker
886-9148
crjunker@civil
3A Civil Engineering

Mark Popik
725-2637
mpopik@civil
3A Civil Engineering

Description of Proposal:

We are going to put in a bid to host the 1999 Great Northern Concrete Toboggan Race (GNCTR) in Waterloo. The bidding process involves travelling to Calgary, Alberta in February of 1998. We are asking for a donation to help fund our trip to Calgary; this will include plane fare and accommodations.

Proposal Benefits:

The donation given by WEEF will be money very well spent if we are granted the hosting privileges. If the GNCTR comes here to Waterloo, it is an opportunity for positive publicity such that the University of Waterloo and the Engineering Facility has ever seen. Therefore we would strongly urge WEEF to help us out.

Cost Breakdown:

We are requesting $3000 from WEEF to allow the organizing committee of 6 engineering students to travel to Calgary to bid for the GNCTR. The amount would be spent in the following way:

- $400 per person for travel cost to the GNCTR in Calgary.
  (6 X $400 = $2400)
- $100 per person for the week accommodations in Calgary.
  (6 X $100 = $600)

No-Dig Conference - Seattle Washington

Submitted By:

John Scholte 4B Civil Engineering
jwscholt@bridge
885-6421

Description of Proposal:

The No-Dig Conference is an annual conference showcasing current and developing technologies within the field of trenchless technologies. The University of Waterloo has recently set up the Centre for the Advancement of Trenchless Technology (CATT) and are currently one of two schools in Canada that teach this subject.

We are planning to send 10-12 4th year Civil Engineering students. Additional funding is currently being sought from other on campus sources, however, WEEF represents our largest source of funding.

Proposal Benefits:

This conference would provide an excellent opportunity for Waterloo students to learn more about this field and in addition make important contacts between industry representatives and the University of Waterloo.

Cost Breakdown:

In order to defer the costs of the air travel, accommodation, and conference fees we are asking for financial support of $1200.00. This amount represents approximately 20% of the estimated cost to attend the conference. Partial funding will of course be accepted and appreciated.

UW CASI Free Flight Glider Team

Submitted By:

Gregory Thompson, Project Manager
Email: g2thomps@novice.uwaterloo.ca
Phone: 416-798-6868 x2843

Description of Proposal:

The UW CASI Free Flight Glider team is a group of students who are constructing a glider to be entered in a National Competition in May 1997, sponsored by the Canadian Aeronautics and Space Institute (CASI) This will be the second entry for the glider team. Last May, we travelled to Calgary and placed third. We also brought home the TOP GUN award for 'The Best Unexpected Arrival.'

Our team has been working very hard since the competition in May of 1996. We have designed a brand new glider which has taken shape in the form of a flying wing. To date we have been flying glider prototypes since October. Since the wind tunnel is not in operation we have been forced to create a large series of prototypes to do all of our dynamic testing. We have achieved tremendous results with these prototypes with some of them flying beyond the best entries into the 1996 competition.

We are looking for WEEF to continue to sponsor our team in our entry into the 1997 competition. We require additional funds to purchase some more materials, some power tools and to help pay for the expense to travel to the competition.

Proposal Benefits:

The competition is a national competition against schools from Ontario, Quebec and the Western Provinces. There are currently nine schools entered into the competition.

- Our team was interviewed by CBC News during our flight trials at the competition last year.
- There is a great possibility of hosting the competition next year which will bring a lot of attention and media to the university.
- Team members include students from Engineering, Math, Arts. (80% from Engineering)
- This project is a lead in to ME564 aerodynamics, ME 533 composite materials, ME 482 project course plus all the basics (MODS etc,.)
- Many large companies are involved in this project which broadens the Universities involvment in the corporate community.
- The tools purchased can be used by other teams if needed, and the tools will be assets for future glider projects

Cost Breakdown:

We need funding for:

Materials	Stryofoam Insulation	$250
	Consumables	$100
	Composite Materials	$150
Tools	Cordless Drill	
	Detail Sander	
	Cordless Dremel toolAL	$200
Transportation	Personnal Cars	$200
	Shipping of Glider	$100

TOTAL	$1000
Partial Funding Options	$800 (transportation and materials) $700 (tools and materials) $500 (materials)

Implementation Schedule:

Report due	March 31
Final Prototype	April 1
Competition gliders completed	April 15
Competition	May 9-11

Formula SAE '97

Submitted By:

Albert Tseng
ext. 5904

Description of Proposal:

Formula SAE is an annual design competition contested by approximately 100 universities from around the world. UW has competed since 1987 and has done as well as fourth overall. Although the 1996 Team was disappointed with their top third of field finish this May, they were very successful, setting the fastest lap time for the main event. Equipped with the knowledge gained from the 1996 team, the 1997 team has set a goal of a top five place overall finish in next year's competition.

Proposal Benefits:

In previous years, each car has been taken apart for parts for the new car. One of the objectives of the 1997 team is to gather enough funds to keep the 1996 car intact. This would be beneficial for both the Formula SAE Program and the Faculty of Engineering. For the Formula SAE program, students will be able to learn from the '96 car, test new ideas, perform driver training, and promote the vehicle for sponsorship. For the Faculty of Engineering, the Formula SAE car represents one of the best public awareness tools available. The fully intact car has already been displayed at many events including the Kitchener/Waterloo Canada Day Celebrations where many elementary and high school students have asked questions about the car and the Engineering Program at UW. Most of the successful US schools at the competition have a very strong history at the competition because of their ability to keep each car and thus learn from them and also attract the brightest students to their university.

There are 25 undergraduate engineering students from most of the engineering disciplines involved with the 1997 Formula SAE Team. These include 2nd to 4th year Mechanical, Civil, Electrical and Chemical engineering students.

Cost Breakdown:

The attached sheet lists the items which will be used on the 1997 car in order to keep the 1996 car intact as well as some tools (which can be used in future years as well) necessary to build the vehicle.

Implementation Schedule:

All parts will be purchased immediately.

Additional Information

The ability to learn from past cars is a definite advantage at the competition as shown by the successful schools. Every effort should be made to keep previous cars intact to help the University of Waterloo excel even further at the competition and at the same time gain recognition for the Faculty of Engineering.

FSAE WEEF Proposal - Winter 1997

Car Items		Qty	Unit Cost	Total
Sets of Tires	Front	6	$ 138.88	$ 833.28
	Rear	6	$ 140.00	$ 840.00
* First 1/3 of each tire will be used for 1997 Racing, the remaining to be used for testing and driver training for years following				
Chain		1	$ 80.00	$ 80.00
Sprocket		1	$ 50.00	$ 50.00
Tools				
Cordless Drill		1	$ 300.00	$ 300.00
3/8" Rachet		1	$ 30.00	$ 30.00
3/8" - 1/2" Adapter		1	$ 20.00	$ 20.00
Rivet Gun		1	$ 30.00	$ 30.00
Rubber Mallot		1	$ 12.00	$ 12.00
Hammer		1	$ 25.00	$ 25.00
Vise		1	$ 100.00	$ 100.00
Pyrometer		1	$ 160.00	$ 160.00
Surface Probe		1	$ 60.00	$ 60.00
Immersion Probe		1	$ 50.00	$ 50.00
Rack Tool		1	$ 60.00	$ 60.00
Other				
Race Car Vehicle Dynamics		1	$ 105.00	$ 105.00
Travel & Display Expenses		1	$ 500.00	$ 500.00

Department	Project Title	Submitted By	Max. Funding Request	Partial Funding
Chemical Engineering	Laboratory Equipment Upgrades - "Keeping up with the Times"	Lillian Liao	$5,794	Yes
	Reactor Engineering Experiment for CH.E. 040 and CH. E. 524	P. Silveston	$15,400	Yes
	Purchase of 4 New Computers for the Undergrad Chem Lab	Brian Barclay	$7,200	
Civil Engineering	Watstar Server Upgrade for Civil Engineering Students	Michael Herz	$7,020	Yes
	New Monitors for E2-2340	Ralph Korchensky	$6,580	
	Computer Controlled Data Acquisition System	Giovanni Cascante	$5,295	
	Flow Proportioning Valve and Control Module	Bruce Stickney	$840	
	Peristaltic Pump	Bruce Stickney	$1,420	
E & CE Engineering	DC Power Supply 150V/18A	William Ott	$1,875	
	AutoBode System	William Ott	$4,934	
	UltraSparc Computing Server for Unix System	Roger Sanderson	$15,519	
Mechanical Engineering	Conversion Heat Transfer Labs	M. Kaptein	$5,800	
	MASTERCAM Software ME 548	M. Kaptein	$14,785	Yes
	Pump Performance Demonstration Laboratories	David Johnson	$5,600	
Systems Design Engineering	Watstar Terminals in the Systems Design DASL Lab	Susan Lee	$16,542	
	Purchase of Working Model Software	John McPhee	$1,575	
	Undergraduate Digital Circuits Lab Upgrade	Paul Fieguth	$12,210	Yes
	3D Graphics Development Tools for Engineering Simulations	Kieran Lal	$4,000	
Other Departments	Faculty of Engineering Undergraduate WATSTAR facility upgrades	Beth Jewkes	$10,220	Yes
	Student Machine Shop Equipment	C. Wallace	$2,739	
Student Projects	Mini Baja Team	Chris Mitchell	$1,800	
	Batteries for the Midnight Sun Solar Race Car Project	Gregory Bridgett	$2,800	Yes
	The 1998 Great Northern Concrete Toboggan Team	Lana Russell	$5,000	Yes
	1999 Concrete Toboggan Team	André Brisson	$2,500	
	Concrete Toboggan 1999 Hosting Proposal	Carrie Junker	$3,000	
	No-Dig Conference - Seattle, Washington	John Scholte	$1,200	
	UW CASI Free Flight Glider Team	Gregory Thompson	$1,000	
	Formula SAE '97	Albert Tseng	$3,255	Yes
		Total:	*$165,903*	
		Funding Maximum:	*$50,000*	